

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

ANNUAL REPORT

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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 25, 2010. Dr. Tokio Wada, Chairman of PICES, welcomed delegates, observers and researchers to Portland and formally declared that the PICES Nineteenth Annual Meeting (PICES-2010) was open. The session agenda is appended as *OP Endnote 1*.

AGENDA ITEM 2

Welcome addresses on behalf of the host country

Dr. Larry Robinson (Assistant Secretary of Commerce for Oceans and Atmosphere and Deputy Administrator for the National Oceanic and Atmospheric Administration, U.S.A.) welcomed participants on behalf of the host country (*OP Endnote 2*).

AGENDA ITEM 3

Remarks by the Chairman of PICES

Dr. Wada thanked Dr. Robinson for his remarks, and addressed the participants on behalf of PICES. His comments are appended as *OP Endnote 3*.

AGENDA ITEM 4

Wooster Award presentation ceremony

Dr. Wada and Dr. John Stein, PICES Science Board Chairman, conducted the 2010 Wooster Award presentation ceremony. Dr. Wada introduced the award, and Dr. Stein announced the 2010 award is being given to Dr. Jeffrey J. Polovina, a world-renowned oceanographer with NOAA's Pacific Islands Fisheries Science Center (*OP Endnote 4*). Reading of the Science Board citation was accompanied by a slide show dedicated to Dr. Polovina. A commemorative plaque was presented to Dr. Polovina (a permanent plaque identifying all Wooster Award recipients resides at the PICES Secretariat), who accepted the award with the following remarks of thanks:

Thank you, Drs. Wada and Stein. What a surprising and amazing honour! I am especially humbled given the outstanding scientific talent in the PICES community and that represented by the previous awardees. This award is especially significant to me for several reasons. In the late 1980s, we observed ecosystem changes in the Hawaiian Archipelago and invited Dr. Wooster to Hawaii to help us develop a research program to understand those changes. Thus, Dr. Wooster's guidance helped shape the direction of much of my subsequent research on decadal variation. Secondly, while much of my research focuses on the subtropical ecosystem south of the PICES geographic area of interest, the PICES community represents my intellectual home. Its approach of addressing large spatial-scale dynamics, physical-biological linkages, and complete ecosystems has always had great appeal to me. Lastly, I would like to acknowledge that my achievements are the result of contributions from many wonderful colleagues, mentors, and co-authors, and I am truly grateful to the collaborations over many years with the talented staff of the Ecosystems and Oceanography Division of the Pacific Islands Fisheries Science Center.

AGENDA ITEM 5

PICES Ocean Monitoring Service Award presentation ceremony

Drs. Wada and Stein also conducted the presentation ceremony of the 2010 PICES Ocean Monitoring Service Award (POMA). Dr. Wada introduced the award, and Dr. Stein announced that the 2010 award be given to the Station Papa/Line-P monitoring program (*OP Endnote 5*). Reading of the Science Board citation was accompanied by a slide show dedicated to the various people who contributed to the program for the past six

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decades. A commemorative plaque (a permanent plaque identifying all POMA recipients resides at the PICES Secretariat) and a certificate were presented to Dr. William Crawford (Head of the State of the Ocean section at the Institute of Ocean Sciences, Fisheries and Oceans Canada), who accepted the award with the following remarks of appreciation:

I was honoured when asked to accept this award on behalf of Marie Robert and the Station Papa/Line-P Program. My role is mainly administrative, as many of the Line-P scientists are in my section of Fisheries and Oceans Canada.

This morning I compiled a list of 36 scientists who stand out among the thousands of persons who contributed to this program over the past years. I admit it is biased to recent years because my knowledge of the start of the program is limited. In mostly chronological order: John Tully, Sus Tabata, Tim Parsons, Robin Lebrasseur, John Strickland, Cary McAllister, John Garrett, Bob Stewart, Cedric Mann, John Davis, C.S. Wong, Paul Harrison, Ken Denman, Peter Nüiler, John Love, Reg Bigham, Bernard Minkley, Laura Richards, Frank Whitney, Tim Soutar, Howard Freeland, Robin Brown, Wendy Richardson, Mike Arychuk, Marie Robert, Ron Bellegay, Janet Barwell-Clarke, Lisa Miller, Keith Johnson, Sophie Johannessen, Angelica Peña, Jim Christian, Hugh MacLean, Doug Anderson, David Mackas, and our data quality queen: Germaine Gatien.

On behalf of Fisheries and Oceans Canada, Marie Robert (godmother), the three godfathers (John Tully, Sus Tabata and Frank Whitney), the list of 36, and the cast of thousands, thank you PICES for this great honour.

AGENDA ITEM 6

PICES “Year-in-Review” 2010

Dr. Stein reviewed PICES’ scientific accomplishments since the Eighteenth Annual Meeting (PICES-2009) in Jeju, Republic of Korea. An article on the state of PICES science for 2010 will be published in the 2011 winter issue of PICES Press (Vol. 19, No. 1).

The 2010 keynote lecture entitled “*Observing change in the Northeast Pacific: Past, present and FUTURE*” was given by Dr. John (Jack) A. Barth (Oregon State University) as a part of the Science Board Symposium on “*North Pacific ecosystems today, and challenges in understanding and forecasting change*”. The abstract of his presentation is appended to the report as *OP Endnote 6*.

AGENDA ITEM 7

Remarks by Dr. Luis Valdés (Intergovernmental Oceanographic Commission of UNESCO)

Dr. Luis Valdés, Head of the Ocean Science Section of the UNESCO Intergovernmental Oceanographic Commission (IOC), addressed the participants in connection with the 50th anniversary of IOC. His remarks are appended as *OP Endnote 7*.

AGENDA ITEM 8

Closing remarks and announcements

After the closing remarks by Dr. Wada, Dr. Stewart (Skip) McKinnell, PICES Deputy Executive Secretary, made announcements related to the logistics of the Annual Meeting. The session was adjourned at 10:15 a.m.

OP Endnote 1**Opening Session agenda**

1. Opening by the Chairman of PICES, Dr. Tokio Wada
2. Welcome address on behalf of the host country by Dr. Larry Robinson, Assistant Secretary of Commerce for Oceans and Atmosphere and Deputy Administrator for the National Oceanic and Atmospheric Administration
3. Remarks by the Chairman of PICES, Dr. Tokio Wada
4. 2010 PICES Wooster Award presentation ceremony
5. 2010 PICES Ocean Monitoring Service Award presentation ceremony
6. *PICES "Year-in-Review" 2010* by Dr. John Stein, PICES Science Board Chairman
7. Remarks by Dr. Luis Valdés, Head of the Ocean Science Section of the UNESCO Intergovernmental Oceanographic Commission (IOC), in connection with the 50th anniversary of IOC
8. Closing remarks/announcements

OP Endnote 2

**Welcome address on behalf of the federal government of the host country
by Dr. Larry Robinson (Assistant Secretary of Commerce for Oceans and Atmosphere and Deputy
Administrator for the National Oceanic and Atmospheric Administration, U.S.A.)**

Good morning, Chairman Wada and all PICES members!

It is a pleasure to welcome you to the United States of America, to the beautiful, if occasionally rainy, city of Portland, and to the 2010 Annual Meeting of the North Pacific Marine Science Organization (PICES). The Pacific Northwest region is home to several important marine science activities – including major research universities in Oregon and Washington, and British Columbia; development of ocean renewable energy based on waves and tides; and some of the most innovative ocean observing systems. It is therefore quite appropriate to have a meeting of PICES in this region.

The theme of this year's meeting, "*North Pacific ecosystems today, and challenges in understanding and forecasting change*", represents an important theme in ocean science and management today. This theme is central to increasing our understanding of the impact of climate change on both marine and terrestrial ecosystems. As you know, advancing scientific knowledge of climate change is a major priority for the United States, and NOAA has recently created the NOAA Climate Service dedicated to bringing together the agency's strong climate science and service delivery capabilities. Clearly, this meeting is a showcase for such science around the North Pacific.

The United States has just adopted a broad-ranging National Policy for the Stewardship of the Ocean, Coasts, and Great Lakes. The new National Oceans Policy strengthens ocean governance and coordination, establishes guiding principles for ocean management, and adopts a flexible framework for effective coastal and marine spatial planning to address conservation, economic activity, user conflict, and sustainable use of the ocean, our coasts and the Great Lakes. Key to this National Oceans Policy is enhanced scientific understanding of marine ecosystem dynamics, and we appreciate the role that PICES is playing in advancing that understanding for the North Pacific.

Critical to ocean management is collaboration with our ocean neighbors, including the members of PICES in the North Pacific: Canada, China, Japan, Korea and Russia. As the oceans science agency for the United States, NOAA – the National Oceanic and Atmospheric Administration -- provides a broad range of scientific information for ecosystem-based fisheries management, understanding how the ocean and atmosphere affect weather and climate; how weather and climate affect marine ecosystems; and to inform the sustainable use of the marine ecosystem goods and services that we all depend on in our daily lives. This science is central to supporting both national and international ocean governance initiatives.

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The United States recognizes and supports PICES as a major contributor to understanding the marine ecosystems that underlie important international and national fisheries, as well as to understanding the environmental conditions related to seafood safety, harmful algal blooms and invasive species, aquaculture, and related topics.

As PICES moves forward with the implementation of your new integrative science program, *FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems)*, we hope to see PICES and its member countries broadening the partnerships that are the foundation to fruitful and effective international collaboration.

I also want to thank PICES for addressing our future, literally, from another perspective. Support of young scientists through the PICES Intern Program is an important priority for the United States and is an initiative we have annually contributed funds to in recent years. We cannot afford to assume that the scientific talent needed to sustain our efforts through this international partnership will develop on its own. I want to commend PICES' leadership for your efforts to nurture and cultivate young scientists who embody this talent.

I also want to encourage scientists at all stages of your careers to consider the value of communicating the outcomes of your work to all segments of society. As individual scientists and as organizations, your involvement will help ensure that more effective and accurate accounts of our work are told when we engage with students of all levels, public officials, the media and the broader public. Publishing your work in the scientific literature, and discussing our work with fellow scientists at scientific conferences are time honored traditions that will continue but we should also explore opportunities to allow the rest of society to witness your ingenuity, integrity and passion for your work and your commitment to solving the complex issues that confront us today. The new communication and outreach priority of PICES is well conceived, and the United States supports this initiative.

With that, let me turn the platform back to the Chairman, and wish you well for this week's meetings.

OP Endnote 3

Welcome address by Dr. Tokio Wada (Chairman of PICES)

Assistant Secretary Robinson, distinguished delegates, guests, ladies and gentlemen, welcome to the 2010 Annual Meeting of our Organization!

First of all, on behalf of PICES and all the participants, I would like to express our sincere thanks to the government of the United States of America for hosting our Annual Meeting and, in particular, I would like to acknowledge NOAA Fisheries and the U.S. State Department for their support of the meeting, and the Pacific States Marine Fisheries Commission for their warm-hearted hospitality and hard work in organizing this Annual Meeting in the beautiful city of Portland.

PICES has collaborated with many organizations that share common interests in ocean science with us. Since the establishment of PICES, the Intergovernmental Oceanographic Commission of UNESCO, IOC, has been our strong partner. IOC is celebrating its 50th anniversary this year. On behalf of PICES, I would like to congratulate IOC on this anniversary and thank them for their collaboration with PICES over the past years.

This year, many parts of the world suffered under abnormal weather conditions such as high temperatures, heavy snowfall, and heavy rain. According to WMO's (World Meteorological Organization) prediction, the mean temperature of 2010 will be the highest since the middle of the 19th century. It cannot be said that all conditions of such abnormal weather are caused by global warming, however, it seems that the intensification of climate change is having a big influence on the marine ecosystems and living resources of the North Pacific.

One of the basic goals of PICES is to elucidate the marine ecosystem response of the North Pacific to climate change, including global warming. Through the PICES/GLOBEC Climate Change and Carrying Capacity

(CCCC) Program, the first integrated science program of PICES, we learned a lot about the behaviour of the North Pacific ecosystems. Scientific knowledge accumulated through the program has been returned to the member countries in various ways. This September, we published a book titled “*Marine Ecosystems of the North Pacific Ocean 2003 – 2008*”. This is the second issue of our North Pacific Ecosystem Status Report. I would expect that this report will be very useful for policy makers and stakeholders in PICES member countries.

In addition to interpreting ecological phenomena, from now on, we are expected to predict how climate change will affect our socioeconomic activities, including fisheries, and to offer scientific advice to national agencies on how to mitigate the influence. We will also be responsible for evaluating the effects of human activity on ecosystem structures and functions, and to develop countermeasures to keep these influences, to the minimum. This will be the task of our second integrative science program called FUTURE, *Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems*, which will focus on the relationship between human society and the North Pacific ecosystems or, how we co-exist with the North Pacific ecosystems. This Annual Meeting marks the first annual meeting where FUTURE is now fully in effect, and I expect that PICES will start a new era for the sustainable use of the North Pacific ecosystems here.

Before I close my remarks, I must announce to you some sad news. To our deep regret, Dr. Bernard Megrey, the Chairman of our Technical Committee on Data Exchange and the recipient of the 2009 PICES Ocean Monitoring Service Award, passed away on October 1 in Seattle. Dr. Megrey participated in PICES since its beginning phase and played a leading part to federate PICES member countries’ meta-databases for the North Pacific. He was also one of the Co-Chairmen of the MODEL Task Team of the PICES/GLOBEC CCCC Program, and contributed to the development of the NEMURO model, one of the standard ecosystem models in the world. When I met him for the first time, he talked earnestly about a plan to develop meta-databases for the Bering Sea and the North Pacific, and the importance of the international collaboration in ocean monitoring and database construction. It may be said that his tireless activity in PICES was intended to realize his dream. His untimely death is a big loss for us. I would like to ask everyone to observe a minute of silence in memory of Dr. Megrey. Thank you very much.

OP Endnote 4

2010 Wooster Award

Introduction of the Wooster Award (Dr. Tokio Wada)

In 2000, PICES established an annual award for scientists who have made significant contributions to North Pacific marine science; have achieved sustained excellence in research, teaching, administration, or a combination of these in the area of the North Pacific; have worked to integrate the various disciplines of the marine sciences; and preferably, all of these in association with PICES. The award was named in honor of Professor Warren S. Wooster, a principal founder and the first Chairman of PICES, a world-renowned researcher of climate variability and fisheries production. Prior recipients of the Wooster Award were Michael Mullin (2001), Yutaka Nagata (2002), William Percy (2003), Paul LeBlond (2004), Daniel Ware (2005), Makoto Kashiwai (2006), Kenneth Denman (2007), Charles Miller (2008) and Kuh Kim (2009).

To our deep regret, Professor Wooster passed away in October 2009. He was not only a distinguished scientist, but also an ambassador of international scientific cooperation. We will no longer be able to see him among the participants at the Annual Meetings, however, his spirit will be living in our minds through this Award.

Science Board citation for the 2010 Wooster Award (Dr. John Stein)

It gives me great pleasure to announce that the Wooster Award for 2010 is being given to Dr. Jeffrey J. Polovina, world-renowned oceanographer with NOAA’s Pacific Islands Fisheries Science Center. Dr. Polovina’s groundbreaking contributions to climate and marine ecosystem research epitomize the PICES approach of

integrating oceanographic factors and biological modeling to significantly advance ecosystem management.

During an exemplary career that spans 30 years, one would never guess that Dr. Polovina did not start out in fisheries. Regardless, his insights as a trained mathematician and statistician may have formed the basis of a landmark scientific achievement in the 1980s—the development of an innovative marine ecosystem model, ECOPATH, to describe energy flow through a coral reef food web. ECOPATH was the first model to apply a type of statistics called “path analysis” to the field of marine ecology, and Dr. Polovina’s role in its development was recognized as one of NOAA’s Top Ten scientific breakthroughs in the agency’s first 200 years. The model’s elegant simplicity and ability to accurately identify ecological relationships has since revolutionized scientists’ ability to understand complex marine ecosystems around the world.

Much like the ocean itself, the scope of Dr. Polovina’s innovative scientific research is wide and deep. With over 115 publications to his name, Dr. Polovina has demonstrated incredible breadth in his theoretical, analytical, and direct approaches to tackle some of the most challenging questions about marine ecosystems and the species that inhabit them. For over a decade, he and his team have made extensive use of satellite remotely-sensed oceanographic data to better understand ecosystem dynamics in the central North Pacific. By combining remotely-sensed data with electronic tracking data from large pelagic animals, Dr. Polovina provided remarkable new insights into the migration and forage habitats of loggerhead sea turtles, bigeye tuna, whale sharks, and whales. His research interests also include the applications of remote sensing and ocean circulation models to fisheries issues and, particularly, protected species of the Hawaiian Islands. Moreover, his distinguished career is anchored by early studies on the impact of climate change on marine fisheries as well as more recent discoveries of how global warming may be contributing to the world’s expanding biological ocean deserts.

Dr. Polovina has worn many hats in his service to the PICES community. His significant roles have included: co-convening a major session on Pacific climate variability for the 2000 PICES “*Beyond El-Niño*” Conference, co-guest-editing a PICES special issue on the marine ecosystem impacts of climate variability in 2001, and helping organize the 2002 PICES symposium on “*Transitional Areas in the North Pacific*”. More recently, he served as a member of the Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* and was honored to deliver the keynote lecture at PICES-2004 on the applications of electronic tags as oceanographic sensors.

Dr. Polovina’s contributions to the international scientific community and award recognition may have thrust him into the limelight, but behind the scenes he is equally engaged in mentoring and training the next generation of scientists. He has served as a strong advocate of his staff scientists’ participation in PICES activities, as evident in the contributions of Drs. Michael Seki, Reka Domokos, Evan Howell and Donald Kobayashi at past PICES meetings and, hopefully, for years to come.

Please join me in congratulating Dr. Jeffrey Polovina as the recipient of the 2010 Wooster Award.

OP Endnote 5

2010 PICES Ocean Monitoring Service Award

Introduction of the PICES Ocean Monitoring Service Award (Dr. Tokio Wada)

Progress in many aspects of marine science is based on ocean observations, monitoring, and management and dissemination of data provided by these activities. However, these activities are often behind the scenes and so inconspicuous that they are seldom evaluated appropriately. To remedy this, a PICES Ocean Monitoring Service Award (POMA) was established in 2007 to recognize the sustained accomplishments of those engaged in monitoring, data management, and communication. This award aims to acknowledge organizations, groups and outstanding individuals who have contributed significantly to the advancement of marine science in the North Pacific through long-term ocean monitoring and data management. The first award was presented in

2008 to the training ship T/S *Oshoro-maru* of Hokkaido University, Japan, for her long-term ecological monitoring activities in the northern North Pacific, and the 2009 award was given to Dr. Bernard A. Megrey of NOAA-Fisheries' Alaska Fisheries Science Center and Mr. S. Allen Macklin of NOAA's Pacific Marine Environmental Laboratory for their sustained efforts, vision, and leadership in building an inventory of biophysical data for the North Pacific, and creating the PICES Marine Metadata Federation.

Science Board citation for the 2010 PICES Ocean Monitoring Service Award (Dr. John Stein)

The PICES Ocean Monitoring Service Award (POMA) was established to recognize organizations, groups and outstanding individuals that have contributed significantly to the advancement of marine science in the North Pacific through long-term ocean monitoring, data management and communication. And it is with great pleasure for me to announce that the 2010 POMA award goes to the Station Papa/Line-P monitoring program.

The seeds that grew into Line-P were sown during the Second World War. With the increase in the number of trans-Pacific flights, there was a need to monitor marine weather systems in the North Pacific. In 1943, the first vessel to occupy Station Peter, as it was then known, was the U.S. Coast Guard cutter *Haida*, and since then many ships have occupied Line-P and Station Papa. The first hydrographic casts at the station began in 1959, and this was the start of Line-P observations. And for the past 60 years, Ocean Station Papa and Line-P have contributed to the region's only multi-decadal time series of oceanographic conditions for the Northeast Pacific Ocean. Today, the Line-P oceanographic sampling program is comprised of 27 hydrographic stations leading to Station Papa, and forms the backbone for cutting-edge, multi-disciplinary research on ocean dynamics, biology and chemistry.

Throughout its history, the rich data provided by this unique monitoring program have given scientists around the world opportunities to revolutionize the field of ocean science and participate in international projects that probe today's most pressing challenges in the physics, biology and chemistry of the ocean—including studies of El Niño, ocean storms, and iron enrichment. The long-term surveys along Line-P have also served as an integral component of global reports on the dynamics and status of our oceans, as well as a training ground for the next generation of oceanographers who have completed (or someday imagine completing) graduate research degrees on Line-P.

The Line-P archive provides a unique picture of the mean state in one part of our global oceans, and has proven critical in developing our ideas of how the ocean evolves. There are far too many people involved in this monitoring program to list. But there are managers who have ensured excellence in ocean sampling along Line-P. In chronological order, they are John P. Tully to whom we owe the original concept, Sus Tabata who years ago showed the power of a long time series, Frank Whitney who managed the program as it expanded to become a training ground for students and PhD theses, and finally, Marie Robert, who is presently juggling the myriad of demands from many universities and other research laboratories.

Please join me in congratulating Dr. Bill Crawford, Head of the State of the Ocean section at the Institute of Ocean Sciences at Fisheries and Oceans Canada, who is receiving the 2010 POMA Award on behalf of the thousands of people, past and present, who contributed to the Station Papa/Line-P monitoring program for the past six decades. Their sustained efforts, extraordinary vision, and dedicated leadership have built an invaluable resource that captures the changing biophysical conditions of the North Pacific and have had a profound impact on the development of ocean science.

OP Endnote 6

“Observing change in the Northeast Pacific: Past, present and FUTURE”

Abstract of the keynote lecture by John (Jack) A. Barth (Oregon State University, U.S.A.)

Observing the fundamental physical and chemical properties of the coastal and adjacent deep ocean is critical to assessing the impacts of changing ocean conditions on marine ecosystems. One important quantity is the

amount of dissolved oxygen available for coastal marine ecosystems. Through a combination of moorings, autonomous underwater gliders and ship-based sampling, we have been measuring dissolved oxygen with increasing temporal and spatial coverage in the Northeast Pacific off the coast of Oregon and Washington, U.S.A. Near-bottom waters over the inner shelf (< 50 m water depth) off central Oregon have been increasingly hypoxic (dissolved oxygen < 1.4 ml/l) over the last 9 years, including the appearance of anoxia in summer 2006. Near-bottom, inner-shelf hypoxia is driven by upwelling of low-oxygen, nutrient-rich source water onto the continental shelf, followed by the decay of organic matter raining down from surface phytoplankton blooms. Data returned in near real-time from moorings and gliders have helped guide additional sampling to assess the impact of low-oxygen on marine organisms, for example on larval and adult fish and invertebrates. Data from the expanding observatory are used in a regression model to link observed inner-shelf, near-bottom oxygen levels with offshore source water dissolved oxygen content and wind forcing. The decreasing oxygen content of the offshore source waters for upwelling is documented from a 50-year time series off central Oregon and is in agreement with observations to the north (Vancouver Island) and south (Southern California Bight) in the California Current. Indeed, decreasing oxygen levels in the oxygen minimum zone (OMZ) appears to be a global phenomenon with a hypothesized connection to global warming.

We are collaborating with other Pacific Northwest measurement programs, in particular the National Oceanic and Atmospheric Administration (NOAA) groundfish and hake surveys, to make maps of the extent of hypoxia over the Oregon and Washington shelves (~43–48°N) from September 2006 to the present. Minimum near-bottom oxygen values are often found over the mid- to inner shelf (50–100 m water depth), with oxygen levels increasing closer to shore and farther offshore toward the permanent OMZ. This reflects the shelf respiration contribution to lowering dissolved oxygen. The size of the near-bottom hypoxia zone increases with time during the upwelling season, reaching its maximum extent in mid- to late summer. In July 2007, the area of hypoxic water inshore of the 200-m isobath covered nearly 18,000 square kilometers, slightly less than the size of New Jersey and on par with the size of the Mississippi River plume hypoxia region. The percent of shelf waters inshore of the 200-m isobath occupied by hypoxic waters varies from 30% early in the season (May) to nearly 80% in the late summer–early fall (Sep), and tracks the cumulative amount of seasonal upwelling-favorable wind stress.

Given the connection of coastal marine ecosystems to basin-scale oceanographic processes, it is imperative to maintain ocean observing systems on both coastal and basin scales. Measurements of physical and an increasing number of chemical and bio-optical properties are being accomplished on both the Argo float array and underwater gliders. In the next few years, the Ocean Observatories Initiative in the United States will construct a multi-element ocean observing array off Oregon and Washington, joining its partner NEPTUNE Canada in laying the long-term foundation for observing change in the Northeast Pacific. Maintaining and expanding these observing systems, in particular to increase the number of biological measurements, will be key for the FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems).

OP Endnote 7

Remarks by Dr. Luis Valdés a (Intergovernmental Oceanographic Commission of UNESCO)

It is a great pleasure and honor for IOC-UNESCO to take part in this PICES 2010 Annual Meeting. On behalf of our organization and its Executive Secretary, Dr. Wendy Watson-Wright, I would like to express my gratitude for the kind invitation and the opportunity to make these opening remarks following our long involvement and cooperation in different research activities.

As you know, IOC is celebrating its 50th anniversary and we would like to share with you this commemoration. UNESCO formed IOC in 1960, and our headquarters are based in Paris. The IOC Secretariat is made up of only 62 people, but I assure you that we do our best to satisfy the needs of the oceanographic community and, of course, we do it in line with the demands and necessities of our 138 Member States.

We have done a long walk since the creation of IOC. From its first session, it became obvious that Member States were looking to the new organization to be more than a meeting place to discuss ocean research and to plan cooperative oceanographic experiments. Throughout its lifetime, IOC has continued to move towards the exploitation of ocean knowledge and information for the use and benefit of national governments and for collectively addressing regional and global problems.

The thrust of discussions at IOC's governing body meetings has evolved over the years beyond ocean research *per se*, to the extension of the knowledge gained in tackling problems in areas such as coastal management, ocean health, climate change, ocean services and capacity-building. Today, IOC has a key role to play as a global knowledge broker to gather, transfer, disseminate and share information, data and knowledge, and to promote best practices related to oceanography. Let me say that this process is done in an inclusive and participatory way, including views of the scientific community, academia, Member States, and considering cultural diversity principles.

The UN Convention on the Law of the Sea considers IOC to be the competent international organization for marine science. In recognition of its mandate as the UN focal point for marine scientific research, IOC also provides a direct link between Member States and those UN agreements and conventions dealing with ocean and coastal issues. These activities are carried out in collaboration with international organizations concerned with the work of the Commission, like PICES, and especially with other sister organizations of the United Nations system.

For achieving the above mandate, IOC has developed a Medium Term Strategy with Four High Level Objectives (HLO) which corresponds to the main challenges facing the world:

1. Prevention and reduction of the impacts of natural hazards;
2. Mitigation of the impacts and adaptation to climate change and variability;
3. Safeguarding the health of ocean ecosystems;
4. Management procedures and policies leading to the sustainability of coastal and ocean environment and resources.

The IOC horizontal functional activities fulfill our mission and guide IOC within the four HLO, and successfully deliver outcomes and results which include: (i) science innovation and management by promotion and coordination of scientific programmes; (ii) science synergy by stimulating co-operation between researchers and organizations to explore new directions; (iii) scientific services by providing guidelines and scientific criteria for ecosystem management; (iv) outreach by publishing results, educating the general public and giving visibility to OSS activities; and (v) capacity building by transferring knowledge to developing countries and scientific communities.

Given our multilateral constituency, it is substantial to our existence and functions to promote international cooperation and coordinate programmes to generate knowledge, and to apply that knowledge for the improvement of Member States. In this regard, IOC has established partnerships with international organizations like PICES.

At this stage it is appropriate to recall that IOC and PICES have an interwoven history. For example, Dr. Warren Wooster, the first Chairman of PICES, was also the first Executive Secretary of IOC, taking that position in 1961 and guiding IOC during its formative years. It is also important to bear in mind that all PICES Contracting Parties are members of IOC and currently all of them are elected members of the IOC Executive Council.

Of course, IOC and PICES have, since the beginning of PICES, been complementary in supporting each other and doing global oceanography. To cite a few examples of cooperation, I could mention our programmes on HAB, GOOS, IOCCP, *etc.* In outreach activities I could mention an extensive list of joint symposia supported by both institutions during the last years, like the 2010 symposium on "*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*", or the one that we are currently preparing together (with ICES as another major international sponsor), the second

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international symposium on “*Effects of climate change on the world’s oceans*” to be held in May 2012, in conjunction with the Ocean Expo-2012 in Yeosu, Korea.

I am sure you are aware that IOC is providing coordination and expertise on climate change and variability of the oceans, on consequences of ocean warming and ocean acidification, on monitoring marine biodiversity, on management and demarcation of Marine Protected Areas, Marine Spatial Planning, and other management tools, among other issues. At this stage I would like to offer IOC’s cooperation in helping to provide scientific and political coordination to strength our collaboration with the scientific stakeholders, like PICES, to create synergies, explore emerging issues and create capacities for the entire scientific community.

For example, there is an urgent necessity for an international framework of cooperation for both ocean research and environmental governance in the Arctic. Climate change, preservation of biodiversity and exploitation of resources in the Arctic are global problems, and their management cannot depend solely in the sovereignty of single States. It is obvious that scientific research and protection of the Arctic need a stewardship and governance that can be provided only by authorized international and transparent agencies.

Better science linked to improved risk management and adaptive management strategies will help scientists and policy makers cope with the high levels of uncertainty related to mitigation alternatives and with the range of impacts associated with climate change and variability. IOC and UNESCO are convening an international expert meeting on Geoengineering at the Paris Headquarters. The meeting is the first to use UNESCO’s ‘honest broker’ role to create a forum for international discussion and create awareness of the science and governance of this rapidly evolving field. PICES has supported a working group on iron fertilization, and the lessons learned by this group will be very positive for the IOC-UNESCO workshop. So, we have formally invited PICES to attend this meeting in Paris.

Credible and timely scientific information is a necessary asset as nations engage in the process of responding to new challenges of global dimensions. Special attention should be given to new marine pollutants, like plastics and microplastics, and their impact on habitats and ecosystems. For instance, during the past 40 years, world production of plastic resins has increased some 25-fold, while the proportion of material recovered has remained quite constant at the level of only 5%, so that plastics account for a growing segment of urban waste. Once discarded, plastics are weathered and eroded into very small fragments known as micro-plastics. These, together with plastic pellets, are already found in most beaches around the world and we still do not know the impacts they will have on the marine environment and on the marine food web. IOC would like to encourage PICES to support IOC and GESAMP in their joint activities to elucidate the importance of these new pollutants in the marine environment.

I will conclude by saying that partnerships are crucial for IOC. IOC cooperation with UN and non-UN organizations is essential, expected by our Member States, and by the scientific community. In this regard, PICES is an IOC core partner in the North Pacific Ocean, and we have common interests in scientific activities that need our mutual cooperation to protect our oceans together.

Thank you very much for your attention. On behalf of IOC, I wish you all a most productive Annual Meeting.

REPORT OF GOVERNING COUNCIL

The Governing Council (GC) met from 9:00–18:00 hours on October 30, 2010, and from 12:00–16:00 hours on October 31, under the chairmanship of Dr. Tokio Wada. All Contracting Parties were represented at the two sessions (*GC Endnote 1*).

AGENDA ITEM 1

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. He reminded that at the 2009 inter-sessional meeting (IGC-2009), Council approved, effective PICES-2009, to change the format of the Opening Session by abolishing remarks by the Contracting Parties, except for the host country. Instead, the opportunity is provided to national delegates to make their statements at the beginning of the Governing Council meeting. All statements made are appended as *GC Endnote 2*.

Dr. Wada noted changes in the GC membership after the 2009 PICES Annual Meeting (PICES-2009) and welcomed new national delegates, Mr. Masaki Sugamiya (Japan), Dr. Lae-Hyung Hong (Korea) and Dr. Vladimir Radchenko (Russia), to the Organization.

In accordance with Rule 1(ii) of the PICES Rules of Procedure (http://www.pices.int/about/rules_procedure.aspx), all Contracting Parties were requested to notify the Executive Secretary, three weeks in advance (by October 1), of the names of delegates, alternate delegates, advisors and members, attending each meeting of the Organization. The Executive Secretary briefly reviewed submitted documents and asked each Contracting Party to examine its draft Delegation List and submit the final Delegation List prior to the second session of Council.

AGENDA ITEM 2

Adoption of agenda and meeting procedures

Council reviewed and approved the provisional agenda circulated on August 22, 2010, with the addition of the update on the development of a new regional fisheries management organization (RFMO) in the North Pacific under Agenda Item 21 – Other Business (*GC Endnote 3*).

At the first session of Council, the Chairman suggested the order in which to take up the various agenda items. 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 2010, the Secretariat did not receive proposals from any country to accede to the PICES Convention.

Many of the scientific and capacity development issues addressed by PICES are not unique to the North Pacific and concern the entire world. To facilitate collaborations with non-Contracting Parties and other organizations, a formal framework to recruit external experts to PICES activities has been discussed by Council since 2006.

At IGC-2009, Council approved (Decision 2009/A/5(i)) the proposed amendments to the Rules of Procedures in order to allow experts from outside of PICES to serve as *ex-officio* members on PICES Technical Committees and subsidiary bodies of PICES Scientific Committees (see *Definitions, Rule 1, 13, 14, 15*). The nomination of an *ex-officio* member can come either from a PICES expert group or from a non-Contracting Party or an organization, and the appointment requires endorsement by Science Board and approval by Council. At PICES-2009, Technical Committees and expert groups were informed about these changes in the Rules of Procedure and were requested to discuss potential implications of these changes on their membership.

Since PICES-2009, representatives of NOWPAP (Northwest Pacific Action Plan; <http://www.nowpap.org/>), IGBP (International Geosphere-Biosphere Programme; <http://www.igbp.kva.se/>) and SAON (Sustaining Arctic Observing Networks; <http://www.arcticobserving.org/>) have joined as *ex-officio* members the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S), Section on *Carbon and Climate* (CC-S) and Technical Committee on Monitoring (MONITOR), respectively. The Chairman indicated that this is a positive development, but pointed out that all three *ex-officio* members came from other organizations, and no interest was expressed so far by non-Contracting Parties. Council discussed how to publicize the PICES *ex-officio* membership system and recruit scientists from other countries, and two approaches were suggested as potentially efficient: scientist-to-scientist communication and bilateral meetings between Contracting and non-Contracting Parties.

AGENDA ITEM 4

Relations with relevant international and regional organizations/programs

The Executive Secretary reviewed the progress made in the integration and coordination of PICES activities with other international scientific organizations/programs of regional and global scale, and with regional scientific and monitoring efforts (national and involving several PICES Contracting Parties) in the North Pacific (for details see *Appendix 4 in GC Endnote 6*). He pointed out that invitation letters to attend PICES-2010 as observers were sent to 47 organizations and programs, and 32 were present at the meeting (*GC Endnote 4*), surpassing 30 observers in 2009 and 21 in 2008, and demonstrating that PICES is continuing to build relations in productive ways. Representatives of these organizations/programs expressed their views on potential areas of collaboration with PICES at the meetings of Science Board, Standing Committees and/or their subsidiary bodies. In particular:

- Dr. Luis Valdés (Head of the Ocean Science Section of IOC-UNESCO) attended the Science Board meeting and meetings of several expert groups to share his views on potential areas of collaboration between IOC and PICES. These areas include: (1) climate change and variability, (2) marine biodiversity, (3) marine protected areas and marine spatial planning, (4) ocean research and environmental governance in the Arctic, (5) geo-engineering (given PICES' expertise in the area of iron fertilization in the North Pacific), and (6) new marine pollutants, such as plastics and microplastics, and their impact on habitats and ecosystems. Dr. Valdés also addressed the participants at the PICES-2010 Opening Session in connection with the 50th anniversary of IOC (see *OP Endnote 7* in the Report on Opening Session).
- Representatives of ICES, Drs. Jürgen Alheit and Harald Loeng, attended the Science Board meeting to discuss joint activities of the two organizations in 2011 and beyond, including the outcomes of the first meeting of the PICES/ICES Study Group on *Strategic Planning for Scientific Cooperation in Northern Hemisphere Marine Science* [see Agenda Item 9 for details]. They also participated in the meetings of several Standing Committees and expert groups, including the PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*, and co-convoked the joint PICES/ICES Topic Session on "*Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting*".
- Dr. Emilie Brévière (Executive Officer of SOLAS) attended the Science Board meeting and meetings of several expert groups to discuss joint scientific and capacity development activities, including the proposal for PICES to co-sponsor the 2011 SOLAS Summer School. She also gave a presentation at the joint PICES/SOLAS Topic Session on "*Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean*".
- Ms. Nora Deans (Communication and Outreach Director of NPRB) gave an invited presentation on various approaches taken by NPRB in their successful outreach and engagement activities at the meeting of the FUTURE Advisory Panel on *Status, Outlooks, Forecasts, and Engagement* (SOFE-AP) and at the joint meeting of FUTURE Advisory Panels.
- Representatives of several programs/organizations expressed their views on potential areas of collaboration with PICES at the meetings of Standing Committees and/or their subsidiary bodies, and submitted specific proposals for joint activities in 2011 and beyond (details can be found in the reports of Standing Committees).
- Some programs and organizations had posters on display outlining general information about their programs/organizations and highlighting their scientific objectives and recent activities.

Council supported the holding of co-sponsored symposia/sessions/workshops/training courses and the creation of joint expert groups as directions of actual collaboration. Council also approved the revised *Standing List of International and Regional Organizations and Programs* developed at ISB-2010 and agreed with the identified priorities for interaction in 2010–2011 (Decision 2010/S/9). This list (*GC Endnote 5*) is used, in part, to assist the Executive Secretary and Science Board in decisions regarding sending PICES representatives to meetings of other organizations/programs.

AGENDA ITEM 5

Report on administration for 2009–2010

The Executive Secretary summarized the activities of the Organization and the Secretariat since PICES-2009. Council reviewed and adopted the report (*GC Endnote 6*).

AGENDA ITEM 6

Schedule, structure and financing of future Annual Meetings

PICES-2011

At IGC-2009, the Russian Federation expressed its willingness to host the Annual Meeting in 2011, and this invitation was accepted by Council (Decision 2009/A/6(iii)). At PICES-2009, Council agreed that the venue and dates for the meeting will be decided in spring 2010. After a site visit by the Executive Secretary in May 2010, a complex of government buildings in Khabarovsk was recommended as the venue. Following presentation by the Russian delegation on the status of preparations for PICES-2011, Council approved the proposal to host PICES-2011 from October 7–16 or October 14–23, 2011, in Khabarovsk (Decision 2010/A/5(i)). At the recommendation of the F&A Committee, it was decided to keep the same registration fee structure for PICES-2011 as for PICES-2010 (Decision 2010/A/5(iv)), and to provide \$40,000 to the host country to partially cover meeting costs (Decision 2010/A/5(i)).

The theme of the meeting, “*Mechanisms of marine ecosystem reorganization in the North Pacific Ocean*”, was approved in principle at PICES-2009, and the theme description was finalized at ISB-2010 in Sendai, Japan.

PICES-2012

At PICES-2009, Japan was requested to explore the feasibility of hosting the Annual Meeting in 2012, and inform the Secretariat on this matter by March 31, 2010 (Decision 2009/A/6(iv)). On March 28, Dr. Mitsuyuki Hirai (Japanese national delegate to PICES) extended an invitation for PICES-2012 to be held in his country. This invitation was confirmed during the visit of the Executive Secretary to Japan in August 2010. Brief information on the status of preparations for PICES-2012 was provided by the Japanese delegation. Council accepted the offer of Japan to host PICES-2012 from October 12–21, 2012, in Hiroshima (Decision 2010/A/5(ii)).

Council approved in principle the proposed theme of the meeting, “*Scientific challenge to the North Pacific ecosystem: Understanding and mitigation of the effects of natural and anthropogenic stress*”, and instructed Science Board to finalize the theme description at ISB-2011.

PICES-2013

Following the established 6-year rotation cycle (Decision 1994/A/6), Council requested Canada to explore the possibility of hosting the Annual Meeting in 2013, and inform the Secretariat on this matter by March 31, 2011 (Decision 2010/A/5(iii)). The Canadian delegation accepted the request and indicated that it has already initiated discussions with its government on this issue.

ISB-2011 and IGC-2011

At earlier meetings, Council expressed and re-iterated its 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

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should be evaluated each year. 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 on “*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems*” (FUTURE). Council approved the Science Board request to convene a 1½- or 2-day inter-sessional meeting in the spring of 2011, immediately after a 3-day inter-sessional FUTURE-workshop on “*Indicators of status and change within North Pacific marine ecosystems*”, and supported extending an invitation to ICES to participate in the workshop and use this opportunity for the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* (SG-SP) to meet immediately after the workshop and prior to ISB-2011 (Decision 2010/A/5(v)).

The Chairman pointed out the importance of the inter-sessional Governing Council meetings for making timely decisions under the current fast-changing situations in ocean science and policy, and asked Council to consider holding IGC-2011 in conjunction with ISB-2011 for discussing and approving revisions to the PICES Strategic Plan. Council did not reach consensus on this issue as the proposal was not supported by China, but agreed convening a 1-day meeting of the Study Group on *Updating the PICES Strategic Plan* (SG-USP) immediately after ISB-2011 (Decision 2010/S/3).

Council accepted with gratitude an offer from the United States to host the FUTURE workshop, ISB-2011 and associated events, with potential venue being Honolulu.

Structure 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 recommended changes in the format of the Annual Meeting starting with PICES-2011 (Decision 2009/A/6(i)). It was decided though that the proposed changes in the format of the Opening Session be implemented beginning with PICES-2009, and the recommendation to increase the number of concurrent scientific sessions to 4 per day (instead of 3 per day) be on trial at PICES-2010. Science Board and Council members exchanged initial impressions from these new arrangements and also from some changes in the Annual Meeting structure made by Science Board for PICES-2010 (e.g., holding the Science Board symposium in plenary not only immediately after the Opening Session on Monday, but also immediately prior to the Closing Session on Friday afternoon). The structure of PICES 2011 proposed by Science Board, and supported by Council, will be in accordance with SG-RAM recommendations, with the exception of the number of concurrent sessions (3) due to the limited capacity of the venue in Khabarovsk.

AGENDA ITEM 7

Progress report on implementation of new PICES integrative scientific program, FUTURE

The second integrative scientific program of PICES, FUTURE, will be one of the highest priority activities of the Organization for the next decade. 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 and finalized in June 2009 (Decision 2009/S/1). 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 the FUTURE goal (http://www.pices.int/members/scientific_programs/FUTURE/FUTURE-main.aspx). These Advisory Panels are expected to recommend specific activities for consideration by Science Board which serves as the FUTURE SSC (Decision 2009/S/7(i)).

At the second session of Council, Drs. John Stein (Science Board Chairman) and Sinjae Yoo (Science Board Chairman-elect) reported on the progress made in the implementation of FUTURE since PICES-2009. It was pointed out that the first year is critical for the success and growth of major programs, and PICES made every effort to foster FUTURE. Activities that took place in 2010 were highlighted:

- At ISB-2010 (April 23–24, Sendai, Japan), one full day was dedicated to FUTURE – it was the first time that Science Board met as the FUTURE SSC. The main objectives of the meeting were to: (1) review the draft work plans for the Advisory Panels, and (2) clarify the process for revising terms of reference for existing expert groups and approving new expert groups to meet FUTURE goals. At this meeting, Science Board strongly supported the idea of convening a 3-day workshop to advance work plans for FUTURE Advisory Panels and to share ideas on the many common threads they are encountering in moving the program forward.
- The inter-sessional workshop, supported by the Korean government and hosted by the Korea Ocean Research and Development Institute (KORDI), was held from August 16–18, 2010, in Seoul, Korea. In addition to FUTURE Advisory Panel members, workshop attendees included representatives from most PICES expert groups associated with these Panels. All Contracting Parties but China were represented at the workshop. The goal of the workshop was to expedite the early phase of FUTURE implementation by (1) identifying priority topics and activities for the Advisory Panels for the first triennium (2010–2012), and (2) discussing the potential for existing and new expert groups to address these priorities. The specific outcomes for Science Board review were the work plans for the early phase of FUTURE and recommendations for new expert groups.
- At PICES-2010, the Advisory Panels met concurrently (½ day) and then jointly (½ day) to: (1) review their terms of reference, (2) complete their work plans for the first triennium, and (3) finalize their proposals for new expert groups.
- To ensure that FUTURE remains relevant to all Contracting Parties, a survey was developed and circulated to PICES members *via* Standing Committees to identify and prioritize stressors that could impact ecosystems in the area of concern to PICES. A matrix of major stressors for both coastal and oceanic systems around the North Pacific was created based on input providing both country and committee perspectives. Although the survey identified regional pressures, it also highlighted a number of high priority stressors across the North Pacific, including climate change, loss of sea ice, hypoxia, organic pollutants, habitat loss, invasive species, harmful algal blooms, and capture fisheries.
- To warrant high-quality reporting, SOFE developed a review process for the Advisory Report on “*The decline of Fraser River sockeye salmon in relation to North Pacific marine ecology*” to be released as a draft to the Cohen Commission on November 15 (see Agenda Item 10 for details). This Advisory Panel also discussed the feasibility of holding a peer-review of PICES Scientific Reports, and an outreach strategy for the second North Pacific Ecosystem Status Report (PICES Special Publication No. 4) and the final report of the Working Group 19 on *Ecosystem-Based Management Science and its Application to the North Pacific* (PICES Scientific Report No. 37). A power point presentation and professional brochure for both products is expected to be produced for a target audience of agencies/organizations dealing with management issues.

Dr. Stein summarized recommendation made by Science Board based on discussions at the 2010 inter-sessional FUTURE workshop and PICES-2010:

- Three new Working Groups (WG) were proposed:
 - WG on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences* (under BIO)
 - WG on *Ecosystem Responses to Multiple Stressors* (under MEQ and BIO)
 - WG on *North Pacific Climate Variability and Change* (under POC)
- Two inter-sessional workshops were specifically suggested to advance FUTURE science:
 - A 3-day workshop on “*Indicators of status and change within the North Pacific marine ecosystems*”, to be held in conjunction with ISB-2011, to identify: (1) the means of determining ecosystem resilience or vulnerability; (2) ecosystem-level indicators of status and change, including but not limited to fisheries-based indicators; (3) methods to characterize uncertainty in these indicators; (4) common ecosystem indicators to be used for regional comparisons by the PICES community. It was agreed that this would be an opportunity to extend an invitation to ICES to participate in the workshop to join forces with FUTURE in exploring this topic.
 - A 2-day workshop, to be convened immediately prior to PICES-2011 in Korea, to: (1) discuss various aspects of regional climate modeling (*e.g.*, different approaches, downscaling, parameterizations, and coupling to general circulation models) and (2) encompass the coupling of regional climate models to ecosystem models.

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Council agreed to establish WG on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences* (Decision 2010/S/7), but put the other two recommended Working Groups on hold, pending further review and revisions to their proposed terms of reference. Council also approved holding both inter-sessional workshops (Decision 2010/S/3).

The Executive Secretary reported on the evolution of the FUTURE fund and indicated that the estimated year-end balance for this fund is small. Given the current lack of funding allocated specifically to FUTURE, Council approved the recommendation of the F&A Committee that funds currently under “high priority PICES projects” (\$21,996) be earmarked for FUTURE (Decision 2010/A/3(v)). Council also instructed the Executive Secretary to send a letter to the Contracting Parties providing information on planned activities for FUTURE and requesting contributions to these activities (Decision 2010/A/3(vi)).

In the general discussion, it was re-iterated that:

- Serious attention should be paid to connections between the FUTURE Science Plan and the Strategic Plan of the Organization, and to linkages between scientific outcomes of FUTURE and the ocean management policies of Contracting Parties;
- National research projects form the basis of FUTURE, and PICES’ role is to coordinate international collaboration. It was premature to conceive coordinating the directions of national projects related to FUTURE at that time, as PICES is only at an early stage of the program. In the coming years though, it will be necessary to review how these national projects can better be coordinated to enhance FUTURE.

AGENDA ITEM 8

Report of the Study Group on *Updating the PICES Strategic Plan*

In 2002, the PICES Review Committee identified the importance of developing a long-term “vision” or Strategic Plan for the Organization. At IGC-2003, a Study Group on *PICES Strategic Issues* was formed, under the direction of Council, to develop a Strategic Plan (Decision 2003/S/5(iv)). The Strategic Plan (http://www.pices.int/about/PICES_strategy.pdf) drafted by this Study Group was adopted at IGC-2004 (Decision 2004/A/6(i)).

At PICES-2009, Council agreed that the Strategic Plan of the Organization should be updated to ensure that it reflects the vision of all Contracting Parties for the direction of PICES over the next 5–10 years, and approved the establishment of a Study Group on *Updating the PICES Strategic Plan* (SG-USP), under the direction of Council, with the following terms of reference (Decision 2009/S/7(ii)):

1. Review the PICES Strategic Plan, the FUTURE Implementation Plan, and current Action Plans of PICES Standing Committees;
2. Review the strategic plans of other relevant international organizations such as ICES;
3. Consider the views of Contracting Parties on the priorities for marine scientific research in the North Pacific Ocean over the next 5-10 years;
4. Propose revisions to the PICES Strategic Plan (if necessary) in time for consideration by Governing Council at PICES-2010 in Portland, U.S.A.

It was agreed that SG-USP will be led by the Chairman of PICES, and its membership will include the Past-Chairman of PICES, the Vice-Chairman of PICES, the Science Board Chairman and Science Board Chairman-elect, and one representative from each of the two Contracting Parties, Canada and China, that otherwise are not represented on the Study Group. The Executive Secretary and Deputy Executive Secretary will serve as *ex-officio* members of the Study Group. The full SG-USP membership is as follows:

Dr. Tokio Wada (PICES Chairman, Japan) – Chairman
Dr. Vera Alexander (PICES Past Chairman) – member
Dr. Lev Bocharov (PICES Vice-Chairman, Russia) – member
Dr. Fangli Qiao (Science Board member, China) – member

Dr. Laura Richards (Council and F&A member, Canada) – member
 Dr. John Stein (Science Board Chairman, U.S.A.) – member
 Dr. Sinjae Yoo (Science Board Chairman-elect, Korea) – member
 Dr. Alexander Bychkov (Executive Secretary) – *ex-officio member*
 Dr. Skip McKinnell (Deputy Executive Secretary) – *ex-officio member*

The draft SG-USP report and the revised Strategic Plan were circulated to Contracting Parties on October 25, 2010. Council reviewed the draft SG-USP report at PICES-2010 and agreed to extend the life span of SG-USP for 6 months (Decision 2010/S/6(vi)) and to convene a SG-USP meeting in conjunction with ISB-2011 (Decision 2010/S/3).

AGENDA ITEM 9

Report of the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*

Dr. Sinjae Yoo updated Council on the progress made by the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* (SG-SP). The SG-SP goal is to develop a formal framework for cooperation between ICES and PICES to serve as the basis for linkages of science plans and longer-term strategic planning of the two organizations. This Study Group was approved in principle at PICES-2009 (Decision 09/S/10(iii)), where Council directed the Secretariat and Science Board to work with ICES to finalize the terms of reference, membership and timelines for the group. The agreed terms of reference are listed below:

1. Study Group members will review their organization's existing and planned scientific activities to identify scientific themes that could potentially benefit from the other's involvement in these activities.
2. Lists of potential areas of cooperation will be exchanged by September 2010.
3. A meeting/workshop will be convened after documents are exchanged in spring 2011 to:
 - a. Improve understanding of the science activities of each organization;
 - b. Review scientific topics from TOR#1 to identify areas of common interest;
 - c. As an example of recent cooperation, review progress of the joint Working Group on *Forecasting of Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS) established in 2008;
 - d. Develop a framework for cooperation between ICES and PICES that lists categories of joint activities and the rationale for each, including the benefits to each Organization from the joint activity; identify priorities for joint activities within categories;
 - e. Recommend processes for implementing TOR#3d;
 - f. Recommend approaches to develop a strategic plan for cooperation and mechanisms to periodically update that plan.
4. The Co-Chairmen will prepare a final Study Group report for distribution by the PICES and ICES Secretariats by August 2011.

The SG-SP membership is limited to 4 people from each organization and includes:

- Dr. Sinjae Yoo, PICES Science Board Chairman (approved at PICES-2009) – Co-Chairman;
- Dr. Skip McKinnell, PICES Deputy Executive Secretary (approved at PICES-2009);
- Dr. Thomas Therriault, Chairman of the PICES FUTURE Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems* (recommended at ISB-2010 and approved by correspondence);
- Dr. Hiroaki Saito, Chairman of the PICES FUTURE Advisory Panel on *Climate, Oceanographic Variability and Ecosystems* (recommended at ISB-2010 and approved by correspondence).
- Dr. Manuel Barange, Chairman of the ICES Science Committee (SCICOM) – Co-Chairman;
- Dr. Adolf Kellermann, Head of the ICES Science Programme;
- Dr. Mark Dickey-Collas, Chairman of the ICES SCICOM Science Steering Group on *Sustainable Use of Ecosystems*;
- Dr. Begoña Santos, Chairman of the ICES SCICOM Study Group on Science Cooperation (SGSC).

Dr. Yoo briefly summarized the results of an informal SG-SP meeting held on September 21, 2010, at the ICES Annual Science Conference (ASC) in Nantes, France (*GC Endnote 7*). At this meeting, improved forecasting of climate change impacts on marine ecosystems, ecosystem resilience and vulnerability, spatial planning, and ocean acidification/hypoxia were identified as areas where collaboration will be beneficial to help advance both FUTURE and the ICES Science Plan. Also discussed was a method for developing a process allowing PICES to consider joint ICES/PICES theme session proposals for the ICES ASC at its ISB meeting in order for this information to be available in a timely manner for decisions to be made at the annual ICES SCICOM meeting. Special consideration was given to the future of the joint PICES/ICES WG on *Forecasting Climate Change Impacts on Fish and Shellfish* and a new entity proposed by ICES and called the “ICES/PICES Strategic Initiative on Climate Change”.

Two major concerns expressed by Science Board at PICES-2010 were that (1) the terms of reference for this Strategic Initiative were very broad and (2) it could potentially overlap with activities of FUTURE. Another challenge in aligning ICES and PICES is the different methods employed by the two organizations to form and run expert groups. To reconcile these issues, Science Board suggested using ISB-2011 as an opportunity for SG-SP to meet. This recommendation was accepted by Council (Decision 2010/A/5(v)).

AGENDA ITEM 10

PICES Advisory Report to the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River

In November 2009, the Prime Minister of Canada established a commission of inquiry to discover why Fraser River sockeye salmon are not as abundant as they once were, especially from 2007 to 2009. As the investigation is being conducted by British Columbia Supreme Court judge, Mr. Bruce Cohen, the commission has taken his name (<http://www.cohencommission.ca>). The mandate of the Cohen Commission is to examine the effect of environmental changes along the Fraser River and in the ocean, and the potential effects of various factors that may have affected the ability of sockeye salmon to reach traditional spawning grounds or to reach the ocean. The Commission is also looking into the current state of Fraser River sockeye salmon stocks and the long-term projections for those stocks to develop recommendations for improving sustainability of the sockeye salmon fishery in the Fraser River, including changes to the existing policies, practices and procedures. To achieve independence from the organizations that manage and assess the fishery, 12 groups of independent scientists were invited to conduct research and offer their views on specific issues.

On April 15, 2010, PICES received an invitation to provide a scientific advice to the Commission. The advice was requested in the form of a technical report on the status and trends of marine ecosystems where Fraser River sockeye are known to occur and on potential effects of recent ecosystem variability on their survival, distribution and migration (“*The decline of Fraser River sockeye salmon in relation to North Pacific marine ecology*”), and participation of a Lead Author in a few expert meetings related to the report’s contents.

PICES is not designed to provide a short-term, tactical, management advice, but Article V(d) of the Convention (<http://www.pices.int/about/convention.aspx>) indicates that one of the scientific functions of the Council is “*to consider request to develop scientific advice pertaining to the area concerned*”. Rule 12(iv)(d) of the Rules of Procedure (http://www.pices.int/about/rules_procedure.aspx) further stipulates that “*Science Board shall review and make recommendations to the Council concerning the provision of scientific advice to the Contracting Parties or other international organizations requesting such advice*”. According to the approved mechanism for dealing with requests from Contracting Parties for advice (Decision 1993/A/5), Council’s role in this process is to: (1) decide on the acceptance of the request for advice, and (2) authorize release of the report.

At ISB-2010, Science Board discussed the invitation and agreed that this request is a clear recognition of PICES’ expertise and scientific leadership on issues of climate variability and marine ecology, and accepting the invitation is something that PICES should undertake. This recommendation was supported by Council. Dr. Skip McKinnell, PICES Deputy Executive Secretary, was asked to lead the project.

Dr. McKinnell presented the summary report on the project to Council:

- The three major objectives of the report were to: (1) provide a summary of what is known about the biology and ecology of Fraser River sockeye salmon in the ocean, (2) describe why returns were especially low in 2009, and (3) discuss the nature and cause(s) of low productivity during the last 15 years.
- Work began in late June with a team of co-authors endorsed by Council and the Commission. The team included: Enrique Curchitser (Rutgers University, U.S.A.), Kees Groot (Canada, DFO emeritus), Masahide Kaeriyama (Hokkaido University, Japan), and Katherine Myers (University of Washington, U.S.A.).
- A draft report consisting of two documents, the Detailed Study (~150 pages) and the Executive Summary (~27 pages, with 1 page of “Short Answers to Key Questions”) was completed and sent to the Science Board Chairman and Science Board Chairman-elect on September 15, 2010.
- At the recommendation by SOFE, the draft was reviewed by several Science Board members and two external reviewers, one from the eastern Pacific (U.S.A.) and one from the western Pacific (Japan), selected by Science Board from the list of “salmon in the marine environment” experts provided by SOFE.
- After comments from peer-reviewers were addressed, the draft report was endorsed by Science Board at PICES-2010 and submitted for consideration by Council. Science Board recommended releasing the draft report to the Cohen Commission by November 15, 2010, with a cover letter stating that PICES is prepared only to correct errors and/or points of clarification that the Commission’s reviewers may find before the final report is submitted on December 15, 2010.

After some questions on the procedure in the Cohen Commission and comments on the conclusion of the report, Council authorized the release of the draft PICES Advisory Report to the Cohen Commission (Decision 2010/S/1). Council thanked Dr. McKinnell and his team for their enthusiastic work to prepare the report within a very short period. Closing discussion on this issue, the Chairman pointed out that the request for advice from the Cohen Commission was different from the 2003 request of the United States government on the implications of the 1998 regime shift for North Pacific fisheries, as the Commission also requested advices from other organizations and individuals for getting a comprehensive view on the poor return of the Fraser River sockeye salmon in 2007–2009. He also indicated that a review process for PICES products was established through the preparation of this report, and these reviews are important to ensure that the products are of the highest quality associated with PICES science.

AGENDA ITEM 11

Progress report on the PICES project “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” supported by the Japanese Trust Fund

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 (from April 1, 2007 to March 31, 2012) PICES project entitled “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*”. The goals of the project are to develop international systems to collect, exchange and store relevant data, and to foster partnerships with non-PICES 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.

The Executive Secretary informed Council on activities under the project since PICES-2009 (the financial report and the scientific progress report for *Year 3* are appended as *GC Endnote 8*) and provided a summary on fund transferring and project reporting to date:

- Funds for the first year of the project (completed by March 31, 2008) in the amount of \$184,980 were transferred to the PICES/MAFF bank account on July 27, 2007. The financial report and the progress report for *Year 1* were submitted to JFA on July 23 and July 19, 2008, respectively.
- Funds for the second year of the project (completed by 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 the third year of the project (completed by March 31, 2010) in the amount of \$187,505 were transferred to the PICES/MAFF bank account on July 15, 2009. The financial report and the progress report for *Year 3* were submitted to JFA on July 26, 2010.

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- The required set of documents requesting funding for *Year 4* (to be completed by March 31, 2011) was sent, following instructions from JFA, to the Consulate General of Japan in Vancouver (Canada) on May 28, 2010, and the requested revisions were directed to JFA on June 24. Funds in the amount of \$187,505 were transferred to the PICES/MAFF bank account on July 12.
- The status of the PICES/MAFF account as of December 31, 2009, was assessed in the regular PICES audit of *FY 2009*. The financial statements for the rest of *Year 3* of the MAFF project (January 1 to March 31, 2010) and for part of *Year 4* (April 1 to December 31, 2010) will be evaluated in the regular PICES audit of *FY 2010*.

Japan expressed their satisfaction with the progress of the current project and indicated that JFA is developing a proposal for a new 5-year (2012–2017) PICES/MAFF project related to ecosystem-based management, including the topics under the 2007–2012 project. It was also pointed out that to assist JFA in the application process, the project leaders were requested to prepare appealing posters or brochures on the accomplishments to date, and also to summarize the issues likely to remain when the current project is completed.

Council concluded that the project has been 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. Council thanked Japan again for their generous contribution.

AGENDA ITEM 12

Capacity building activities including PICES Intern Program

The Executive Secretary reported on capacity building activities in 2010 and plans for 2011 and beyond. All essential components of PICES' strategy for capacity building (http://www.pices.int/about/capacity_strategy.pdf) were reviewed by Council.

2012 PICES/ICES Early Career Scientists Conference

At ISB-2009, Science Board endorsed the concept of the second PICES/ICES Early Career Scientists (ECS) Conference to be held in 2012 in Europe. The main objective for the conference is to provide an opportunity for scientists at the beginning of their careers to meet colleagues from around the globe and develop contacts and collaborations across international borders and disciplines that would persist for decades. The conference, under the theme "*Oceans of change*", will take place in April 2012, in Majorca, Spain, with local arrangements made by the Mediterranean Institute for Advanced Studies (<http://www.ices.dk/marineworld/oceans/index.asp>). The Scientific Steering Committee (SSC) consisting of 6 early career scientists (3 from each Organization) was set. PICES SSC members include: Bryan Black (Oregon State University, U.S.A.), Hanna Na (Seoul National University, Korea) and Naoki Yoshie (Ehima University, Japan). Drs. Skip McKinnell (PICES) and Adolf Kellermann (ICES) will serve as conference coordinators. Drs. Franz Mueter (PICES) and Elizabeth North (ICES), SSC members of the 2007 ECS Conference, accepted an invitation to join the group as senior advisors.

Fund-raising for the conference was initiated, and the contribution of \$50,000 US was received from the U.S. National Marine Fisheries Service. At the recommendation of the F&A Committee and in order to have participation comparable to the 2007 PICES/ICES ECS Conference, Council agreed that the remainder of unused funds from the 2010 PICES/ICES/FAO Symposium on "*Climate change effects on fish and fisheries*" be allocated for the 2012 ESC Conference (Decision 2010/A/3(vii)).

Schools on marine sciences

At PICES-2009, Science Board suggested that collaborating with IMBER and SOLAS on summer schools, normally dominated by attendees from Europe and North America, may provide additional opportunities for PICES and would also broaden the participating countries and scientific cultures involved. In 2010, PICES co-sponsored the IMBER-led international ClimECO2 Summer School on "*Oceans, marine ecosystems, and society facing climate change - A multi-disciplinary approach*" (August 23–28, Brest, France) by providing

travel funds and arranging additional support (through national programs/agencies) for 9 early career scientists from all PICES member countries (1 from Canada, 1 from Japan, 2 from Korea, 2 from China, 1 from Russia, and 2 from U.S.A.). PICES expenses for this event were at the level of \$7,000. At the recommendation of Science Board, Council approved the request to co-sponsor the 5th SOLAS Summer School to be held August 29–September 10, 2011, in Corsica, France (Decision 2010/S/3).

Training courses and manuals/guides

The common use of agreed methods for observations and modeling is essential for the pooling of data resulting from cooperative programs. The inter-comparability of methods and their use can be improved through the development of methodological workshops/training courses and publication/distribution of manuals/guides.

PICES was invited to join NOWPAP and WESTPAC in organizing a training course on “*Remote sensing data analysis*” to be held in fall 2011, and hosted by the Far Eastern Branch of Russian Academy of Sciences, with the Pacific Oceanological Institute (POI) as the main organizer, in Vladivostok, Russia. At ISB-2010, Science Board supported PICES involvement in the proposed course that will focus on practical applications, such as red tide detection, eutrophication, oil spill monitoring, *etc.*, and will be complementary to the training at the 2009 PICES Summer School on “*Satellite oceanography for the earth environment*” which had emphasis on sensors (optical, infra-red and microwave) and image processing. The Science Board recommendation was approved by Council (Decision 2010/S/3).

A component of the PICES/MAFF project (see Agenda Item 11) conducted by the Section on *Ecology of Harmful Algal Blooms in the North Pacific* focuses on teaching country-specific training courses most required to ensure seafood safety in Pacific countries outside the PICES region. In 2010, two courses were conducted in Guatemala: (1) training in screening methods for testing shellfish for paralytic shellfish poisoning toxins and phytoplankton identification, with specific focus on harmful species in Guatemala (February 15–19, 2010; in Guatemala City and San José; http://www.pices.int/publications/pices_press/volume18/18_issue2.aspx), and (2) training on High Performance Liquid Chromatography (HPLC) and Mass Spectrometry (MS) for detection of domoic acid and saxitoxins (April 26–29, 2010, in Guatemala City; http://www.pices.int/publications/pices_press/volume17/17_issue2.aspx). Planning is in progress for a training course for the South Pacific Island community (with focus on ciguatoxins and ciguatoxic cells, a devastating problem to Pacific Island fisheries), to be held in the spring of 2011 (Decision 2010/S/3).

One of key activities for a component of the PICES/MAFF project conducted by the Working Group on *Non-indigenous Aquatic Species* (WG 21) is 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. A pilot workshop was held July 13–16, 2010, at the Kobe University Research Center for Inland Seas, Awaji Island, Japan, and attended by scientists from Indonesia (1), Malaysia (1), Philippines (2), Singapore (1), Thailand (1) and Vietnam (1). Planning is initiated for a larger-scale demonstration workshop for Southeastern Asian countries to be held tentatively in late spring or early summer 2011, in Thailand (Decision 2010/S/3).

To foster the common use of best methods for CO₂ measurements and allow for inter-comparability of collected data, the PICES Section on *Carbon and Climate* oversaw the development of the “*Guide to best practices for ocean CO₂ measurements*” published in 2007 as PICES Special Publication No. 3 and IOCCP (SCOR/IOC International Ocean Carbon Coordinated Project) Report No. 8. The Guide is now used worldwide, and is considered the definitive reference of the ocean CO₂ system. The Guide is available on-line from the Carbon Dioxide Information Analysis Center (CDIAC) web-site in individual chapters or as a whole document. Hard copies are also available upon request from PICES and CDIAC. To increase the use of the Guide, volunteers were being sought to assist with translations of the Guide to languages other than English. The Executive Secretary reported that the Korean and Chinese translations of the Guide were published in 2010.

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Travel grants

A total of about \$29,400 from the Trust Fund were spent in 2010 to support participation of students and early career scientists in the 2010 PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries*” (Sendai, Japan) and PICES-2010 (Portland, U.S.A.). This amount includes a SCOR (Scientific Committee on Oceanic Research) grant of US\$5,000 to cover participation of scientists from countries with “economies in transition” to SCOR-relevant sessions and workshops at PICES-2010. Council members expressed their thanks to SCOR for continuing support of PICES activities. Following the revised guidelines for operating the Trust Fund adopted in 2006 (Decision 2006/A/4(i)), the Executive Secretary provided a detailed report on applications received for support and their disposition at the F&A Committee meeting.

From the Working Capital Fund, PICES also provided travel support for 6 students from the Oregon State University to attend PICES-2010.

The Megrey Student Fund was established within the Trust Fund based on donations by the family and friends of the late Dr. Bernard Megrey to provide travel awards to graduate students and early career scientists from all Contracting Parties 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.

In 2011, travel grants from the Trust Fund (including the Megrey Student Fund) will be provided to students and early career scientists to attend the PICES/ICES Zooplankton Production Symposium (Pucón, Chile), ESSAS Open Science Meeting (Seattle, U.S.A.) and PICES-2011 (Khabarovsk, Russia). It is also expected that travel grants from the MAFF Fund will be provided to support participation of students and early career scientists in the “*Marine bioinvasions*” conference (Barcelona, Spain).

Intern Program

The PICES Intern Program (<http://www.pices.int/projects/intern.aspx>) 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 10 years, 11 scientists and managers from three member countries (4 from China, 4 from Korea and 3 from Russia) have worked as interns at the PICES Secretariat.

The Program requires about \$30,000–\$32,000 per year (\$2,000 stipend per month, travel expenses and English lessons), and has been financed solely by voluntary contributions. In 2010, the U.S. National Marine Fisheries Service (NMFS), the Korean Ministry of Land, Transport and Maritime Affairs (MLTM) and Fisheries and Oceans Canada (DFO) contributed US\$15,000, US\$10,000 and CND\$10,000, respectively, to the Trust Fund for the Intern Program. The Executive Secretary indicated that NMFS and DFO have been the most generous partners of this activity to date, providing from 2000–2010 ~\$182,500 and \$91,500, respectively, for the Program. Council thanked both organizations and MLTM for their support, and instructed the Executive Secretary to invite all Contracting Parties to make voluntary contributions to maintain the Program in 2011 and beyond (Decision 2010/A/6(ii)).

At the end of *FY* 2010, PICES will be holding about \$22,000 for the Intern Program. With the stipend level of \$2,000 per month (Decision 2007/A/6(iii)), this amount is sufficient to maintain the Program for only 8 months in 2011. On September 10, 2010, Ms. Jeongim Mok (Marine Policy Division, MLTM, Korea) was nominated and subsequently selected as the 2011 PICES intern. Considering the current level of the stipend and funding available for the Intern Program, Council agreed to offer her a 6-month term (starting May 1, 2011), with possible extension (up to 12 months) if additional funding becomes available (Decision 2010/A/6(i)).

At the recommendation of the F&A Committee, Council approved changes in the description of the Intern Program clarifying that the focus of the Program is on the professional development of early career marine scientists and managers from Contracting Parties (Decision 2010/A/6(iii)).

Conference on “Developing a global strategy for capacity building in the ocean sciences”

Dr. George Boehlert, U.S. national delegate, represented PICES at the SCOR-led conference to discuss a global capacity building strategy in the ocean sciences held August 16–18, 2010, in Bremen, Germany. He presented a brief report from the conference and pointed out that the conference website (http://www.scor-int.org/CB_Summit.htm) is a good source of capacity building information from participating organizations. Council agreed that Dr. Boehlert should continue to serve a liaison between PICES and the SCOR Committee on Capacity Building.

AGENDA ITEM 13

Improvement of participation in PICES activities

At PICES-2008, the Executive Secretary presented for the first time the background graphic materials for the last six Annual Meetings to better assess problems existing in the 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 requested that these files be updated annually (Decision 2009/A/8(iii)). 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.

The Executive Secretary provided information on the participation of Contracting Parties in PICES activities for the period from 2005 to 2010. He specified that for PICES-2010 preliminary data on registration and abstract submission (as of September 30) were used to create the graphs, and the numbers have to be revised after the meeting. It was highlighted that all Contracting Parties have Committee or expert group members who never, or rarely, attend PICES Annual Meetings, but the problem is most serious with Chinese scientists.

China informed Council that after PICES-2009 some measures were taken to improve involvement of Chinese scientists in activities of the Organization, unfortunately without significant positive outcome to date, mainly due to: (1) national- and agency-level restrictions on the overall number of delegations to international meetings and the number of members in one delegation; (2) internal problems, including inter-agency communication and coordination, with appointment of members; and (3) differences in key research areas for Chinese scientists and scientists from other Contracting Parties. China committed to make the appropriate changes in the national membership to ensure better involvement of Chinese experts, and recommended that PICES should take into account the key research areas in different Contracting Parties to balance the participation. It was also noted that this year, the delegation from the State Oceanic Administration (SOA) encountered unexpected and undesirable visa problems, and several SOA scientists missed PICES-2010 as they did not get their U.S. visas in time. China expressed hope that the host country can do more to help PICES members in receiving their visas easier.

The Chairman indicated the importance of materials provided by the Secretariat for improving the participation in PICES activities and suggested that Council should review this issue at each Annual Meeting in the future.

AGENDA ITEM 14

U.S. proposals on a new membership category and web- and video-conferencing in PICES

Dr. George Boehlert explained the background of both proposals.

“Corresponding member” category

The rationale for this proposal was that PICES is often limited in the individuals able to contribute to its working bodies to those able to regularly attend PICES meetings. Many PICES bodies would benefit from expertise of additional individuals who may be unable to attend meetings, but have the potential to strongly contribute via correspondence to the deliberations and output of the group. Such a category may not be

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appropriate to the Standing Committees, which require face-to-face meetings and Annual Meeting participation, but it might be useful for selected expert groups (Advisory Panels, Working Groups, *etc.*). There would be no expectation of meeting attendance, but responsiveness, document review, and value added to the body's deliberations and output would be required. If this proposal is supported, changes to the Rules of Procedure will be required under *Definition of Terms, Rules 13 and 15*.

It was pointed out that the F&A Committee discussed the proposal for the new "corresponding member" category in PICES and noted that the current Rules of Procedure do not prevent such membership. Therefore, no amendments to the Rules of Procedure to explicitly add this membership category were recommended by the Committee. The U.S. concurred with the sense of the F&A Committee that the "corresponding member" category is permitted under the current Rules of Procedure but noted that should such members be appointed they have to be properly identified so that the lack of expectation of PICES Annual Meeting attendance is clear. Following the suggestion by the F&A Committee, the U.S. withdrew the proposal.

Web- and video-conferencing

The basis for this proposal was the necessity to facilitate PICES activities without the cost and time commitments of long-distance travel. While PICES obviously cannot function without valuable face-to-face meetings, there are other times when IP-based video- or tele-conferencing, can serve as a low-cost, valuable means of improving the function of various PICES bodies. It can also serve the purpose of engaging those members of bodies who are unable to travel – who otherwise might have little input to the discussion. Many organizations, including ICES, are making use of tele-conferencing methods, and they are gaining greater acceptance.

The Executive Secretary reported on options for tele-conferencing in different functions, and suggested that though there are no technical and financial problems in implementing this proposal, the time difference, English proficiency and cultural differences among Contracting Parties can potentially be a problem. This view was supported by all Asian countries.

The U.S. thanked the Secretariat for researching the topic and acknowledged the successful use of these techniques during the inter-sessional FUTURE workshop in August 2010. The U.S. accepted the point made by the Executive Secretary that PICES encompasses many time zones, and that arranging meetings across the Pacific can be logistically difficult, but pointed out that video- and tele-conferencing is not recommended to routinely replace face-to-face meetings, but should be used where possible to decrease travel requirements (and associated carbon footprint) or to include members who were unable to attend for other reasons.

After discussion, Council agreed that video- and tele-conferencing should not replace the current business meetings at the Annual Meetings. As this approach is helpful in reducing the cost and time commitments, the Executive Secretary was instructed to attempt implementing it for smaller meetings and meetings of appropriate expert groups selected in consultation with Science Board. Practical ways have to be sought to resolve logistical difficulties.

AGENDA ITEM 15

Proposed changes in PICES Rules of Procedure

After the proposal on the "corresponding member" category was withdrawn, the only suggested amendments to the Rules of Procedure were in respect to a specific review period and the chairmanship for a Section. At the recommendation of the F&A Committee, Council approved the changes as proposed, with the exception of changing the time period for review and Co-Chairmen terms to be three years instead of the proposed five years (Decision 2010/A/4). Changes are shown in italics in boxes below:

- Including a specific review period for a Section by the parent Scientific Committee [*Rule 13(iii)(d)*]

Section

(d) shall be responsible to and reviewed regularly (*every three years*) by the parent Scientific Committee.

- Adding a clause on the chairmanship for a Section [*Rule 17*]

For Sections, Co-Chairmen are selected from the membership by the Science Board for approval by the Council to serve for a term of three years, and shall be eligible for re-appointment;

AGENDA ITEM 16

Report of Science Board

The Science Board met from 12:30–15:00 on October 24 and from 9:00–18:00 hours on October 30, under the chairmanship of Dr. John E. Stein. Drs. Stein and Yoo presented the report to Council on October 31. The full report can be found elsewhere in this Annual Report. Discussions on some issues can be found under agenda items 4, 6, 7 and 9–11. Decisions on scientific issues are summarized in *GC Appendix A* (Decisions 2010/S/1–2010/S/9).

AGENDA ITEM 17

Report and recommendations of the Finance and Administration Committee

The Finance and Administration (F&A) Committee met from 09:00–13:00 hours on October 27 and from 09:00–11:30 hours on October 28, under the chairmanship of Ms. Patricia Livingston, who presented the report to Council on October 30. The full report is included elsewhere in this Annual Report. Decisions on financial and administrative issues are summarized in *GC Appendix A* (Decisions 2010/A/1 – 2010/A/6).

The F&A Committee report expressed special concern to the operation of the PICES Secretariat in the future, as the terms of the Executive Secretary and Deputy Executive Secretary are now scheduled to end in the same year, 2014. Council briefly discussed the necessity of taking some measures to ensure continued smooth operations of the Organization well before this date. It was pointed out that the advanced hiring of a replacement even for one of these positions to allow a sufficient training period has significant financial implications. Japan requested the Secretariat to develop several possible approaches (scenarios) for Council to better assess these implications.

AGENDA ITEM 18

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 Regulations 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)). 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 2009 report submitted by the Executive Secretary, Dr. Alexander Bychkov, 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 report on the performance evaluation of the Executive Secretary for 2009, with tasks for 2010, is appended as *GC Endnote 9*.

AGENDA ITEM 19

Election of Chairman and Vice-Chairman of PICES

In accordance with 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*”. Drs. Tokio Wada (Japan) and Lev Bocharov (Russia) were elected as the Chairman and Vice-Chairman of Council, respectively, at PICES-2006 (Decision 2006/A/9), and re-elected for these positions at PICES-2008 (Decision 2008/A/9). Their second terms will end at the conclusion of PICES-2010.

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Following Rule 5(ii) of the Rules of Procedure, “*Nominations of candidates for elections in the Council shall be sent in writing to the Executive Secretary at least 60 days prior to the start of the Annual Meeting at which the election will occur*”. On October 13, 2009, Dr. Bocharov was recommended by Mr. Victor Risovaniy (Acting Head, Russian Federal Agency for Fisheries) to be considered for the next PICES Chairmanship. On July 27, 2010, Dr. Laura Richards (Canada) was recommended by Dr. Sylvain Paradis (Director-General, Ecosystem Science, Fisheries and Oceans Canada) for the position of the PICES Vice-Chairman. At the meeting, Council unanimously elected Dr. Bocharov as the Chairman (Decision 2010/A/8(i)) and Dr. Richards as the Vice-Chairman (Decision 2010/A/8(ii)) of PICES. Drs. Bocharov and Richards expressed their gratitude for the support given by Council.

Delegates thanked Dr. Wada for his strong leadership and efforts over the past four years. He will continue serving PICES as the Past-Chairman (Decision 1996/A/5) and, in this advisory capacity, will attend the meetings of Council for the period of Dr. Bocharov’s Chairmanship (Decision 2010/A/8(i)).

AGENDA ITEM 20

Appointment of F&A Committee Chairman

In accordance with Rule 19(iii) of the Rules of Procedure, “*The Chairman of the F&A 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.) was appointed as the Chairman of the F&A Committee at PICES-2008 (Decision 2008/A/10), and her first term of office would come to an end at this year’s Annual Meeting. At the recommendation of the Committee, and in accordance with Rule 19(iii), Council re-appointed Ms. Livingston as the F&A Chairman for another 2-year term (Decision 2010/A/9).

AGENDA ITEM 21

Other business – Update on the development of a new regional fisheries management organization (RFMO) in the North Pacific

At PICES-2008, Council briefly touched on the issue of future collaboration with a new Regional Fisheries Management Organization for the North Pacific (NPRFMO), currently under consideration, following the adoption of the Resolution 61/105 on *Sustainable Fisheries* by the United Nations (UN) General Assembly. Negotiations originally targeted the regulation of the deep sea fisheries in the North Pacific (especially the fisheries around Emperor’s Sea Mounts), but then have extended to cover the entire North Pacific and to include some pelagic species which are not covered by existing RFMOs (squid, sardines, *etc.*) Initial expert and technical consultations related to vulnerable marine ecosystems involved Japan, Korea, Russia, and the United States of America. Canada, China, Chinese Taipei, and Mexico were invited and they had agreed to join this discussion. It was indicated that PICES is interested and willing to work closely with this new NPRFMO, but this collaboration should be based on, and take advantage of, the well-established and balanced scientific activities of PICES. It was also pointed out that even though PICES is not designed to provide short-term tactical management advice, the Organization is well placed to provide advice on broad issues concerning North Pacific marine systems.

More substantial discussion on the approach to be taken in working with NPRFMO proceeded at IGC-2009. At this meeting, Council agreed that PICES could contribute to a sustainable and wise use of the North Pacific marine ecosystems and bio-resources by giving broad scientific advice to NPRFMO, and this would also meet the expectations of the Contracting Parties for scientific products of PICES to be relevant for national policy making. Council also suggested that PICES should pay attention to the progress of the inter-governmental negotiations on NPRFMO. National delegates were asked to approach their governments about the nature of cooperation between the two organizations.

The Chairman requested all Contracting Parties to comment on the expectations of their governments on relations between PICES and NPRFMO, and the following views were expressed:

- Canada pointed out that since the convention area for the NPRFMO is likely to be similar to that of PICES, significant opportunities for collaboration on scientific issues among PICES, NPRFMO and NPAPFC are anticipated, and recommended to consider any cost efficiencies which might be possible through cooperative arrangements.
- China indicated that as NPRFMO has not been established, its scope, structure and functions are not clear yet. In addition, some countries proposed to extend the NPRFMO boundaries ten degrees toward south to make the jurisdiction docked between the NPRFMO and the South Pacific RFMO. If accepted, the convention areas for NPRFMO and PICES will be different and that may cause some unexpected problems. China suggested to re-visit the issue after every aspect of NPRFMO will be decided.
- Japan advised that PICES should pay due attention to the progress of the inter-governmental negotiations on NPRFMO and not prejudge on the specifics about nature of cooperation between the two organizations before the NPRFMO convention is ratified.
- Following the intervention from Japan, the United States agreed it would be premature to make concrete approaches concerning the formal relationship between PICES and NPRFMO pending completion of the arrangements for the convention and indicated their willingness to raise the issue on collaboration between the two organizations with U.S. delegations to NPRFMO.
- Korea pointed out that MLTM (Ministry of Land, Transport and Maritime Affairs) has the responsibility for PICES, but is not involved in the inter-governmental negotiations on NPRFMO. Information was requested from the relevant ministry and will be provided after the Annual Meeting.
- Russia provided substantive information on the outcomes from the 9th Negotiating Session to establish NPRFMO held on September 5–9, 2010, in Yuzhno-Sakhalinsk (Russia), and plans for 10th Multilateral Meeting on the management of high seas fisheries in the North Pacific Ocean to be hosted from February 27 to March 4, 2011, in Vancouver (Canada). As for the relationships between PICES and NPRFMO, Russia suggested that PICES should wait until the convention is signed, and only after that establish relationships with the new organization.

Based on this discussion, it was concluded that PICES should continue keeping attention to the progress of the inter-governmental negotiations on NPRFMO and be open for establishing working relations after the NPRFMO convention is ratified.

GC Endnote 1

Participation list

Canada

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

Japan

Taro Ichii (advisor, F&A member)
Yukimasa Ishida (alternate delegate)

People's Republic of China

Yingren Li (alternate delegate)
Yuan Wang (alternate delegate)

Republic of Korea

Chungmo Jung (alternate delegate)
Hyun-Young Kim (advisor)
Chul Park (GC and F&A member)

Russian Federation

Lev Bocharov (GC member)
Oleg Katugin (advisor)
Vladimir Radchenko (GC member)

U.S.A.

George Boehlert (GC member)
Samuel Pooley (GC member)
Elizabeth J. Tirpak (advisor, F&A member)

Other

Tokio Wada (PICES Chairman)
Vera Alexander (PICES Past-Chairman)
Patricia Livingston (F&A Chairman; only October 30)
John Stein (Science Board Chairman)
Sinjae Yoo (Science Board Chairman-elect)
Alexander Bychkov (Executive Secretary)
Skip McKinnell (Deputy Executive Secretary; only October 30)

GC Endnote 2

Opening remarks by representatives of Contracting Parties

Dr. Laura Richards (Regional Director of Science, Pacific Region, Fisheries and Oceans Canada)

Dear Mr. Chairman: On behalf of Canada and the Canadian delegation, I would like to thank the United States of America for hosting PICES-2010 in Portland, Oregon. We especially appreciate the hard work of the Pacific States Marine Fisheries Commission and the Secretariat in making this meeting a success.

Canada is particularly pleased to see the progress we have made in turning the FUTURE science program into reality. Many of the sessions at PICES-2010 were already focused on topics relevant to FUTURE. This is an encouraging start. However, we still need additional and ongoing work to ensure that the PICES Standing Committees continue to be engaged and active in FUTURE-related activities.

We will also need to continue our work on updating the PICES Strategic Plan so that all activities within PICES are aligned with the current priorities and information needs of member countries.

I understand that today we will discuss progress on negotiations for the new North Pacific RFMO. Since the convention area is likely to be similar to that of PICES, Canada anticipates significant opportunities for collaboration on scientific issues among PICES, the new RFMO and NPAFC. We should also consider any cost efficiencies which might be possible through cooperative arrangements.

Cost efficiencies are obviously important for any organization. Many of the world's economies are dealing with the fall-out from the global economic situation. In Canada, my department of Fisheries and Oceans is about to undergo a five-year strategic review and will be expected to reduce its budget by 5%. While we will continue to support PICES, we may not be able to provide the same level of participation as in the past.

This has been an interesting year for Canada for other reasons. As you may know, about a year ago the Canadian Government initiated a federal inquiry to study the apparent collapse of the sockeye salmon from the

Fraser River on Canada's West coast. Quite unexpectedly, in 2010 we have seen the highest returns of sockeye salmon to the Fraser River in a century. Clearly, as evidenced by these recent events, the biology of Pacific salmon is complex. The cooperative scientific research and exchange of information on the North Pacific ecosystem and its resources, including Pacific salmon, is very important to Canada. Thank you.

Dr. Yukimasa Ishida (Director-General, Tohoku National Fisheries Research Institute, Fisheries Research Agency, Japan)

Dear Mr. Chairman: First of all, I would like to thank the Government of the United States of America and the Local Organizing Committee for kindly hosting the Nineteenth PICES Annual Meeting here in Portland. Also, I thank the PICES Secretariat for its effort to prepare this meeting.

Secondly, Japan is very pleased with PICES activities, including the PICES project entitled "*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*" supported by the Japanese Trust Fund. This 5-year project was initiated in 2007, and Japan hopes that PICES will complete this project successfully next year. Japan also expects that these kinds of activities will be continued based on the successful present project.

Thirdly, Japan is pleased with the good start of the second PICES integrated science program, FUTURE. There were three Topic Sessions at PICES-2010 supported jointly by FUTURE and the Standing Committees. I am especially pleased to learn that the PICES Chairman, Dr. Tokio Wada, and the US national delegate, Dr. George Boehlert, made presentations at one of these sessions on marine renewable energy. I am happy that the leaders on both sides of the North Pacific Ocean have an interest in marine renewable energy and hope that they will direct their additional renewable energy into PICES activities. Thank you very much.

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

Dear Mr. Chairman, distinguished delegates, ladies and gentlemen: On behalf of China and the Chinese delegation, I would like to thank the United States of America for inviting us here to the beautiful city of Portland. We appreciate the hard work of the Local Organizing Committee and the PICES Secretariat in preparing for this meeting.

This year, China welcomed many international events, such as the 33rd World Ocean Peace Conference, the celebration of the 50th anniversary of IOC-UNESCO, the 1st China International City Forum and the Marine Eco-civilization Forum (Wenzhou) 2010.

China is very pleased with the ongoing success of PICES activities and hopes that they will contribute to the cooperation throughout the Pacific Rim, and will serve to encourage and promote the abilities of scientists in developing countries to address this growing concern. Also, at PICES-2010 activities for implementing a new PICES integrated science program called FUTURE started. This program is focused on marine environmental issues, and includes the coastal areas of each member country. China expects that the activities of FUTURE will provide valuable knowledge not only to scientists but also to ordinary citizens and policy makers in PICES member countries and other nations around the world.

Since its involvement in PICES, China has put a lot of emphasis on, and has taken a very active part in PICES activities, and at the same time, shouldered the responsibility and made contributions to its development together with other member countries. In the future, China will continue to support PICES by encouraging more involvement and cooperation. We also hope that through the implementation of FUTURE, we can achieve a better understanding of the responding mechanism of the marine ecosystem in the North Pacific to climate change and human activities, improve the capacity of forecasting and understanding the trends and development of marine ecosystem in the North Pacific, and help to adapt to climate change and make sustainable use of the marine ecosystem.

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Finally, I hope the coordinated activities of the PICES scientific community will foster the international cooperation needed to carry out our important tasks more effectively. I wish productive days to every participant here in Portland. Thank you very much.

Dr. Chul Park (Chungnam National University, Republic of Korea)

Distinguished Chairman and national delegates: On behalf of the government of the Republic of Korea and the Korean delegation, I would like to show our appreciation to Dr. Tokio Wada, Chairman of PICES, Ms. Patricia Livingston, Chairperson of the F&A Committee, and Dr. Alexander Bychkov, Executive Secretary of PICES, for their enthusiastic effort in putting together this Nineteenth Annual Meeting, PICES-2010. I also would like to thank the Government of the United States of America for successfully preparing this meeting.

In spite of the relatively short history of the Organization, we, in PICES, are catching up ICES pretty fast. And this must be due to the excellent leadership shown by the former chairpersons and present leaders. On behalf of the Korean delegation, I would like to thank them for their devotion.

We are gathered here in the need for improved scientific understanding of the North Pacific Ocean and its processes, living resources, and oceanographic features. Obviously, questions related to the main theme of this year's Annual meeting, "*North Pacific ecosystems today, and challenges in understanding and forecasting change*", can be best answered through a spirit of international scientific cooperation.

The United Nations (UN) has launched a program "*UN Regular Process (UNRP) for Global Reporting and Assessment of the State of the Marine Environment*". Based on the assessment of assessments, the global ocean environments are going to be evaluated for sustainable use by humanity. This work, scheduled to be completed by 2014, is very much similar to what PICES has done already. Following the first edition in 2004, the second edition of the North Pacific Ecosystem Status Report was produced this year, although the chapter on the "East/Japan Sea" was missing. We congratulate PICES for this landmark publication, and also expect to see the missing chapter on website as well as independent hard copy as soon as possible. This report itself shows that PICES is proceeding in the right direction in a timely manner. I believe our new science program, FUTURE, must be a leading action for the UN Regular Process, and the Korean government is willing to support FUTURE as we did for the former Climate Change and Carrying Capacity program.

In 2012, Korea will host an Ocean Expo in Yeosu. PICES, along with ICES and IOC, has proposed a symposium during the Expo, and this symposium titled "*Effects of climate change on the world's oceans*" was chosen as one of the opening acts. The symposium is a follow-up of the previous one in Gijón (Spain) in 2008, and we believe it will prove to be a milestone in humanity's effort to cope with climate change. The Korean government will do everything to make this symposium a success. Also, I would like to ask all Contracting Parties to join the efforts.

Again, I would like to extend my special thanks to all the staff of the PICES Secretariat and Local Organizing Committee for their efforts and hard work, which enabled this Annual Meeting to be very fruitful. Thank you very much.

Dr. Lev Bocharov (Director-General, Pacific Research Institute of Fisheries and Oceanography, Russian Federation)

Distinguished Mr. Chairman, national delegates and advisors: On behalf of the Russian Federation, our delegation would like to express our great appreciation on how this year's Annual Meeting has been organized and held. It is due to the PICES Secretariat and representatives of the Contracting Parties, whose efforts have made this meeting a success.

In Russia, we foresee that the progress of PICES as an international scientific body is largely associated with the successful implementation of the FUTURE program. PICES has notably increased diversity in the scientific fields and directions under its expertise. It leads us to new results but also creates some new

challenges and obligations. We must respond in a proper and timely manner to these new challenges by improving our organization structure, strengthening our efforts, and involving new specialists in the major framework of our activities.

Russia is going to host the next PICES Annual Meeting in Khabarovsk in 2011. It will be the 20th anniversary of our Organization, a small jubilee not for celebration, but for making a brief stop in order to look behind us to see what has been done and into the future (=FUTURE) at our prospects to make milestone reports, and after that... to continue our work. I would like to ensure you that Russia will maintain PICES activities at the highest level. Thank you.

Dr. George Boehlert (Director, Hatfield Marine Science Center, Oregon State University, U.S.A.)

The United States would like to thank the Pacific States Marine Fisheries Commission and PICES Secretariat for the excellent organization of the meeting and the hospitality. As the member of the Governing Council from this State, I would like to welcome you all to Oregon. Ocean and coastal science in Oregon is very strong, as evidenced by the high level of participation of Oregon scientists at PICES-2010. My institution, Oregon State University (OSU), has one of the larger marine science programs among US academic institutions. We have a great diversity of organizations at OSU's Hatfield Marine Science Center in Newport, and facilities are under construction to house NOAA's research fleet headquarters there. This Center also hosted the successful rapid assessment survey conducted by scientists from the PICES Working Group on *Non-indigenous Aquatic Species* during the week prior to the meeting. We note that the excellent scientific sessions at PICES-2010 clearly demonstrate the excitement of PICES scientists about the FUTURE program. Finally, I would like to express the appreciation of the US delegation for the fine work of the Council and Science Board Chairmen as they complete their terms in 2010.

GC Endnote 3

Governing Council meeting agenda

1. Opening remarks by representatives of Contracting Parties
2. Adoption of agenda and meeting procedures
3. Membership and observers from other countries
4. Relations with relevant international and regional organizations/programs
5. Report on administration for 2009–2010
6. Schedule, structure and financing of future Annual Meetings
7. Progress report on implementation of new PICES integrative scientific program, FUTURE
8. Report of the Study Group on *Updating the PICES Strategic Plan*
9. Report of the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*
10. PICES Advisory Report to the Commission of inquiry into the decline of Fraser River sockeye salmon
11. Progress report on the PICES project "*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*" supported by the Japanese Trust Fund
12. Capacity building activities including PICES Intern Program
13. Improvement of participation in PICES activities
14. U.S. proposals on
 - Consideration of a new membership category called "corresponding member" in PICES
 - Investigation of web- and video-conferencing for PICES activities
15. Proposed changes in PICES Rules of Procedure
16. Report and recommendations of the Science Board
17. Report and recommendations of the Finance and Administration Committee
18. Report of the Executive Committee for evaluating annual performance of the Executive Secretary
19. Election of Chairman and Vice-Chairman of PICES
20. Appointment of F&A Committee Chairman
21. Other business

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GC Endnote 4

List of organizations/programs present as observers at PICES-2010

Alaska Ocean Observing System (AOOS)	Ms. Molly McCammon
Bering Sea Ecosystem Study (BEST/BSIERP)	Dr. Jeffrey Napp
	Dr. Phyllis Stabeno
Census of Marine Life	Dr. Vera Alexander
	Dr. Michael Feldman,
	Dr. Paul Snelgrove
Climate Variability and Predictability Program (CLIVAR)	Dr. Toshio Suga
Coastal and Estuarine Research Federation (CERF)	Dr. Steven Rumrill
Ecosystem Study of Sub-Arctic Seas (ESSAS)	Dr. Kenneth Drinkwater
	Dr. George Hunt, Jr.
<i>Exxon Valdez</i> Oil Spill Trustee Council (EVOSTC)	Dr. Elise Hsieh
	Ms. Catherine Boerner
Group of Experts on Scientific Aspects of Marine Pollution (GESAMP)	Dr. Peter Kershaw
Global Ocean Observing System (GOOS)	Dr. Luis Valdés
Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)	Dr. Sinjae Yoo
Intergovernmental Oceanographic Commission (IOC) of UNESCO	Dr. Luis Valdés
International Association of Marine Science Libraries	Mr. Brian Voss
International Council for the Exploration of the Sea (ICES)	Dr. Jürgen Alheit
	Dr. Harald Loeng
	Dr. Juan Valero
International Pacific Halibut Commission (IPHC)	
International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)	Dr. Jae Bong Lee
International Program for Deployment of Profiling Floats (Argo)	Dr. Howard Freeland
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. Jin Yeong Kim
North Pacific Fishery Management Council (NPFMC)	Dr. Chris Oliver
North Pacific Research Board (NPRB)	Dr. Clarence Pautzke
	Ms. Nora Deans
Northwest Pacific Action Plan (NOWPAP)	Dr. Sangjin Lee
Northwest Association of Networked Ocean Observing Systems (NANOOS)	Dr. Jan Newton
Northwest Atlantic Fisheries Organization (NAFO)	Dr. Vladimir Shibanov
Pacific Arctic Group (PAG)	Dr. Sue Moore
Pacific Fishery Management Council (PFMC)	Mr. Michael Burner
Scientific Committee on Oceanic Research (SCOR)	Dr. Wolfgang Fennel
Sir Alister Hardy Foundation for Ocean Science (SAHFOS)	Dr. Sonia Batten
Southern California Coastal Ocean Observing System (SCCOOS)	Dr. Karen Baker
	Dr. Tony Koslow
	Dr. Sam McClatchie
	Dr. William Sydeman,
Surface Ocean Low Atmosphere Study (SOLAS)	Dr. Emilie Breviere
World Climate Research Programme (WCRP)	Dr. Toshio Suga
Yellow Sea Large Marine Ecosystem Project (YSLME)	Dr. Sinjae Yoo

GC Endnote 5

2010 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 WG, 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 (linked with GOOS)
BEST*	Bering Ecosystem Study
CERF	Coastal and Estuarine Research Federation
CLIVAR*	Climate Variability and Predictability Program
CoML*	Census of Marine Life
ESSAS*	Ecosystem Studies of Sub-Arctic Seas
EVOSTC	Exxon Valdez Oil Spill Trustee Council (EVOSTC)
FAO	Food and Agriculture Organization
GCOS*	Global Climate Observing System
GEOSS	Global Earth Observing System of Systems
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GLOBEC*	Global Ocean Ecosystem Dynamics
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
ICSU	International Council of Scientific Unions
IGBP*	International Geosphere-Biosphere Program
IGOSS	Integrated Global Ocean Services System
IMBER*	Integrated Marine Biogeochemistry and Ecosystems Research (former OCEANS)
IMO	International Maritime Organization
IOC*	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IPCC*	Intergovernmental Panel on Climate Change
IPHC	International Pacific Halibut Commission
IWC	International Whaling Commission
NAFO	Northwest Atlantic Fisheries Organization
NANOOS	Northwest Association of Networked Ocean Observing Systems – Integrated Ocean Observing System
NASCO	North Atlantic Salmon Conservation Organization
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
PSA	Pacific Science Association
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
SAHFOS*	Sir Alister Hardy Foundation for Ocean Science
SAON	Sustaining Arctic Observing Networks
SCOR*	Scientific Committee on Oceanic Research
SOLAS*	Surface Ocean Low Atmosphere Study
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program

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START	South Asian Regional Committee for the System for Analysis, Research and Training
UNEP	United Nations Environment Program
WCRP	World Climate Research Program
WESTPAC*	Cooperative Study of the Western Pacific, IOC Sub Committee for the Western Pacific
WMO	World Meteorological Organization

GC Endnote 6

Report on Administration for 2009–2010

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

- The 2009 fiscal year operations were completed within budget and with pre-agreed parameters. In the auditor's opinion, the financial statements accurately represent the financial position of the Organization as at December 31, 2009, and the results of its operations and changes in fund balances for the year are in accordance with PICES Financial Regulations and Canadian generally accepted accounting principles. Details are reflected under *FA Agenda Item 3*. The audit of *FY 2010* will be conducted in April 2011.
- 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 2010*. Japan and the United States paid prior to the due date. Korean, Russian and Canadian contributions arrived at the end of the first quarter, and the Chinese contribution was received in early August. 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, the amount of funds from voluntary contributions, grants and partnerships for various activities initiated or sponsored by PICES exceeded, for the first time, the total annual contribution by Contracting Parties. Special emphasis was put on fund raising for the 2010 PICES/ICES/FAO Symposium on "*Climate change effects on fish and fisheries*" (Sendai, Japan), the 2011 Zooplankton Production Symposium on "*Population connections, community dynamics, and climate variability*" (Pucón, Chile), the North Pacific Continuous Plankton Recorder (CPR) program, and capacity building activities. Details are reflected under *FA Agenda Item 5*.

B. Planning and organizing the 2010 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 2010 Annual Meeting (October 22–31, Portland, U.S.A.) was hosted by the Government of the United States of America, in coordination with the PICES Secretariat, with logistical support provided by the Pacific States Marine Fisheries Commission. The PICES-2010 theme was "*North Pacific Ecosystems Today, and Challenges in Understanding and Forecasting Change*". About 430 scientists and managers from 16 countries and 32 international and regional organizations and programs attended 17 sessions, 5 workshops and 22 business meetings of the committees and expert groups (see *Appendix 1* for the complete list), and presented 376 talks and posters.
- To get a more comprehensive picture on the Annual Meeting theme and to secure funding, 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 Topic Sessions relevant to their scientific interests: "*Census of Marine Life – Exploring ocean life: Past, present and future*" (US CoML), "*Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting*" and "*Development and use of ocean observing and forecasting systems*

in coastal and marine management” (ICES), “Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function” (IMBER), “Identifying vulnerable marine ecosystems in the North Pacific” (NPFMC), and “Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean” (SOLAS).

- The Secretariat was also actively involved in the implementation of changes in the format of the Annual Meeting approved by Council based on the recommendation of the Study Group on *Restructuring the PICES Annual Meeting* (SG-RAM).

C. 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 2010, logistical and financial arrangements were made for 15 inter-sessional 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 premier event of the year was the symposium on “*Climate change effects on fish and fisheries*” held in April 2010 in Sendai, Japan. PICES was the major international sponsor of this event, along with ICES and FAO. The response to the symposium exceeded our expectations, with over 350 abstracts submitted, and almost 400 scientists from 37 countries attending.
- Preparations, arrangements or planning are in progress for 5 more international symposia to be convened in 2011–2012. This includes the upcoming landmark events such as the 5th International Zooplankton Production Symposium on “*Population connections, community dynamics, and climate variability*” (March 2011, Pucón, Chile), the ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” (May 2011, Seattle, U.S.A.), the second PICES/ICES Early Career Scientist Conference on “*Oceans of change*” (April 2012, Balearic Islands, Spain), and the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” to be held in conjunction with the Ocean Expo-2012 (May 2012, Yeosu, Korea).

D. 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 in 2010 included: 4 special issues of primary journals (peer-reviews are in progress for 2 special issues and 1 special section in a regular issue to be published in 2011), 1 PICES Special Publication, 2 reports in the PICES Scientific Report Series, 2 issues of PICES Press, 1 special USB and several Books of Abstracts, announcements and posters (see *Appendix 3* for the complete list).
- Significant progress had been made in the implementation of the Action Plan resulting from the 2008 PICES Publications Review, especially with respect to:
 - PICES branding on the article level in special issues of primary journals published by Elsevier;
 - Development of a PICES digital document library using “geo-network” software on a remote server;
 - Translating PICES publications into other languages;
 - Negotiating a License Agreement on the inclusion of PICES Publications in the ProQuest Science Journals database.

E. 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 and concern the entire world, 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 these organizations and programs is reflected in *Appendix 4*.
- Thirty two international and regional organizations and programs were present at PICES-2010, surpassing 30 observers in 2009 and 21 in 2008, and demonstrating that we are continuing to build our international

relationships in productive ways. Representatives of these organizations/programs expressed their views on potential areas of collaboration with PICES (including specific proposals for 2011 and beyond) at the meetings of Science Board, Standing Committees and/or their subsidiary bodies.

- The holding of co-sponsored symposia/sessions/workshops/training courses and the creation of joint expert groups were chosen as directions of actual collaboration:
 - Two international symposia and several topic sessions and workshops were organized in partnership with other organizations and programs in 2010 (see *Appendixes 1* and *2* for the complete list). Preparations are in progress for 4 joint international symposia/conferences to be held in 2011–2012.
 - Amendments to the PICES Rules of Procedure (http://www.pices.int/about/rules_procedure.aspx) were made to allow experts from outside of PICES to serve as *ex-officio* members on PICES Technical Committees and subsidiary bodies of PICES Scientific Committees (*Rules 13–15*). Three international organizations, IGBP (International Geosphere-Biosphere Programme), NOWPAP (Northwest Pacific Action Plan) and SAON (Sustaining Arctic Observing Networks), expressed their interest in having *ex-officio* members on the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S), Section on *Carbon and Climate* (CC-S), and Technical Committee on Monitoring (MONITOR), respectively. These requests were supported by PICES expert groups, endorsed by Science Board and approved by Council. In 2010, the Secretariat took necessary steps in completing these arrangements.
 - In 2008, PICES and ICES formed the first joint expert group, Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS). At PICES-2009, Council approved in principle a joint PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* to develop a formal framework to serve as the basis for linkages of science plans and longer-term strategic planning for the two organizations. In 2010, the Secretariat and Science Board worked with ICES to finalize the terms of reference, membership and timelines for the group.
 - PICES supported the establishment of SCOR WG 137 on *Patterns of Phytoplankton Dynamics in Coastal Ecosystems: Comparative Analysis of Time Series Observation*, and agreed to provide funding for an Associate Member from the North Pacific (Dr. Sinjae Yoo, Korea) to participate in its activities. This Working Group is considered as a logical methodological continuation of the successful SCOR WG 125 on *Global Comparisons of Zooplankton Time Series*, in which PICES was also represented by an Associate Member (Dr. Harold Batchelder, U.S.A.).

F. Coordinating special projects

The staff of the Secretariat was involved in coordinating/leading several special projects:

- The Deputy Executive Secretary, Dr. Skip McKinnell, served as the Co-Editor (with Dr. Michael Dagg, BIO Chairman) of the second PICES North Pacific Ecosystem Status Report, and as the Lead Author of the report on “*The decline of Fraser River sockeye salmon in relation to North Pacific marine ecology*” for the Cohen Commission, Canada. To allow Dr. McKinnell to focus mostly on these two projects, his duties within the Secretariat were adjusted.
- The Executive Secretary was responsible for the funding management and reporting for the 5-year project on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” supported by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, and served as the co-coordinator (with Dr. Sonia Batten) of a funding consortium to support the North Pacific Continuous Plankton Recorder (NP CPR) survey.

G. Administrating the Secretariat

- To increase the capacity of the Secretariat, a funding of approximately \$36,000 was secured to support a part-time contract position at the PICES Secretariat. This amount includes overheads for PICES projects on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” (funded by the Ministry of Agriculture, Forestry and Fisheries of Japan) and “*The decline of Fraser River sockeye salmon in relation to North Pacific marine ecology*” (funded by the Cohen Commission, Canada).

- The PICES Intern Program, commenced in 2000, 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 October 2010, 11 scientists from three countries (4 from China, 4 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. Since PICES-2009, Fisheries and Oceans Canada (\$10,000), the Ministry of Land, Transport and Maritime Affairs of Korea (\$10,000 US), TINRO-Center of Russia (\$5,000 US) and the U.S. National Marine Fisheries Service (\$15,000 US) contributed a total of ~\$40,500 to the Trust Fund for the Program. These contributions were sufficient to maintain the Program for about 18 months.

Appendix 1: Scientific sessions, workshops and business meetings convened at PICES-2010

Sessions

- 1½-day Science Board Symposium on “*North Pacific ecosystems today, and challenges in understanding and forecasting change*”;
- 1-day BIO Contributed Paper Session;
- ½-day BIO Topic Session on “*Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean*” (co-sponsored by SOLAS);
- ½-day BIO Topic Session on “*The Practical Handbook at 50: A celebration of the life and career of Tim Parsons*”;
- ½-day BIO Topic Session on “*Census of Marine Life – Exploring ocean life: Past, present and future*” (co-sponsored by CoML);
- 1-day FIS Contributed Paper Session;
- ½-day FIS Topic Session on “*Oceanographic and demographic processes affecting the reproductive biology of exploited marine stocks*”;
- 1-day FIS/BIO Topic Session on “*Observations of ecosystem mixing under climate change*”;
- 1-day FIS/MEQ Topic Session on “*Economic relation between marine aquaculture and wild capture fisheries*”;
- 1-day FIS/POC/BIO Topic Session on “*Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting*” (co-sponsored by ICES);
- ½-day MEQ Topic Session on “*Conceptual and numerical models of HAB dynamics*”;
- ½-day MEQ/FIS Topic Session on “*Identifying vulnerable marine ecosystems in the North Pacific*” (co-sponsored by NPFMC);
- 1-day MEQ/FUTURE Topic Session on “*Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function*” (co-sponsored by IMBER);
- 1-day POC Contributed Paper Session
- ½-day POC/BIO/MONITOR/FUTURE Topic Session on “*Comparing the two major gyres of the subarctic North Pacific – Seasonal and interannual variability and its predictability*”;
- ½-day POC/MEQ/FUTURE Topic Session on “*Marine renewable energy development in coastal and estuarine environments around the North Pacific*”;
- 1-day MONITOR Topic Session on “*Development and use of ocean observing and forecasting systems in coastal and marine management*” (co-sponsored by ICES);
- TCODE E-Poster Session on “*Monitoring and ocean observing systems*”.

Workshops

- 2-day BIO Workshop on “*Marine ecosystem model inter-comparisons (III)*”;
- ½-day FIS Workshop on “*Beyond Lagrangian: Modeling migratory fish behavior in Global Circulation Models*”;
- 1-day MEQ Workshop on “*New technologies and methods in HAB detection. I. HAB species detection*” (includes ½-day laboratory demonstration);
- ½-day POC Workshop on “*PICES Working Group 20 on Evaluations of Climate Change Projections: Progress and FUTURE*”;
- 2-day POC/BIO Workshop on “*Carbon data synthesis (III)*”.

Business meetings

- ¼-day Science Board meeting (October 24) and 1-day Science Board meeting (October 30);
- ½-day meetings of Scientific (BIO, FIS, MEQ and POC) and Technical (MONITOR and TCODE) Committees to be run concurrently;
- 1-day meeting of the POC/BIO Section on *Carbon and Climate* (CC-S);
- 1-day meeting of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S);
- 2-day meeting of the MEQ Working Group on *Non-indigenous Aquatic Species* (WG 21), immediately after a 4-day PICES Rapid Assessment Survey (RAS-2010);
- ½-day meeting of the BIO Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22);
- 1-day meeting of the BIO Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim* (WG 23);
- ½-day meeting of the MEQ/FIS Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24);
- ½-day meeting of the PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS);
- ½-day meeting of the BIO Advisory Panel on *Marine Birds and Mammals* (MBM-AP);
- ½-day meeting of the MONITOR Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific* (CPR-AP);
- ½-day meeting of the POC/MONITOR Advisory Panel for a CREAMS/PICES Program in East Asian Marginal Seas (CREAMS-AP)
- ½-day meetings concurrent meetings of the FUTURE Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems* (AICE-AP), *Climate, Oceanographic Variability and Ecosystems* (COVE-AP) and *Status, Outlooks, Forecasts, and Engagement* (SOFE-AP);
- ½-day joint meeting of AICE-AP, COVE-AP and SOFE-AP;
- 1-day meeting of the Study Group on *Human Dimensions for Environmental Change*.

Appendix 2: Inter-sessional symposia/workshops/meetings organized/sponsored after PICES-2009

Since PICES-2009, the following inter-sessional symposia, workshops and meetings were convened, for which financial, travel and logistical arrangements were made:

- Second PICES Harmful Algal Bloom training course, February 10–19 and April 26–29, 2010, Guatemala;
- 12th Salmon Ecology Workshop (co-sponsored by PICES), March 24–25, 2010, Santa Cruz, CA, U.S.A.;
- PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*”, April 25–29, 2010, Sendai, Japan (approved in 2008);
- Inter-sessional Science Board meeting, April 23–24, 2010 (immediately prior to the PICES/ICES/FAO Symposium), Sendai, Japan;
- Meetings of the PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*, April 29–30, 2010 (immediately after the PICES/ICES/FAO Symposium), Sendai, Japan, and September 22, 2010 (in conjunction with the 2010 ICES ASC), Nantes, France;
- POC/BIO Workshop on “*Carbon data synthesis (II)*”, June 2–3, 2010, Tokyo, Japan;
- Meeting of the Study Group on *Human Dimensions for Environmental Change*, June 24–25, 2010, Yokohama, Japan;
- Demonstration workshop on “*Introduction to rapid assessment survey and collector survey methodologies for application in developing countries*”, July 13–16, 2010, Kobe University Research Center for Inland Seas, Awaji Island, Japan;
- Inter-sessional FUTURE workshop, August 16–18, 2010, Seoul, Korea;
- International ClimeCO2 Summer School on “*Oceans, marine ecosystems, and society facing climate change - A multidisciplinary approach*” (co-sponsored by PICES), August 23–28, Brest, France;
- CREAMS/PICES EAST-II (East Asian Seas Time-series) Workshop, September 11–12, 2010 (at the 5th PEACE (Program of the East Asian Cooperative Experiments) Conference, Gangneung, Korea;
- ICES/PICES Theme Session on “*Responses to climate variability: comparison of northern hemisphere marine ecosystems*” at the 2010 ICES Annual Science Conference, September 20–24, 2010, Nantes, France;

- Second IMBER IMBIZO on “*Integrating biogeochemistry and ecosystems in a changing ocean: Regional comparisons*” (co-sponsored by PICES), October 10–14, 2010, Crete, Greece;
- 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*” (co-sponsored by PICES), November 8–11, 2010, Anchorage, U.S.A.;

Appendix 3: PICES publications in 2010 and beyond

Primary journals

- Special issue of *Deep-Sea Research II* based on papers from the SEEDS-II experiment (Guest Editors: M. Uematsu, M. Wells, A. Tsuda and H. Saito) was published in December 2009 (Vol. 56, Is. 26, pp. 2731-2958) and includes the introduction and 20 papers co-authored by scientists from Japan (majority), Canada and U.S.A.;
- Special issue of *Deep-Sea Research II* on krill biology and ecology dedicated to Edward Brinton based on selected papers from the 4th International Zooplankton Production Symposium (Guest Editors: S. Kawaguchi and W. Peterson) was published in April 2010 (Vol. 57, Is. 7-8, pp. 493-692) and includes the introduction, memorial and 17 papers co-authored by scientists from Australia, Chile, China, France, Japan, Korea, Mexico, UK and U.S.A.;
- Special issue of *Continental Shelf Research* on tides in marginal seas dedicated to Prof. Alexei Nekrasov (Guest Editors: A. Rabinovich, M. Foreman, B. Kagan and J. Cherniawsky) was published in April 2010 (Vol.30, No. 6, pp. 533-714) and includes the introduction, memorial and 16 papers co-authored by scientists from all PICES member countries, Germany, Italy and Mexico, with 10 papers focusing on the North Pacific and adjacent seas;
- Special issue of *Deep-Sea Research II* based on selected papers from the OECOS (Oceanic Ecosystem Comparison in the Subarctic Pacific) experiment (Guest Editors: C. Miller and A. Yamaguchi) was published in September 2010 (Vol. 57, Is. 17–18, pp. 1593-17420) and includes the introduction and 11 papers co-authored by scientists from Japan and U.S.A.;
- Special section in a regular issue of *Journal of Oceanography* based on selected papers from the PICES-2009 Topic Session on “*Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific*” (Guest Editors: T. Ono, K. Lee, C. Sabine and T. Saino) is expected to be published in June 2011;
- Special issue of *ICES Journal of Marine Science* based on selected papers from the 2010 PICES/ICES/FAO Symposium on “*Forecasting climate change impacts on fish and shellfish*” (Guest Editors: A. Hollowed, S.-I Ito, S. Kim, H. Loeng and M. Peck) is expected to be published in June 2011, with sufficient time to be considered by review panels responsible for the next assessment report (AR5) of the Intergovernmental Panel on Climate Change (IPCC);
- Special issue of *Fisheries Research* based on selected papers from the PICES-2009 Topic Session on “*Ecosystem-based approaches for the assessment of fisheries under data-limited situations*” (Guest Editors: P. Livingston (lead), G. Kruse and L. Richards) is expected to be published in September 2011.

PICES Special Publications

- McKinnell, S.M. and Dagg, M.J. (Eds.). *Marine Ecosystems of the North Pacific Ocean, 2003-2008* (PICES Special Publication No. 4, 393 pp.) was published in September 2010;
- Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.). *Guide to best practices for ocean CO₂ measurements* (PICES Special Publication No. 3, 2007) was published in Korean and Chinese languages in 2010.

PICES Scientific Report series

- Jamieson, G. Livingston P. and Zhang C.-I. (Eds.). *Final Report of Working Group 19 on Ecosystem-based Management Science and its Application to the North Pacific* (PICES Sci. Rep. No. 37, 166 pp.) was published in September 2010;
- Pakhomov, E. and Yamamura, O. (Eds.). *Final Report of the Advisory Panel on Micronekton Sampling Inter-calibration Experiment* (PICES Sci. Rep. No. 38, 109 pp.) was published in September 2010.

Special CD-ROM/USB

- USB with PICES Scientific Publications from 1993–2010 was published in October 2010 and included in the PICES-2010 registration package.

PICES Press – newsletter

- Two regular issues: Vol. 18, No. 1 (winter 2010) and Vol. 18, No. 2 (summer 2010) were published in February and July 2010, respectively.

Other publications

- Book of Abstracts for the PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 25–29, 2010, Sendai, Japan);
- Announcement and Book of Abstracts for PICES-2010 (October 22–31, 2010, Portland, U.S.A.);
- Announcement and Poster for the 2011 Zooplankton Production Symposium on “*Population connections, community dynamics, and climate variability*” (March 14–18, Pucón, Chile)
- Announcement for the ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” (May 22–26, 2011, Seattle, U.S.A.);
- Poster for PICES-2011 (October 14–22, 2011, Khabarovsk, Russia).

Appendix 4 Relations with international scientific organizations and programs

Asia-Pacific Fishery Commission (APFIC)

- PICES was represented as an observer at the Third Regional Consultative Forum (RCFM) of APFIC held September 1–4, 2010, in Jeju, Korea. Dr. Mitsutaku Makino, Chairman of PICES Study Group on *Human Dimensions*, gave a presentation focused on human dimensions on the ecosystem approach, and Dr. Suam Kim, Co-Chairman of the joint PICES/ICES Working Group on *Forecasting Climate Change Impact on Fish and Shellfish* introduced activities of this Working Group to South Pacific colleagues.

Ecosystem Studies of Sub-Arctic Seas (ESSAS)

- PICES and ESSAS, a regional program initiated by GLOBEC in 2005 and moved under IMBER since 2009, share the goal of developing comparative studies of the sub-arctic seas and understanding how climate variability affects their productivity and ability to support sustainable commercial and subsistence harvests.
- PICES and ESSAS have organized a series of joint workshops on “*Marine ecosystem model inter-comparisons*” convened in conjunction with PICES Annual Meetings since PICES-2008.
- PICES agreed to provide organizational support for the ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” to be held May 22–26, 2011, in Seattle, U.S.A. This support includes: maintaining the OSM website, handling on-line registration and abstract submission, compiling the book of abstracts, and arranging the logistics for the venue.
- PICES/ICES Working Group on *Climate Change Impacts on Fish and Shellfish* will convene a workshop on “*Biological consequences of a decrease in sea ice in Arctic and Sub-Arctic seas*” at the 2011 ESSAS OSM.

Exxon Valdez Oil Spill Trustee Council (EVOSTC)

- EVOSTC joined a funding consortium to support the North Pacific Continuous Plankton Recorder (NP CPR) survey and approved a grant for PICES in the amount of \$188,600 US for operations of the NP CPR project in 2010–2013 (project on “*Measuring interannual variability in the herring’s forage base from the Gulf of Alaska*”), with the amount of \$56,800 US for 2010.

Food and Agriculture Organization of UN (FAO)

- FAO became a major international sponsors (with PICES and ICES) for the symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 25–29, 2010, Sendai, Japan).

Global Ocean Ecosystem Dynamics project (GLOBEC)

- The PICES Climate Change and Carrying Capacity (CCCC) Program provided a mechanism for integrating national GLOBEC or GLOBEC-like research programs in the North Pacific and was a regional component of the international GLOBEC effort. Results from the CCCC Program were included in several chapters of the GLOBEC Synthesis Book on “*Marine Ecosystems and Global Change*” published in 2010. A special issue of *Progress in Oceanography* resulted from the PICES/GLOBEC Symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” and published

in June 2008 (Vol. 77, Nos. 2–3, pp. 83–268; Guest Editors: H. Batchelder and S. Kim) (April 19–21, 2006, Honolulu, U.S.A.) is also considered as a part of GLOBEC synthesis effort.

- The PICES/ICES/GLOBEC special issue of *Deep-Sea Research II* on krill biology and ecology dedicated to Edward Brinton based on selected papers from the 4th Zooplankton Production Symposium (Guest Editors: S. Kawaguchi and W. Peterson) was published in April 2010 (Vol. 57, Is. 7-8, pp. 493-692).

Global Ocean Observing System (GOOS)

- PICES as one of the endorsing organizations had a representative (Dr. Jack Barth, MONITOR member) to serve on the Program Committee for the OceanObs'09 Conference. Dr. David Checkley represents PICES on a post-conference Integrated Framework for Sustained Ocean Observations Task Team charged with formulating recommendations on a future framework for planning and moving forward an enhanced global sustained ocean observing system over the next decade.

International Council for the Exploration of the Sea (ICES)

- PICES and ICES served as major international sponsors (with FAO) for the symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 25–29, 2010, Sendai, Japan).
- The joint Theme Session on “*Responses to climate variability: comparison of northern hemisphere marine ecosystems*” was held at the 2010 ICES Annual Science Conference (September 20–24, 2010, Nantes, France), and two joint Topic Sessions on “*Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting*” and “*Development and use of ocean observing and forecasting systems in coastal and marine management*” were convened at PICES-2010.
- PICES and ICES are working together to organize the 5th Zooplankton Production Symposium on “*Population connections, community dynamics, and climate variability*” (March 14–18, 2011, Pucón, Chile) the second PICES/ICES Early Career Scientists Conference on “*Oceans of change*” (April 2012, Balearic Islands, Spain) and the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” to be held in conjunction with the Ocean Expo-2012 (May 2012, Yeosu, Korea).
- PICES and ICES are both involved in co-sponsoring the 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*” (November 8–11, 2010, Anchorage, U.S.A.), and the ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” (May 22–26, 2011, Seattle, U.S.A.).
- In 2008, PICES and ICES established a joint Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*. This Working Group held three meetings during 2010: immediately after the PICES/ICES/FAO on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” in April, at the 2010 ICES Annual Science Conference (ASC) in September, and at PICES-2010 in October.
- In 2009, Council approved in principle a joint PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* to develop a formal framework to serve as the basis for linkages of science plans and longer-term strategic planning for the two organizations. In 2010, the Secretariat and Science Board worked with ICES to finalize the terms of reference, membership and timelines for the group. The first meeting of the Study Group was held at 2010 ICES ASC.
- The PICES/ICES/GLOBEC special issue of *Deep-Sea Research II* on krill biology and ecology dedicated to Edward Brinton based on selected papers from the 4th Zooplankton Production Symposium (Guest Editors: S. Kawaguchi and W. Peterson) was published in April 2010 (Vol. 57, Is. 7-8, pp. 493-692).
- PICES was represented as an observer at the meeting of the ICES GOOS Working Group held April 20–21, 2010, in Woods Hole, U.S.A.

Integrated Marine Biogeochemistry and Eco-system Research (IMBER)

- Issues of marine biogeochemistry and food webs are important components of the new integrative science program of PICES on “*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems*” (FUTURE). FUTURE was invited to become a Contributing Project to IMBER (to be discussed at PICES-2010).
- IMBER co-sponsored (by supporting an additional invited speaker) the Topic Session on “*Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function*” at PICES-2010 (Portland, U.S.A.).

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- PICES co-sponsored the IMBER-led Summer School on “*ClimECO2: Oceans, Marine ecosystems, and society facing climate change - A multidisciplinary approach*” (August 2010, Brest, France) by providing travel funds and arranging additional support (through national programs/agencies) for 9 early career scientists from all PICES member countries.
- PICES co-sponsored the 2010 IMBER IMBIZO Conference on “*Integrating biogeochemistry and ecosystems in a changing ocean: Regional comparisons*” (October 2010, Crete, Greece) by providing travel support for 3 invited speakers from the North Pacific.
- IMBER agreed to co-sponsor the PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” to be held in May 2012, in conjunction with the Ocean Expo-2012 in Yeosu, Korea.

Intergovernmental Oceanographic Commission of UNESCO (IOC)

- IOC provided financial support (\$7,500 US) for the 2010 PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 25–29, 2010, Sendai, Japan).
- IOC and PICES are working together (with ICES as another major international sponsor) to organize the second International Symposium on “*Effects of climate change on the world’s oceans*” to be held in May 2012 in conjunction with the Ocean Expo-2012 in Yeosu, Korea.
- In June 2005, IOC and PICES signed a formal agreement to establish a partnership in systematically compiling, storing and presenting on-line, records on harmful algal events. Event records are compiled and stored annually in the format specified in the **Harmful Algal Event Database (HAE-DAT)** hosted by IOC. The HAE-DAT partnership is open to other appropriate and complementary regional organizations so as to achieve global coverage. 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 work proceeds at each PICES Annual Meeting.
- PICES has partnered with IOC to implement the project on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” supported by the Japanese Ministry of Agriculture, Forestry and Fisheries. The IOC network is used to determine countries which have the greatest need and a strong interest in improving HAB monitoring and testing, and a commitment to sustainability.

North Pacific Anadromous Fish Commission (NPAFC)

- NPAFC co-sponsored the PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 2010, Sendai, Japan) and convened a workshop on “*Salmon workshop on climate change*” in conjunction with the symposium.
- NPAFC contributed to the second PICES North Pacific Ecosystem Report by reporting on the status of salmon in the North Pacific.

North Pacific Research Board (NPRB)

- NPRB joined a funding consortium to support the North Pacific Continuous Plankton Recorder (NP CPR) survey in 2009 and committed support for operations of the project at the level of \$50,000 US per year for 5 years (from June 1, 2009 to May 31, 2014).
- NPRB provided financial support for the 2010 PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (\$30,000 US), 2011 Zooplankton Production Symposium on “*Population connections, community dynamics, and climate variability*” (\$4,000 US) and 2011 ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ecosystems: Progress in observation and prediction*” (\$30,000 US).
- Ms. Nora Deans (Communication and Outreach Director of NPRB) will give a presentation on various approaches used by NPRB in their successful outreach and engagement activities at the meeting of the FUTURE Advisory Panel on *Status, Outlooks, Forecasts, and Engagement* (SOFE-AP) and at the joint meeting of all FUTURE Advisory Panels.

Scientific Committee on Oceanic Research (SCOR)

Relationships with SCOR-sponsored large-scale ocean research programs such as IMBER and SOLAS are reflected separately. Other collaborations are listed below.

- PICES was represented by Dr. George Boehlert, U.S. national delegate, at the SCOR-led conference to discuss a global capacity building strategy in the ocean sciences (August 16–18, 2010, in Bremen, Germany).
- SCOR continues to provide travel support for scientists from countries with “economies in transition” to attend SCOR-relevant sessions/workshops at PICES Annual Meetings and international symposia co-organized by PICES. In 2010, \$5,000 US from the SCOR/NSF fund were allocated for each of the following two events: PICES/ICES/FAO symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 2010, Sendai, Japan) and PICES-2010 (October 2010, Portland, U.S.A.).
- Terms of reference for PICES Working Group 22 on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* include compiling and synthesizing available iron biogeochemistry data in the North Pacific, and data sets of iron and related parameters in the North Pacific will be included in the WG 22 final report to be published in 2011. These activities are closely linked to the mandate of SCOR WG 131 on *The Legacy of in situ Iron Enrichment: Data Compilation and Modeling* to develop a database for open access of the completed iron-enrichment experiments.
- PICES strongly supported the establishment of SCOR WG 137 on *Patterns of Phytoplankton Dynamics in Coastal Ecosystems: Comparative Analysis of Time-Series Observations*, and agreed to finance an associate member from the North Pacific (Dr. Sinjae Yoo, KORDI, Korea).

Surface Ocean-Lower Atmosphere Study (SOLAS)

- The main research area for collaboration between PICES and SOLAS has been the impact of iron on biogeochemistry and marine ecosystems. PICES, through its Advisory Panel on the *Iron Fertilization Experiment in the Subarctic Pacific Ocean* (IFEP-AP; 1999–2007), and now through Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG-22; 2007–present), has long been acting as a regional coordinator for these activities. Terms of reference for WG 22 are closely linked with those of SOLAS Implementation Group 1 on *Biogeochemical Interactions and Feedbacks between Ocean and Atmosphere*.
- A set of 19 papers resulting from the Second Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study (SEEDS-II; 2004) developed under the umbrella of IFEP-AP and SOLAS-Japan was published as a special issue of *Deep-Sea Research II* (Guest editors: M. Uematsu, M. Wells, A. Tsuda and H. Saito) in December 2009 (Vol. 56, No. 26, pp. 2731–2957).
- SOLAS co-sponsored (by supporting an additional invited speaker) the topic session on “*Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean*” at PICES-2010.

GC Endnote 7

The Minutes of the PICES/ICES SG-SP meeting Nantes, France, ICES ASC, September 21, 2010

Attendance

Manuel Barange, Chairman of the ICES Science Committee (SCICOM)

Mark Dickey-Collas (The Netherlands), Chairman of the ICES SCICOM Science Steering Group on *Sustainable Use of Ecosystems* (SSGSUE)

Begoña Santos (Spain), Chairman of the ICES SCICOM Science Study Group on *Science Cooperation* (SSGSC)

William Karp (U.S.A.), Chairman of the ICES SCICOM Science Steering Group on *Ecosystem Surveys Science and Technology* (SSGESST)

Sinjae Yoo, Science PICES Board Chairman-elect

Skip McKinnell, PICES Deputy Executive Secretary

Anne B. Hollowed (U.S.A.), Co-Chairman of the PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS)

Suam Kim (Korea), Co-Chairman of the PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS)

Jürgen Alheit (Germany), member of the PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS)

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(This meeting was not planned as a formal SG meeting. As the two PICES members (Drs. Yoo and McKinnell) were attending the ICES ASC, the meeting was called on. Consequently, the other two PICES members (Hiroaki Saito, Thomas Therriault) did not participate, but will be briefed on the progress.)

Agenda

1. *Strategic cooperation: Topics and issues*

Sinja Yoo presented information on the PICES second integrative science program FUTURE (*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems*) to be implemented from 2009 to 2019. The research theme of FUTURE can be constructed around the following 3 questions:

- What determines an ecosystem's intrinsic resilience and vulnerability to natural and anthropogenic forcing?
- How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?
- How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?

Manuel Barange had already presented the ICES Revised Science Plan, which will be implemented from 2009 to 2013, during the ASC. The ICES Science Plan consists of sixteen research topics under three thematic areas:

- Understanding Ecosystem Functioning
- Understanding Interactions of Human Activities with Ecosystems
- Development of Options for Sustainable Use of Ecosystems

The discussion then centred on the identification of synergies and areas where collaboration will be beneficial to help deliver both FUTURE and the ICES Science Plan. Obvious areas where a global perspective of research is needed were:

- Climate change (improving forecasting)
- Ecosystem resilience and vulnerability (a central theme of the European Marine Strategy Framework Directive)

In the first case, progress has already been made towards cooperation by the establishment of a joint Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS) in 2008.

In the case of ecosystem resilience and vulnerability, both organizations could benefit from joining forces since this topic is not well developed in either, and cooperation will both reduce duplication and improve efficiency. A possible way forward could be the setting up of a Joint Workshop tasked with addressing the meaning of resilience and vulnerability, the mechanisms involved and the design of potential indicators to measure these ecosystem metrics. The earliest opportunity in this direction is a workshop on "*Ecological indicators for ecosystem structure, function, resilience, and vulnerability*" (tentative title) being planned and to be discussed at PICES-2010. If approved, this workshop will take place in conjunction with the inter-sessional PICES Science Board meeting in spring 2011. Some ICES scientists will participate in the workshop. The PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* will also take this opportunity to meet.

Other potential areas of common interests were spatial planning and ocean acidification. There were some discussion on these issues and SG-SP will consider these topics and others in preparing the strategic plan.

2. *Managing joint sessions/workshops at ICES Annual Science Conferences and PICES Annual Meetings*

At present, the participation of PICES scientists in the ICES ASC and joint symposia is being covered by PICES. This is not a common mechanism in ICES (money to cover the travelling costs of ICES participants has been made available on some occasions from sources such as the SI Fund, but normally it is expected to be covered at a national expense). Manuel Barange proposes to discuss with the ICES Council the possibility of creating/identifying a pot of money specific for this purpose as a way forward.

Theme session proposals for the ICES ASC are voted on and decided one year in advance, at the previous September meeting of SCICOM. The PICES Science Board meets 3 weeks after the ASC. This could cause a problem if some of the theme sessions are going to be run in collaboration between both organizations since the decisions will, in principle, be taken by ICES before PICES has had a chance to approve them. It was suggested that a possible solution will be to present the joint theme sessions for PICES consideration at their inter-sessional Science Board meeting in April before the ICES SCICOM meeting in September. Drs. McKinnell and Kellermann were requested to develop a schedule that would allow better planning of jointly convened P/ICES theme/topic sessions at each other's annual meetings.

Joint workshops do not need to go through this process since they can be approved during the year.

3. *Symposia: Update and future plans*

The list of co-sponsored symposia is given in Table 1. There is a good number of symposia being run in collaboration between both organizations and it was felt that no changes were needed in this area. The table also lists two symposia in 2012 (*Forage Fish Interactions and Ecosystem Approach to Fisheries Management* and *Early Career Scientist Conference "Oceans of Change"*) where a final decision about co-sponsorship has not yet been reached.

4. *Roadmap for the joint P/ICES SG*

The joint PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* (SG-SP), as presently structured, is due to produce a final report by August 2011. It was felt that its ToRs would be better served if the life span of this Study Group was extended, due to the importance and long-term nature of the framework for cooperation between ICES and PICES.

If the life span of the SG-SP is to be extended, it was discussed that members could meet each year, alternately at the ICES Annual Conference or at the PICES Annual Meeting.

5. *AOB*

The issue of a joint ICES/PICES training programme was raised but not discussed further during the meeting due to a lack of time. No other items of business were raised during the meeting

GC Endnote 8

Financial and progress reports for Year 3 (completed on March 31, 2010) of the PICES/MAFF project on "Development of the prevention systems for harmful organisms' expansion in the Pacific Rim"

PICES/MAFF PROJECT FINANCIAL REPORT FOR YEAR 3

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 PICES project entitled "*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*". The anticipated duration of the project is 5 years (from April 1, 2007 to March 31, 2012), and its goals 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.

The Japanese Trust Fund was announced in April 2007, at the inter-sessional Governing Council meeting in Yokohama, Japan. The following organizational principles, agreed by MAFF/JFA and PICES, apply to the project:

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- 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 2007 to October 2009. Dr. Steven Rumrill (University of Oregon, U.S.A., E-mail: steve.rumrill@state.or.us) was elected as Chairman of MEQ at the 2009 PICES Annual Meeting. He has delegated the previous MEQ Chairman, Dr. Glen Jamieson, to continue serving as the Project Scientific Coordinator and to be responsible for reporting annually on the progress of the scientific implementation of the project.]
- 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 scientific progress report for *Year 3* will be submitted as a separate document simultaneously with this financial report.

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 is responsible for the management of the fund and for reporting annually on its disposition to PICES Governing Council and JFA, 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 (Chairman of PICES MEQ), based on recommendations from a PI 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 and 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 following 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)

Funds for the first year of the project (completed by March 31, 2008) in the amount of \$184,980 were transferred to the PICES/MAFF bank account on July 27, 2007. The financial report and the progress report and for *Year 1* were submitted to JFA on July 23 and July 19, 2008, respectively.

Funds for the second year of the project (completed by 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 the third year of the project (completed by March 31, 2010) in the amount of \$187,505 were transferred to the PICES/MAFF bank account on July 15, 2009. The financial report and the progress report for *Year 3* are due to July 31, 2010.

BUDGET EXECUTION FOR FISCAL YEAR 3

The budget allocated for *Year 3* was \$187,505. The second year of the project ended up with a surplus of \$3,489. JFA had no objections to PICES' suggestion of using the surplus to support the HAB training program held in Guatemala. The initially proposed budget breakdown and final allocations (with the *Year 2* surplus) is shown in Table 1. This table also includes actual expenses and remaining (or overspent) funds for each of the budget categories, and the project account balance as of March 31, 2010. There is a surplus of \$13,337 at the fiscal year end. Table 2 provides more details on actual expenses of the major categories.

Table 1 Allocations and expenses for *Year 3*.

Category	Initial Allocations	Final Allocations	Actual Expenses	Remainder
Travel & meetings	80,000	83,489	67,580	15,909
Contracts	54,000	54,000	57,856	(3,856)
Equipment	28,000	28,000	27,991	9
Miscellaneous	1,130	1,130	64	1,066
Overhead	24,375	24,375	24,375	-
Total	187,505	190,994	177,866	13,128
Interest earned				209
Account Balance				13,337

Table 2 Breakdown of expenses for various budget categories for *Year 3*.

Category/Activity	Expenses
Travel & meetings	67,580
Travel of PICES experts to Guatemala for preparing the PICES/MAFF HAB training program (September 2009)	9,323
PICES/MAFF HAB training classes in Guatemala (February and April 2010) and follow-up	21,273
Participation of PICES experts in conferences and workshops focused on seafood safety in developing nations to promote the PICES/MAFF HAB project and discuss training program/class strategy with other international partners (IOC/WESTPAC Workshop on “ <i>Marine Invasive Species and Management in the Western Pacific Region</i> ” in June 2009 (Bangkok, Thailand), GEOHAB Open Science Meeting on “ <i>HABs and Eutrophication</i> ” in October 2009 (Beijing, PR China), PICES Annual Meeting in October 2009 (Jeju, Korea))	5,777
Second PICES/MAFF Rapid Assessment Survey held in conjunction with the PICES Annual Meeting (Jeju, Korea, October 2009)	10,454
Travel of PICES experts for preparing the Third PICES/MAFF Rapid Assessment Survey (Newport, U.S.A.) to be held in conjunction with the PICES Annual Meeting (Portland, U.S.A., October 2010)	5,385
Participation of PICES experts and early career scientists in the Sixth International Conference on “ <i>Marine Bioinvasions</i> ” (August 2009, Portland, OR, U.S.A.)	15,368
Contracts	57,856
To modify the PICES NISIS database and manual by including (1) a bulk data import utility; (2) functionality for searching, extracting and exporting summarized data on NIS distributions; (3) ability of adding pictures and pdf files associated with NIS for taxonomic identification (Ms. Deborah Reusser, U.S. Geological Survey)	26,195
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)	5,411
To provide assistance to project Coordinators and sub-project Principle Investigators (Ms. Rosalie Rutka, Stranby Technical Services)	26,250
Equipment	27,991
Equipment and materials for a HAB training program in developing countries	27,558
Shipping of equipment to member countries for a NIS survey	433
Overhead	24,375
Miscellaneous (bank and mail charges)	64

RECOMMENDATION ON THE USE OF YEAR 3 SURPLUS

The *Year 3* surplus of \$13,337 was mainly due to unexpected substantial support provided by host counties for two major events of that year, the second PICES rapid assessment survey in Korea and the HAB training program in Guatemala. It is recommended that these funds be used for future rapid assessment surveys and HAB training programs in developing countries.

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, 2009, was assessed during the regular PICES audit for *FY 2009*. The financial statements were submitted to the auditor on March 30, 2010, and the Auditor's Report was completed on May 12. In the auditor's opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2008, and the results of its operations and changes in the fund balances are in accordance with Canadian generally accepted accounting principles. The financial statements for the rest of *Year 3* of the MAFF project (January 1 to March 31, 2010) will be evaluated during the regular PICES audit for *FY 2010*.

PICES/MAFF PROJECT SCIENTIFIC PROGRESS REPORT FOR YEAR 3

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 PICES project entitled "*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*". The anticipated duration of the project is 5 years (from April 1, 2007 to March 31, 2012), and its goals 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.

The Japanese Trust Fund was announced in April 2007, at the inter-sessional Governing Council meeting in Yokohama, Japan. The following organizational principles, agreed by MAFF/JFA and PICES, apply to 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 2007 to October 2009. Dr. Steven Rumrill (University of Oregon, U.S.A., E-mail: steve.rumrill@state.or.us) was elected as Chairman of MEQ at the 2009 PICES Annual Meeting. He has delegated the previous MEQ Chairman, Dr. Glen Jamieson, to continue serving as the Project Scientific Coordinator and to be responsible for reporting annually on the progress of the scientific implementation of the project.]
- 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.

This report includes summaries of the activities carried out for *Year 3* (ended on March 31, 2010) and workplans for *Year 4* (to be completed by March 31, 2011) for both sub-projects. The financial report for *Year 3* is being submitted by the PICES Executive Secretary as a separate document.

Marine/Estuarine Non-Indigenous Species (NIS sub-project)

There are two initiatives within the NIS sub-project:

- *Database Initiative*: Development of a database of marine/estuarine species to be used to capture information on non-native species and to allow sharing of this information, not only among PICES member countries, but more broadly with any community studying non-indigenous species. Dr. Henry Lee II (U.S. Environmental and Protection Agency, U.S.A., E-mail: lee.henry@epa.gov) serves as the Principle Investigator for this initiative.
- *Taxonomy Initiative*: Development of a taxonomic system to allow identification and documentation of non-indigenous species establishment outside of their native range. Dr. Thomas Therriault (Fisheries and Oceans Canada, E-mail: Thomas.Therriault@dfo-mpo.gc.ca) serves as the Principle Investigator for this initiative.

Database Initiative

The main objectives under the *Database Initiative* are to:

- a. Develop and populate a database of marine/estuarine species that can be queried for distributional, ecological, and physiological data at different taxonomic levels and spatial distributions;
- b. Couple natural history with species' spatial distributions to better understand potential risks.

A comprehensive database, named PICES NISIS database, is being developed based on the United States Environmental Protection Agency (EPA) and the United States Geological Survey (USGS) "Pacific Coast Ecosystem Information System" (PCEIS) spatial database. In *Year 1*, a prototype database was developed and tested for a pilot non-indigenous taxon (bivalves) by all PICES member countries in order to identify potential limitations and agree on standards, data elements and data entry templates. In *Year 2*, a revised working version of the database was distributed for testing and population by all PICES member countries.

Specific activities under the *Database Initiative* in *Year 3* are as follows:

- Version 1 of the PICES NISIS database with information as supplied by member countries was completed and distributed to all member countries at the 2009 PICES Annual Meeting (October 2009, Jeju, Korea).
- The PICES NISIS manual was updated and distributed with the latest version of the database.
- Data from the first PICES rapid assessment survey conducted in October 2008 (Dalian, PR China) was incorporated into the database.
- A bulk data import utility called the "BitBot" was developed to support easier integration of species location information from "comma-delimited" files, databases and excel spreadsheets.
- Functionality for searching, extracting and exporting summarized data on NIS distributions was added to the database.
- The ability of adding pictures and pdf files associated with NIS for taxonomic identification purposes was added to the database.
- Taxonomic conflicts of NIS in the database are in the process of being resolved by taxonomic experts.
- Collection and standardization of NIS data from Pacific Rim countries were initiated.
- Some progress was made on summarizing the situation on bioinvasions in the North Pacific based on information submitted by WG 21 members. This information is being entered into the database, and the database is being enhanced to generate an atlas-format pdf with distribution and life history information on all species that are classified non-indigenous somewhere in the North Pacific. This task is scheduled for completion by October 2010.

A *Database Initiative* workplan for *Year 4* includes the following activities:

- Complete the final version of the PICES NISIS database by November 2010 (no additional funds are requested for database development);
- Revise the PICES NISIS database manual to include all updates to the database;
- Continue collection, standardization and entry of NIS data by PICES member countries, including data from PICES rapid assessment and collector surveys;

- Publish on a CD-ROM and on the PICES website a *Species Atlas* summarizing the situation on bioinvasions in the North Pacific with distribution and life history information extracted from the PICES NISIS database.

Taxonomy Initiative

The main objectives under the *Taxonomy Initiative* are to:

- a. Identify taxonomic needs in PICES member countries;
- b. Conduct rapid assessment surveys (in both inter-tidal and sub-tidal environments) in conjunction with PICES Annual Meetings, using taxonomic experts and students from the host country, supplemented by international experts as needed, and enter georeferenced data into the PICES NISIS database;
- c. Conduct collector surveys for biofouling organisms in PICES member countries or other Pacific Rim countries by using standardized methodology with assistance of taxonomic experts within the survey country, supplemented by international experts as needed, and enter georeferenced data into the PICES NISIS database;
- d. Develop taxonomic information system/tools.

Specific activities under the *Taxonomy Initiative* in Year 3 are as follows:

- The second PICES rapid assessment survey was conducted in conjunction with the 2009 PICES Annual Meeting to identify and document both native and non-indigenous species at four port locations (Busan, Ulsan, Masan, and Jungmok) in Korea. Samples were collected by scientists and technicians from the host country, and processed by a group of Korean and international taxonomic experts immediately prior to the Annual Meeting (October 19-22, 2009) at the Jeju Biodiversity Institute. In addition, visual surveys and trapping were conducted in Jeju Port, and intertidal samples were collected at the UNESCO Seongsan Ilchulbong (Sunrise Peak) Heritage site. Tremendous support was provided by the local hosts, especially Drs. Kyoung-Soon Shin and Jung-Hoon Kang (KORDI).
- At least 386 species were identified from all samples (though some organisms could not be identified to species). At least 7 non-indigenous species were positively identified, including a barnacle (*Balanus eburneus*), the bivalve *Mytilus galloprovincialis*, 4 amphipods and a polychaete. Several cryptogenic amphipods were also detected. The invasion status of many species is currently under resolution.
- Sub-tidal collectors for biofouling organisms were prepared and shipped by Dr. Therriault to each PICES member country for deployment during the summer of 2009. Collectors were deployed by Canada, China, Japan and Korea. Initial sample processing was done by the collecting country and discussed at the WG 21 meeting during the 2009 PICES Annual Meeting. In Japan, the survey was built upon one conducted last year when efforts focused on Tokyo Bay. In 2009, collectors were deployed at several locations around Osaka Bay (data analysis is underway, forming the basis of a graduate thesis for a student at Kobe University). To characterize fouling communities in 2009, Canada deployed collectors at two sites and re-confirmed the presence of a number of non-indigenous species, especially tunicates.
- Plans were developed and logistical details were coordinated for the third rapid assessment survey in conjunction with the 2010 PICES Annual Meeting to be held in Portland, Oregon, U.S.A. The survey will be conducted at two port locations: Coos Bay (collectors) and Yuquina Bay (collectors and field collections). Collectors will be deployed by scientists and technicians from the host country during the summer of 2010, and samples will be processed by a group of U.S. and international experts in October 2010, immediately prior to the PICES Annual Meeting, using the Hatfield Marine Science Center (Newport, Oregon) as a technical base. In addition, selected taxonomic groups will be targeted this year, which will involve bringing together experts on these groups from both Asia and North America. This will allow significant cross-pollination and provide the opportunity to resolve outstanding taxonomic issues for these selected groups of organisms.
- Planning was initiated and preliminary arrangements for a venue for a Demonstration Workshop on “*Methodology for rapid assessment and collector surveys*” for developing countries to be held in Japan in Year 4.

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A Taxonomy Initiative workplan for Year 4 includes the following activities:

- Continue database entry of taxonomic groups, as determined by WG-21, including data from the first (Dalian, PR China, October 2008) and second (Jeju, Korea, October 2009) PICES rapid assessment surveys and completed collector surveys;
- Conduct the third PICES rapid assessment survey prior to the PICES Annual Meeting in October 2010, at two port locations in the United States of America: Coos Bay (collectors) and Yuquina Bay (collectors and field collections);
- Start preparations for the fourth rapid assessment survey to be conducted in Russia immediately prior to the PICES Annual Meeting in October 2011;
- Evaluate the potential of additional collector deployments in 2010 or 2011 (additional collectors, if needed, will be shipped early in *Year 4*);
- Finalize and conduct a Demonstration Workshop on “Methodology for *rapid assessment and collector surveys*” for developing countries planned for mid-July 2010 in Japan (at ‘Marine Site’, Kobe University Research Center for Inland Seas, Awaji Island, Hyogo Prefecture);
- Initiate consultations with researchers responsible for NIS monitoring in developing Pacific Rim countries, especially with respect to the adoption of the rapid assessment survey and/or collector survey protocols;
- Continue to identify taxonomic gaps for PICES member countries and explore options to fill these gaps using the PICES NISIS database developed under the *Database Initiative*, including NIS from other regions (e.g., Atlantic, Southern Pacific).

In summary, for the *NIS sub-project* all deliverables for *Year 3* are on target and completed as scheduled.

Harmful Algal Blooms (HAB sub-project)

The HAB sub-project focuses on preparing and teaching country-specific training courses most needed to ensure seafood safety in the Pacific countries outside the PICES region, *i.e.* in Southeast Asia and in Central/South America. Dr. Vera Trainer (Northwest Fisheries Science Center, U.S.A., E-mail: Vera.L.Trainer@noaa.gov) serves as the Principle Investigator for this sub-project,

Specific activities under the *HAB sub-project* in *Year 3* are as follows:

- Surveying the Pacific community and selection of Guatemala for the HAB training program:
The community research partnership approach to seafood safety training, adopted by the HAB sub-project has been expanded to Guatemala. The choice of Guatemala as a country fulfilling the project guidelines was determined through assessment of a response from Dr. Leonel Carrillo Ovalle, (Center for Marine Studies and Aquaculture (CEMA) at the University of San Carlos, Guatemala) to a questionnaire distributed via the IOC (Intergovernmental Oceanographic Commission of UNESCO) network, and conversations with Drs. Leonardo Guzman, Chairman of IPHAB (IOC International Panel on Harmful Algal Blooms) and member of HAB-FANSA (IOC HAB Working Group for South America) and José Luis Peña Manjarrez, Chairman of ANCA (IOC HAB Working Group for Central America and Caribbean) at the IPHAB Conference (April 22–25, 2009, Paris). Based on our discussions with these individuals representing Central America and South America, Guatemala was assessed as a country with a strong need for a HAB training program and a suitable infra-structure for success. Guatemala was a perfect match to the criteria used for country selection in the project, such as (1) the magnitude of the HAB problem, (2) the need for training, and (3) the likelihood of sustainability.

The sustainable model for the implementation of the PICES-led initiative in Guatemala included:

- *Initiation and implementation at the community level:* Dr. Carrillo Ovalle, our primary in-country contact, has developed strong partnerships with all the institutions responsible for management of red tides, known as “marea roja” in Guatemala.
- *Engagement of participants in cross-disciplinary research and management groups:* Through cross-fertilization, individuals can gain a balanced perspective on both the value of the project and of their own contribution.

- *Building partnerships for extended interactions and commitments*: Continued education and knowledge transfer are essential for proper capacity building, and our communications with Dr. Carrillo Ovalle will persist through monthly Skype calls to assist with data interpretation and to assess further needs.
- Development of training program in Guatemala:
An initial visit to Guatemala took place in September 2009. During this visit, PICES scientists involved in developing course content had discussions with personnel at several institutions:
 - University of San Carlos (USAC): Dr. Leonel Carrillo Ovalle, Professor-Investigator at the Center for Marine Studies and Aquaculture (CEMA) at USAC and a representative of Guatemala and a country focal point at IOC;
 - National Institute for Seismology, Volcanology, Meteorology and Hydrology (INSIVUMEH), the organization responsible for emergency response to natural disasters (earthquake, volcanoes, harmful algal blooms, *etc.*) in Guatemala: Engineer Eddy Sanchez, Director of INSIVUMEH and President of the National Commission on Red Tides, and Engineer Mario Bautista, General Deputy Director of INSIVUMEH;
 - Fisheries and Aquaculture Management Unit (UNIPESCA): Mr. Manuel Cabrera (Director), Mr. Manuel de Jesus Ixquiac (Coordinator), Mr. Ruben Bran Lopez (seafood safety inspector responsible for, monitoring of biotoxins), and Mr. Vinicio Juarez (GIS specialist responsible for the mouse bioassays);
 - Naval Academy: Head of Academy, and Captains A. Porras and L. Veliz. There is a letter of understanding between the Naval Academy and CEMA that allows for cooperation in training and resource use (*i.e.*, small boats used for sampling);
 - Universidad Del Valle (private university in Guatemala City): Dr. Lucia Gutierrez.

The site visit confirmed that the close collaboration of university scientists with peers in industry and government management groups form the basis for a strong project in Guatemala and that the greatest need for training included:

- screening methods for toxin detection for paralytic shellfish poisoning (PSP) toxins;
 - a review of phytoplankton identification, with specific focus on harmful species in Guatemala;
 - instructions in basic concepts in oceanography as there is no oceanography program in Guatemala.
- Training classes in Guatemala:
The training program in Guatemala included two training classes held from February 15–19, 2010, at the USAC in Guatemala City, and at the Naval Academy in San Jose on the Pacific coast of Guatemala near the border to El Salvador.
 - There were 31 participants at the 4-day intensive course at USAC: 25 CEMA/USAC students, 4 inspectors from UNIPESCA and 2 members of the National Health Laboratory (LNS-Laboratorio Nacional de Salud).
 - There were also a total of 15 participants during the 2.5-day training at the Naval Academy, including the Pacific Coast Guard Commander, 2 Caribbean Command members, 4 Pacific Command members, 4 UNIPESCA inspectors, 3 members of the Quetzal Port Authority, the lab manager for Acuamaya shrimp farm and 2 agronomists.
 - Both classes included training on screening methods for toxin detection, phytoplankton identification and basics in oceanography. The quality of teaching and the students' understanding of concepts were assessed through impromptu quizzes and a final exam. A notebook was provided to all participants that included an agenda, a summary of HAB syndromes in humans, a phytoplankton key, individual micrographs of HAB species of concern in Guatemala, and handouts on toxin detection methods, including the Jellett PSP test and ELISA (Abraxis shipboard Enzyme-Linked Immunosorbent Assay). Reference materials for the classes were provided by Dr. Yasukatsu Oshima (Kitasato University, Japan).
 - Over the next year, Jellett PSP rapid tests and ELISA will be evaluated by LNS. A combination of techniques will be used to assess the accuracy of toxin screening methods. Chemical methods (HPLC and LC/MS) will provide structural confirmation of toxins present in samples tested by biologically-based methods (ELISA, Jellett and the standard mouse bioassay). A Memorandum of Understanding will be possibly implemented to clarify project goals and to assure steady progress. Monthly Skype

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calls with our CEMA colleagues will allow PICES scientists to provide advice on data analysis and interpretation.

HAB sub-project Workplan for Year 4 includes the following activities:

- Expand influence of the PICES HAB project by participating in conferences and workshops focused on seafood safety in developing nations and by discussing training course/class strategy with other international partners:
 - The protocols and teaching strategies for monitoring development and effective use of the demonstration equipment (purchased in *Years 1–3*) will be discussed at upcoming conferences, including the GEOHAB Open Science Meeting (OSM) on “*Harmful Algal Blooms in Benthic Systems*” (especially at the training workshop on “*Taxonomy challenges and identification of benthic dinoflagellates*”) in June 2010 (Honolulu, U.S.A.), and the PICES Annual Meeting in October 2010 (Portland, Oregon, U.S.A.). Ideology of the PICES HAB project complements the intensive cell-based monitoring approach by GEOHAB. The advice of OSM organizers and attendees will help in identifying the next nation that will benefit from a joint toxin- and toxic cell-monitoring program that distinguishes PICES HAB training classes.
 - Articles will be prepared for the spring 2010 issue of IOC Harmful Algal News and the summer 2010 issue of PICES Press that document the distinctive strategy of the PICES HAB project.
- Continue to survey the Pacific community to establish need(s) for the HAB training program, and types of training most needed to ensure seafood safety:

The need for a HAB training program in Pacific developing countries was assessed in a questionnaire sent through the IOC network to a number of WESTPAC (IOC Regional Secretariat for Study of the Western Pacific), IOCARIBE (IOC Sub-Commission on the Caribbean and Adjacent Regions) and ANCA (IOC Sub-Commission in Central and South American) countries (*Years 1-3*). Through IOC involvement, we plan to continue gaining formal support of key national and local regional officials, especially in the Southeast Pacific Island community, and to improve our understanding of the regional operational structure and laboratory facilities in countries suitable for hosting training classes under this project.
- Follow-up on the 2009 and 2010 PICES HAB training classes:
 - The first PICES training class was held in January 2009, in Manila, the Philippines. Monthly SKYPE communications have been underway since March 2009, which allow assessment of the progress made. A follow up visit to the Philippines is planned for October 2010, to review data and to strategize future seafood safety monitoring in this country.
 - Another Guatemala training class will be held in April 2010, to fulfill the specific request of Guatemalan scientists to learn high performance liquid chromatographic (HPLC) and mass spectrometry (MS) methods for the detection of marine toxins. HPLC equipment was donated to USAC by US AID, but is currently not in use. The class will be organized in collaboration with the U.S. Food and Drug Administration, and will be led by their lead HPLC expert, Dr. Alison Robertson. Training will include lectures on the chemistry of marine toxins and the theory of chromatography, and practical laboratory exercises on sample extraction and clean-up for both paralytic shellfish toxins and domoic acid, data analysis and interpretation of HPLC chromatographs, and enzyme-linked immunosorbent assay for paralytic shellfish toxins. The participation of one Guatemala scientist in the training course on approved methods for Paralytic Shellfish Toxin Analysis (June 2010, Seattle, U.S.A.) is planned to complete the HPLC training. This will be combined with a visit to Dr. Trainer’s laboratory at the Northwest Fisheries Science Center.
- Plan logistics and hold the 2011 PICES HAB training class:

The next PICES HAB training class in the Southeast Pacific is tentatively planned for January-February 2011, for the Cook Islands. Again, the need and desire for this training was expressed through the PICES questionnaire circulated by IOC. Course content is under development and will be structured following discussions during the site visit. The focus of this training class will be on monitoring for ciguatoxins and

ciguatoxic cells, a devastating problem to Pacific Island fisheries. In fact, this problem is so severe that certain populations of the Cook Islands are no longer eating fish, a major source of protein to the region. Neighboring countries may be invited to participate in this training.

In summary, *Year 3* for the HAB sub-project involved planning for and conducting a training class in Guatemala; and planning for future training classes. It further developed the framework for training activities.

GC Endnote 9

Report on the performance evaluation of the Executive Secretary for 2009

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 2009 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 2010. 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 2009, and the commitments for 2010, 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 2009

Dr. Bychkov’s commitments in 2009 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 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. Facilitating the development of the next North Pacific Ecosystem Status Report;
- h. Fund-raising for prioritized activities of the Organization in 2009 and beyond.

Items (a) to (e) are commitments routinely required of the Executive Secretary (“ongoing commitments”), and items (f) to (h) are additional commitments requested by the Committee in last year’s performance evaluation report of the Executive Secretary (“key commitments”).

Evaluation 2009 accomplishments

Executive Secretary, the Chief Executive Officer of the Organization, is important for managing the Organization. 2009 was a pivotal year in PICES’ history, with the initiation of FUTURE, the new integrative science program of the Organization. Dr. Bychkov’s accomplishments on the ongoing commitments (items (a) to (e)) fulfilled our expectations, even though his tasks were not easy.

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 2009 Annual

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Meeting (PICES-2009) in Jeju, Korea, was very successful, with almost 500 participants from 18 countries and 30 organizations/programs. PICES also held 14 inter-sessional events in 2009. Logistical and financial arrangements provided by the Secretariat were essential for the success of the Annual Meeting and inter-sessional events. In the activities of the Study Group on *Restructuring the PICES Annual Meeting* (SG-RAM), the Secretariat provided statistical analysis of the practice and structure of the previous Annual Meetings. This analysis was helpful in developing recommendations that will hopefully allow reaching a balance between scientific requests and administrative needs. Dr. Bychkov also guided and supervised well the Secretariat staff, including the PICES interns. In addition, he implemented the publication program of the Organization. His performance was also significant for the additional commitments (items (f) to (h)). In 2009, PICES amended its Rules of Procedure to allow experts from outside of PICES to serve as *ex-officio* members on PICES Technical Committees and subsidiary bodies of PICES Scientific Committees. PICES also established a joint Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* with ICES. In consultation with the Council and Executive Committees, he led these activities. To facilitate the development of the next North Pacific Ecosystem Status Report, he arranged for Dr. Skip McKinnell, Deputy Executive Secretary, to be one of the Co-Editors by adjusting Dr. McKinnell's duties within the Secretariat. Because there are funding constraints due to limitations in increasing the annual contributions, fund-raising continues to be an important component of PICES activities. Dr. Bychkov actively performed in this area in cooperation with the Governing Council and Executive Committees.

Based on his accomplishments in 2009 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 2009

In accordance with practice of the Canadian Public Service system, an executive is eligible for a maximum of 12% performance 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 2009 as "Succeeded+". Because the Committee also considered that his tasks in 2009 were difficult, the Committee decided that a performance pay equal to 12% of his salary would be appropriate for this period.

Setting commitments for 2010

The Committee set Dr. Bychkov's commitments in 2010 as follows. Items (a) to (e) are essential for administration of the Organization in 2010 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 is 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 2010 and beyond.

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

Overall performance is evaluated with the following possible results:

- *Did not meet*
Did not achieve 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
- *Succeeded*
Has fully achieved the 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
- *Surpassed*
Went well beyond performance expectations

If performance is evaluated as “Did not meet”, no performance pay (“at-risk” pay) can be awarded. Otherwise, the candidate is eligible for “at-risk” pay. In addition, if performance is evaluated as “Surpassed”, then the candidate is eligible for a “bonus”.

GC Appendix A

2010 Governing Council decisions

2010/A/1: Auditor

Council accepted the audited accounts for *FY* 2009.

2010/A/2: Annual contributions

- i. Council instructed the Executive Secretary to send a letter commending Contracting Parties for their performance in submitting annual contributions for *FY* 2010, and describing the difficulties that late and/or partial payment causes the Organization.
- ii. 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.

2010/A/3: Budget and fund-raising

- i. Council accepted the estimated accounts for *FY* 2010.
- ii. Council approved the *FY* 2011 budget of \$814,000. The amount of \$116,800 will be transferred from the Working Capital Fund to balance the budget, setting the total annual contribution at \$697,200, and the 2011 annual fee at \$116,200 per Contracting Party.
- iii. Council approved a transfer from the Working Capital Fund to the Trust Fund to recover the 2010 expenses, and to restore the Trust Fund to the level of \$110,000 by the end of the fiscal year.
- iv. Council approved a transfer from the Working Capital Fund to restore the Relocation and Home Leave Fund to the level of \$100,000 by the end of the fiscal year.
- v. Council approved that funds (\$21,996) under “high priority PICES projects” be earmarked for the development of the PICES integrative science program on “*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems*” (FUTURE).
- vi. Council instructed the Executive Secretary to send a letter to the Contracting Parties providing information on planned activities for FUTURE and requesting contributions to these activities.
- vii. Council approved that the surplus funds remaining from the 2010 PICES/ICES/FAO symposium on “*Climate change effects on fish and fisheries*” be allocated for the 2012 PICES/ICES Conference for Early Career Scientists.
- viii. Council directed the Executive Secretary to write letters soliciting new members and additional contributions for the consortium to support the North Pacific Continuous Plankton Recorder program.
- ix. Council approved an additional lump sum employer contribution of \$20,000 to the International Fisheries Commission Pension Plan to pay down unfunded liabilities.

2010/A/4: PICES Rules of Procedure

Council approved the proposed amendments to the Rules of Procedure (*Rule 13(iii)(d)* and *Rule 17*) to more clearly describe the review period and co-chairmanship duration for Sections.

2010/A/5: Future PICES Annual Meetings and 2011 inter-sessional Science Board meeting

- i. Council accepted the proposal from the Russian Federation to host PICES-2011 from October 7–16 or October 14–23, 2011, in Khabarovsk, and agreed to provide \$40,000 to the host country to partially cover meeting costs. The theme of the meeting, “*Mechanisms of marine ecosystem reorganization in the North Pacific Ocean*”, was approved in principle at PICES-2009, and the theme description was finalized at ISB-2010.
- ii. Council accepted the offer of Japan to host PICES-2012 from October 12–21, 2012, in Hiroshima. Council approved in principle the proposed theme of the meeting, “*Scientific challenge to the North Pacific*”

ecosystem: Understanding and mitigation of the effects of natural and anthropogenic stress”, and instructed Science Board to finalize the theme description at ISB-2011.

- iii. Following the established 6-year rotation cycle, Council requested Canada to explore the possibility of hosting PICES-2013, and inform the Secretariat on this matter by March 31, 2011.
- iv. Council agreed to keep the same registration fee structure for PICES-2011 as for PICES-2010:

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

- v. Council approved a 1½- or 2-day inter-sessional Science Board meeting to be hosted by the United States of America and be held in the spring of 2011, immediately after a 3-day inter-sessional FUTURE workshop on “*Indicators of status and change within North Pacific marine ecosystems*”, and supported extending an invitation to ICES to participate in this workshop and use this opportunity for the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* (SG-SP) to meet immediately prior to ISB-2011.

2010/A/6: Intern Program

- i. Considering the current level of the stipend (\$2,000) and funding available for the Intern Program, Council agreed that the 2011/2012 intern, Ms. Jeongim Mok (Marine Policy Division, Ministry of Land, Transport and Maritime Affairs, Republic of Korea), be offered a 6-month term, with possible extension (up to 12 months) if additional funding become available.
- ii. Council instructed the Executive Secretary to invite Contracting Parties to provide voluntary contributions to the Trust Fund to support the Intern Program in 2011 and beyond.
- iii. Council approved changes in the description of the Intern Program clarifying that the focus of the Program is on the professional development of early career marine scientists and managers from PICES member countries.

2010/A/7: Improvement of participation in PICES activities

- i. Council re-iterated the necessity for Contracting Parties to (1) regularly review their national membership and make changes as appropriate, 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 stating that “*each Contracting Party is requested to notify the Executive Secretary, three weeks in advance, of the names of delegates, alternate delegates, advisors and members, attending each meeting of the Organization*”. 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.
- ii. 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 for the previous six years.

2010/A/8: Election of Chairman and Vice Chairman

- i. Council unanimously elected Dr. Lev Bocharov (Russia) as the Chairman of PICES for a 2-year term (2010–2012). Accordingly Dr. Tokio Wada (Japan) will serve as the Past-Chairman.
- ii. Council unanimously elected Dr. Laura Richards (Canada) as the Vice-Chairman of PICES for a 2-year term (2010–2012).

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2010/A/9: Appointment of F&A Committee Chairman

Council re-appointed Ms. Patricia Livingston (U.S.A.) as the Chairman of the Finance and Administration Committee for a 2-year term (2010–2012).

2010/S/1: PICES Advisory Report to the Cohen Commission

Council authorized the release of the PICES Advisory Report to the Cohen Commission (*Commission of Inquiry into the Decline of Fraser River Sockeye Salmon*) on the decline of Fraser River sockeye salmon in relation to marine ecology. Council endorsed the invitation to provide scientific advice on this issue in June 2010, noting that this request is a clear recognition of PICES' expertise and scientific leadership on issues of climate variability and marine ecology.

2010/S/2: 2011 PICES Annual Meeting

The following scientific sessions are to be convened at PICES-2011:

- ¾-day Science Board Symposium on “*Mechanisms of marine ecosystem reorganization in the North Pacific Ocean*”;
- 1-day BIO Contributed Paper Session;
- 1-day BIO/POC Topic Session on “*Mechanisms of physical-biological coupling forcing biological ‘hotspots’*”;
- 1-day FIS Contributed Paper Session;
- ½-day FIS Topic Session on “*Population dynamics, trophic interactions and management of cephalopods in the North Pacific ecosystems*”;
- 1-day FIS/POC Topic Session on “*Recent changes of North Pacific climate and marine ecosystems: Implications for dynamics of the dominant species*”;
- ½-day MEQ Topic Session on “*Harmful algal blooms in a changing world*”;
- ½-day MEQ/FIS Topic Session on “*Identification and characterization of environmental interactions of marine aquaculture in the North Pacific*”;
- 1-day MEQ/FUTURE Topic Session on “*Land-sea interactions and anthropogenic impacts on biological productivity of North Pacific Ocean coastal ecosystems*”;
- 1-day POC Contributed Paper Session;
- ½-day POC/FIS Topic Session on “*Linking migratory fish behavior to end-to-end models*”;
- 1-day MONITOR/POC/FUTURE Topic Session on “*How well do our models really work and what data do we need to check and improve them?*”;
- TCODE E-Poster Session on “*Data and data systems for validation of numerical models*” (linked with the MONITOR/POC/FUTURE Topic Session).

The following workshops are to be convened at PICES-2011:

- 1½-day BIO Workshop on “*MEMIP-IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems—humble pie or glee?*”;
- 1-day MEQ Workshop on “*Remote sensing techniques for HAB detection and monitoring*” (jointly with NOWPAP);
- 1-day MEQ Workshop on “*Pollutants in a changing ocean: Refining indicator approaches in support of coastal management*”;
- ¾-day POC/MONITOR/TCODE Workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES EAST-I Program*”.

The following business meetings are to be held at PICES-2011:

- ¼-day Science Board (SB) meeting (first Sunday) and 1½-day SB meeting (second Friday and Saturday);
- 1½-hour overture meetings and ½-day meetings of Scientific (BIO, FIS, MEQ and POC) and Technical (MONITOR and TCODE) Committees to be run concurrently;
- 1-day meeting of the POC/BIO Section on *Carbon and Climate (CC-S)*;
- 1-day meeting of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific (HAB-S)*;

- 1½-day meeting of the MEQ Working Group on *Non-indigenous Aquatic Species* (WG 21), immediately after a 4-day PICES Rapid Assessment Survey (RAS-2011);
- ½-day meeting the BIO Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim* (WG 23);
- 1-day meeting of the MEQ/FIS Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24);
- 1-day meeting of the PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS);
- 1-day meeting the BIO Working Group on *Jellyfish Blooms around the North Pacific Rim* (WG 26);
- 1-day meeting the POC Working Group on *North Pacific Climate Variability and Change* (WG 27), if this Working Group is approved prior to PICES-2011;
- ½-day meeting the MEQ/BIO Working Group on *Ecosystem Responses to Multiple Stressors* (WG 28), if this Working Group is approved prior to PICES-2011;
- ½-day meeting the SB Study Group on *Human Dimensions for Environmental Change* (SG-HD)
- ½-day meeting of the BIO Advisory Panel on *Marine Birds and Mammals* (MBM-AP);
- ¼-day meeting of the MONITOR Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific* (CPR-AP);
- ¼-day meeting of the POC/MONITOR Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* (CREAMS-AP);
- ½-day meetings concurrent meetings of the FUTURE Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems* (AICE-AP), *Climate, Oceanographic Variability and Ecosystems* (COVE-AP) and *Status, Outlooks, Forecasts, and Engagement* (SOFE-AP);
- ½-day joint meeting of AICE-AP, COVE-AP and SOFE-AP.

2010/S/3: Inter-sessional symposia/sessions/workshops/meetings

The following inter-sessional events are to be convened/co-sponsored in 2011 and beyond:

Symposia

- 5th International Zooplankton Production Symposium on “*Population connections, community dynamics and climate variability*” (primary international sponsors: PICES and ICES), March 14–18, 2011, Pucón, Chile (approved in 2008);
- Second ESSAS (Ecosystem Studies of Sub-Arctic Seas) Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” (organizational support and travel support for early career scientists by PICES), May 22–26, 2011, Seattle, U.S.A. (approved in 2009);
- 7th International Conference on Marine Bioinvasions (co-sponsored by PICES), August 23–25, 2011, Barcelona, Spain;
- 2nd International Symposium on “*Effects of climate change on the world’s oceans*” (primary international sponsors: PICES, ICES and IOC) as one of the official events related to Ocean Expo-2012, May 14–18, 2012, Yeosu, Korea (approved in 2009).

Joint Theme Sessions at the 2011 ICES Annual Science Conference (September 19–23, 2011, Gdansk, Poland)

- *Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*, with Drs. Emanuele Di Lorenzo (U.S.A.) and Ichiro Yasuda (Japan) serving as PICES co-convenors;
- *Atlantic redfish and Pacific rockfish: comparing biology, ecology, assessment and management strategies for *Sebastes* spp.*, with Dr. Paul Spenser (U.S.A.) serving as a PICES co-convenor;
- *Recruitment processes: Early life history dynamics – from eggs to juveniles*, with Dr. Richard Brodeur (U.S.A.) serving as a PICES co-convenor;
- *Surplus production models: Quantitative tools to manage exploited fisheries and compare the productivity of marine ecosystems*, with Drs. Jennifer Boldt and R. Ian Perry (Canada) serving as PICES co-convenors.

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Workshops and meetings

- FUTURE Workshop on “*Indicators of status and change within North Pacific marine ecosystems*”, April 26–28, 2011, Honolulu, U.S.A.;
- Inter-sessional Science Board meeting (ISB-2011), April 29–30, 2011, Honolulu, U.S.A.;
- Meeting of the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*, April 2011, Honolulu, U.S.A., in conjunction with ISB-2011;
- Meeting of the Study Group on *Updating the PICES Strategic Plan (SG-USP)*, May 1, 2011, Honolulu, U.S.A., in conjunction with ISB-2011;
- ICES/PICES workshop on “*Reaction of northern hemisphere ecosystems to climate events: A comparison*”, May 2–6, 2011, Hamburg, Germany, with Drs. Sukgeun Jung (Korea) and Yoshiro Watanabe (Japan) serving as PICES co-convenors;
- ICES/PICES workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*”, May 22, 2011, Seattle, U.S.A., in conjunction with the 2nd ESSAS Open Science Meeting, with Dr. Anne Hollowed (U.S.A.) serving as a PICES co-convenor;
- Workshop on “*Comparative analyses of marine bird and mammal responses to climate change*”, May 22, 2011, Seattle, U.S.A., in conjunction with the 2nd ESSAS Open Science Meeting;
- Meetings of the PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS), in conjunction with the 2nd ESSAS Open Science Meeting and the 2011 ICES Annual Science Conference;
- Meeting of the Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas*, spring 2011, Hangzhou, China;
- 45th CMOS (Canadian Meteorological and Oceanographic Society) Congress on “*Ocean, atmosphere and the changing Pacific*”, June 6–9, 2011, Victoria, Canada (co-sponsored by PICES);
- International workshop on “*Development and application of Regional Climate Models*”, October 11–12, 2011, Incheon, Korea, immediately prior to PICES-2011;
- 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.

Capacity development events

- 3rd PICES/MAFF Harmful Algal Bloom training course for the South Pacific Island community, spring 2011, Fiji;
- PICES/MAFF Rapid Assessment Survey Demonstration Workshop for Southeastern Asian countries, late spring or early summer 2011, Bangkok, Thailand;
- 5th SOLAS Summer School (co-sponsored by PICES), August 29–September 10, 2011, Cargèse, Corsica, France;
- NOWPAP/PICES/WESTPAC training course on “*Remote sensing data analysis*”, October 8–12, 2011, Vladivostok, Russia, immediately prior to PICES-2011;
- 2nd ICES/PICES “*Oceans of Change*” Conference for Early Career Scientist, April 2012, Majorca, Spain.

2010/S/4: Travel support

PICES will provide/arrange travel support for:

2011 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;
- Two invited speakers for each of the following workshops: BIO Workshop on “*MEMIP-IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems--humble pie or glee?*” and POC/MONITOR/TCODE Workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES EAST-I Program*”;
- One invited speaker for each of the following workshops: MEQ Workshop on “*Remote sensing techniques for HAB detection and monitoring*” and MEQ Workshop on “*Pollutants in a changing ocean: Refining indicator approaches in support of coastal management*”.

Inter-sessional events

- TCODE representative to attend the 21st Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XXI; March 23–26, 2011, Liege, Belgium);
- Three invited speakers for the FUTURE Workshop on “*Indicators of status and change within North Pacific marine ecosystems*” (April 26–28, 2011, Honolulu, U.S.A.);
- Two PICES convenors for the ICES/PICES workshop on “*Reaction of Northern Hemisphere ecosystems to climate events: A comparison*” (May 2–6, 2011, Hamburg, Germany);
- Two scientists to attend the ICES/PICES workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*” (May 22, 2011, Seattle, U.S.A.);
- Two Asian early career scientists to participate in the 2nd ESSAS Open Science Meeting (May 22–26, 2011, Seattle, U.S.A.);
- PICES plenary speaker for the 45th Canadian Meteorological and Oceanographic Society Congress on “*Ocean, atmosphere and the changing Pacific*” (June 6–9, 2011, Victoria, Canada);
- PICES representative to attend the 2011 IOC General Assembly (June 22–30, 2011, Paris, France);
- PICES SSC member and early career scientists to attend the 7th International Conference on Marine Bioinvasions (August 23–25, 2011, Barcelona, Spain);
- Three early career scientists to attend the 5th SOLAS Summer School (August 29–September 10, 2011, Cargèse, Corsica, France);
- PICES representative to attend the 2011 SCOR Executive Committee Meeting (September 12–15, 2011, Helsinki, Finland);
- PICES representative and convenors for the joint sessions on “*Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*”, “*Atlantic redfish and Pacific rockfish: comparing biology, ecology, assessment and management strategies for *Sebastes* spp.*” and “*Recruitment processes: Early life history dynamics – from eggs to juveniles*” to participate in the 2011 ICES Annual Science Conference (September 19–23, 2011, Gdansk, Poland);
- Two invited speakers for the international workshop on “*Development and application of Regional Climate Models*” (October 11–12, 2011, Incheon, Korea);
- Three trainees from the Northwest Pacific region and 1 lecturer for the NOWPAP/PICES/WESTPAC training course on “*Remote sensing data analysis*” (October 8–12, 2011, Vladivostok, Russia);
- PICES representative to attend the 2011 NPAFC Annual Meeting (October 24–28, 2011, Nanaimo, Canada);
- PICES SSC member for the NPAFC-led workshop on “*Production trends of pink and chum salmon: Why they can retain high abundance?*” (October 30–31, 2011, Nanaimo, Canada);
- MONITOR representative to attend the 2011 meeting of the ICES Working Group on *Operational Oceanographic Products for Fisheries and Environment* (dates and venue are unknown) – subject to fund availability;
- MONITOR representative to attend the 2011 meeting of the ICES Working Group on *Oceanic Hydrography* (dates and venue are unknown) – subject to fund availability;
- MONITOR representative to attend the 2011 meeting of the ICES Working Group on *The Northwest Atlantic Regional Sea* (dates and venue are unknown) – subject to fund availability;
- MEQ representative to attend the 2011 meeting of ICES/IOC Working Group on *Harmful Algal Bloom Dynamics* (dates and venue are unknown) – subject to fund availability.

2010/S/5: Publications

The following publications are to be produced in 2011–2012:

Primary journals

- Special section in a regular issue of *Journal of Oceanography* based on selected papers from the PICES-2009 Topic Session on “*Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific*” (Guest Editors: T. Ono, K. Lee, C. Sabine and T. Saino) to be published in June 2011 (approved in 2009);
- Special issue of *ICES Journal of Marine Science* based on selected papers from the 2010 PICES/ICES/FAO Symposium on “*Forecasting climate change impacts on fish and shellfish: Forecasting impacts,*

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assessing ecosystem responses, and evaluating management strategies” (Guest Editors: A. Hollowed, S.-I Ito, S. Kim, H. Loeng and M. Peck) to be published in June 2011, with sufficient time to be considered by review panels responsible for the next assessment report (AR5) of the Intergovernmental Panel on Climate Change (approved in 2009);

- Special issue of *Fisheries Research* based on selected papers from the PICES-2009 Topic Session on “*Ecosystem-based approaches for the assessment of fisheries under data-limited situations*” (Guest Editors: P. Livingston, G. Kruse and L. Richards) to be published in September 2011 (approved in 2009);
- Review paper on “*The decline of Fraser River sockeye salmon in relation to marine ecology*” in *Reviews in Fish Biology and Fisheries* to be published in late 2011 or early 2012 (Lead Author: S. McKinnell);
- Special issue of *ICES Journal of Marine Science* based on selected papers from the 2011 PICES/ICES Zooplankton Production Symposium on “*Population connections, community dynamics and climate variability*” (Guest Editors: J. Keister, C. Johnson and D. Bonnet) to be published in late spring or early summer of 2012;
- Special issue of a peer-reviewed journal (*Aquaculture Economics and Management, Aquaculture, Reviews in Aquaculture, or Fishery Research*) based on selected papers from the PICES-2010 Topic Session on “*Economic relation between marine aquaculture and wild capture fisheries*” to be published in 2012.

PICES Scientific Report series

- Final report of the POC Working Group (WG 20) on *Evaluations of Climate Change Projections* (Editors: M. Foreman and Y. Yamanaka);
- Final report of the BIO Working Group (WG 22) on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (Editors: F. Chai and S. Takeda);
- Final report for the Climate Change and Carrying Capacity Program (Editor: H. Batchelder and M. Kishi);
- Interim report of the POC/FIS Working Group (PICES/ICES WGFCIFIS) on *Forecasting Climate Change Impacts on Fish and Shellfish* (Editors: A. Hollowed, M. Barange, S. Kim and H. Loeng).

PICES Press – newsletter

- Two regular issues to be published in winter (Vol. 19, No. 1) and summer (Vol. 19, No. 2) of 2011.

Other publications

- PICES Advisory Report to the Cohen Commission on “*The decline of Fraser River sockeye salmon in relation to marine ecology*” as Cohen Commission Technical Report (Editor: S. McKinnell);
- Review paper from the PICES-2009 workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*” (Lead Authors: S. Minobe and E. Di Lorenzo);
- Synthesis paper from the 2010 PICES/ICES/FAO Symposium on “*Forecasting climate change impacts on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (Coordinators: A. Hollowed, M. Barange, S. Kim and H. Loeng);
- Brochure and slide show based on the final report of the MEQ Working Group (WG 19) on *Ecosystem-based Management Science and its Application to the North Pacific* (PICES Scientific Report, September 2010, No. 37, 166 pp.) – summary for policy makers, managers, commercial stakeholders and other interested members of society;
- Brochure and slide show based on the Second North Pacific Ecosystem Status Report (PICES Special Publication, September 2010, No. 4, 393 pp.) – summary for policy makers, managers, commercial stakeholders and other interested members of society;

2010/S/6: Future of current PICES expert groups

- i. The following two expert groups completed their terms of reference and should be disbanded:
 - POC Working Group on *Evaluations of Climate Change Projections* (WG 20; 2006–2010);
 - BIO Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22; 2007–2010).Final reports of these expert groups will be published in the PICES Scientific Report series in 2011.

- ii. Following a 5-year review by the parent committees, the lifespan of the POC/BIO Section on *Carbon and Climate* (CC-S) was extended for a 3-year term (until October 2013).
- iii. The lifespan of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S) was extended for 1 year (until October 2011), with the required review of past activities and future directions by the parent committee at PICES-2011 for a possible continuation.
- iv. The lifespan of the BIO Advisory Panel on *Marine Birds and Mammals* (MBM-AP) was extended for 1 year (until October 2011), with the required review of past activities and future directions by the parent committee at PICES-2011 for a possible continuation.
- v. The life span of the Science Board Study Group on *Human Dimensions for Environmental Change* (SG-HD) was extended for 1 year (until October 2011). The SG-HD draft report has to be presented at the 2011 inter-sessional Science Board meeting and the final report has to be completed by PICES-2011.
- vi. The life span of the Study Group on *Updating the PICES Strategic Plan* (SG-USP) was extended for 6 months (until April 2011). The final report of this group has to be presented at the 2011 SG-USP meeting to be held in conjunction with ISB-2011.

2010/S/7: New PICES expert groups

A Working Group on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequence* (WG 26) was established, under direction of the Biological Oceanography Committee (BIO), with the following terms of reference:

1. Review past and ongoing studies on the reproductive biology of jellyfish species that cause problematic blooms.
2. Compile existing data on temporal variations in jellyfish abundance in the North Pacific and its marginal seas, and analyze them in relation to regional environmental and climate changes in order to identify causes of increasingly recurrent jellyfish blooms.
3. Elucidate the role of jellyfish in coastal and oceanic marine food webs and assess the impacts of jellyfish blooms on marine ecosystems and socio-economies such as fisheries and aquaculture.
4. Evaluate methodologies for predicting blooms and for diminishing their impact on marine and human systems, including bloom forecast modeling and the modification of fishing gears.
5. Promote international collaboration among PICES member countries for exchanging available information on jellyfish, and encourage joint research surveys on jellyfish among PICES member countries.
6. Provide jellyfish metrics as indicator of ecosystem change and resiliency in cooperation with FUTURE AICE-AP and SOFE-AP and FUTURE related expert groups.
7. Publish a final report summarizing the results, including recommendations to policy makers for reducing impacts of jellyfish blooms in the North Pacific.

2010/S/8: Chairmen and Vice-Chairmen for standing committees and *ad hoc* expert groups

The following reflects changes in Chairmanship/Vice-Chairmanship and new appointments for Scientific and Technical Committees and *ad hoc* expert groups:

- Dr. Sinjae Yoo (Korea) became Science Board Chairman to replace Dr. John Stein (U.S.A.);
- Dr. Thomas Therriault (Canada) was elected Science Board Vice-Chairman;
- Dr. Atsushi Tsuda (Japan) was elected BIO Chairman to replace Dr. Michael Dagg (U.S.A.);
- Dr. Michael Dagg (U.S.A.) was elected BIO Vice-Chairman;
- Dr. Kyung-Il Chang (Korea) was elected POC Chairman to replace Dr. Michael Foreman (Canada);
- Dr. Michael Foreman (Canada) was elected POC Vice Chairman to replace Dr. Ichiro Yasuda (Japan);
- Dr. Hiroaya Sugisaki (Japan) was elected MONITOR Chairman for a second 3-year term;
- Dr. Phillip Mundy (U.S.A.) was elected MONITOR Vice-Chairman for a second 3-year term;
- Dr. Toru Suzuki (Japan) was elected TCODE Chairman to replace late Dr. Bernard Megrey (U.S.A.);
- Dr. Hernan Garcia (U.S.A.) was elected TCODE Vice-Chairman to replace Dr. Kyu-Kui Jung (Korea);
- Dr. Changkyu Lee (Korea) was appointed Co-Chairman of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* to replace Dr. Hak-Gyoon Kim (Korea);

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- Drs. James Christian (Canada) and Toshiro Saino (Japan) were re-appointed as Co-Chairmen of the POC/BIO Section on *Carbon and Climate*;
- Dr. Brett Dumbauld (U.S.A.) was appointed as Co-Chairman of the FIS/MEQ Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24) to replace Dr. Kevin Amos (U.S.A.);
- Drs. Rolf Ream (U.S.A.) and Yutaka Watanuki (Japan) were appointed as Co-Chairmen of the BIO Advisory Panel on *Marine Birds and Mammals* to replace Drs. Hidehiro Kato (Japan) and William Sydeman (U.S.A.);

2010/S/9: Relations with other organizations and programs

Council approved the revised *Standing List of International and Regional Organizations and Programs* developed by Science Board at ISB-2010 and agreed with the identified priorities for interaction in 2010–2011.

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2010 Governing Council decisions

2010/A/1: Auditor

Council accepted the audited accounts for *FY* 2009.

2010/A/2: Annual contributions

- i. Council instructed the Executive Secretary to send a letter commending Contracting Parties for their performance in submitting annual contributions for *FY* 2010, and describing the difficulties that late and/or partial payment causes the Organization.
- ii. 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.

2010/A/3: Budget and fund-raising

- i. Council accepted the estimated accounts for *FY* 2010.
- ii. Council approved the *FY* 2011 budget of \$814,000. The amount of \$116,800 will be transferred from the Working Capital Fund to balance the budget, setting the total annual contribution at \$697,200, and the 2011 annual fee at \$116,200 per Contracting Party.
- iii. Council approved a transfer from the Working Capital Fund to the Trust Fund to recover the 2010 expenses, and to restore the Trust Fund to the level of \$110,000 by the end of the fiscal year.
- iv. Council approved a transfer from the Working Capital Fund to restore the Relocation and Home Leave Fund to the level of \$100,000 by the end of the fiscal year.
- v. Council approved that funds (\$21,996) under “high priority PICES projects” be earmarked for the development of the PICES integrative science program on “*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems*” (FUTURE).
- vi. Council instructed the Executive Secretary to send a letter to the Contracting Parties providing information on planned activities for FUTURE and requesting contributions to these activities.
- vii. Council approved that the surplus funds remaining from the 2010 PICES/ICES/FAO symposium on “*Climate change effects on fish and fisheries*” be allocated for the 2012 PICES/ICES Conference for Early Career Scientists.
- viii. Council directed the Executive Secretary to write letters soliciting new members and additional contributions for the consortium to support the North Pacific Continuous Plankton Recorder program.
- ix. Council approved an additional lump sum employer contribution of \$20,000 to the International Fisheries Commission Pension Plan to pay down unfunded liabilities.

2010/A/4: PICES Rules of Procedure

Council approved the proposed amendments to the Rules of Procedure (*Rule 13(iii)(d)* and *Rule 17*) to more clearly describe the review period and co-chairmanship duration for Sections.

2010/A/5: Future PICES Annual Meetings and 2011 inter-sessional Science Board meeting

- i. Council accepted the proposal from the Russian Federation to host PICES-2011 from October 7–16 or October 14–23, 2011, in Khabarovsk, and agreed to provide \$40,000 to the host country to partially cover meeting costs. The theme of the meeting, “*Mechanisms of marine ecosystem reorganization in the North Pacific Ocean*”, was approved in principle at PICES-2009, and the theme description was finalized at ISB-2010.
- ii. Council accepted the offer of Japan to host PICES-2012 from October 12–21, 2012, in Hiroshima. Council approved in principle the proposed theme of the meeting, “*Scientific challenge to the North Pacific*”

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ecosystem: Understanding and mitigation of the effects of natural and anthropogenic stress”, and instructed Science Board to finalize the theme description at ISB-2011.

- iii. Following the established 6-year rotation cycle, Council requested Canada to explore the possibility of hosting PICES-2013, and inform the Secretariat on this matter by March 31, 2011.
- iv. Council agreed to keep the same registration fee structure for PICES-2011 as for PICES-2010:

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

- v. Council approved a 1½- or 2-day inter-sessional Science Board meeting to be hosted by the United States of America and be held in the spring of 2011, immediately after a 3-day inter-sessional FUTURE workshop on “*Indicators of status and change within North Pacific marine ecosystems*”, and supported extending an invitation to ICES to participate in this workshop and use this opportunity for the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science (SG-SP)* to meet immediately prior to ISB-2011.

2010/A/6: Intern Program

- i. Considering the current level of the stipend (\$2,000) and funding available for the Intern Program, Council agreed that the 2011/2012 intern, Ms. Jeongim Mok (Marine Policy Division, Ministry of Land, Transport and Maritime Affairs, Republic of Korea), be offered a 6-month term, with possible extension (up to 12 months) if additional funding become available.
- ii. Council instructed the Executive Secretary to invite Contracting Parties to provide voluntary contributions to the Trust Fund to support the Intern Program in 2011 and beyond.
- iii. Council approved changes in the description of the Intern Program clarifying that the focus of the Program is on the professional development of early career marine scientists and managers from PICES member countries.

2010/A/7: Improvement of participation in PICES activities

- i. Council re-iterated the necessity for Contracting Parties to (1) regularly review their national membership and make changes as appropriate, 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 stating that “*each Contracting Party is requested to notify the Executive Secretary, three weeks in advance, of the names of delegates, alternate delegates, advisors and members, attending each meeting of the Organization*”. 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.
- ii. 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 for the previous six years.

2010/A/8: Election of Chairman and Vice Chairman

- i. Council unanimously elected Dr. Lev Bocharov (Russia) as the Chairman of PICES for a 2-year term (2010–2012). Accordingly Dr. Tokio Wada (Japan) will serve as the Past-Chairman.
- ii. Council unanimously elected Dr. Laura Richards (Canada) as the Vice-Chairman of PICES for a 2-year term (2010–2012).

2010/A/9: Appointment of F&A Committee Chairman

Council re-appointed Ms. Patricia Livingston (U.S.A.) as the Chairman of the Finance and Administration Committee for a 2-year term (2010–2012).

2010/S/1: PICES Advisory Report to the Cohen Commission

Council authorized the release of the PICES Advisory Report to the Cohen Commission (*Commission of Inquiry into the Decline of Fraser River Sockeye Salmon*) on the decline of Fraser River sockeye salmon in relation to marine ecology. Council endorsed the invitation to provide scientific advice on this issue in June 2010, noting that this request is a clear recognition of PICES' expertise and scientific leadership on issues of climate variability and marine ecology.

2010/S/2: 2011 PICES Annual Meeting

The following scientific sessions are to be convened at PICES-2011:

- ¾-day Science Board Symposium on “*Mechanisms of marine ecosystem reorganization in the North Pacific Ocean*”;
- 1-day BIO Contributed Paper Session;
- 1-day BIO/POC Topic Session on “*Mechanisms of physical-biological coupling forcing biological ‘hotspots’*”;
- 1-day FIS Contributed Paper Session;
- ½-day FIS Topic Session on “*Population dynamics, trophic interactions and management of cephalopods in the North Pacific ecosystems*”;
- 1-day FIS/POC Topic Session on “*Recent changes of North Pacific climate and marine ecosystems: Implications for dynamics of the dominant species*”;
- ½-day MEQ Topic Session on “*Harmful algal blooms in a changing world*”;
- ½-day MEQ/FIS Topic Session on “*Identification and characterization of environmental interactions of marine aquaculture in the North Pacific*”;
- 1-day MEQ/FUTURE Topic Session on “*Land-sea interactions and anthropogenic impacts on biological productivity of North Pacific Ocean coastal ecosystems*”;
- 1-day POC Contributed Paper Session;
- ½-day POC/FIS Topic Session on “*Linking migratory fish behavior to end-to-end models*”;
- 1-day MONITOR/POC/FUTURE Topic Session on “*How well do our models really work and what data do we need to check and improve them?*”;
- TCODE E-Poster Session on “*Data and data systems for validation of numerical models*” (linked with the MONITOR/POC/FUTURE Topic Session).

The following workshops are to be convened at PICES-2011:

- 1½-day BIO Workshop on “*MEMIP-IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems—humble pie or glee?*”;
- 1-day MEQ Workshop on “*Remote sensing techniques for HAB detection and monitoring*” (jointly with NOWPAP);
- 1-day MEQ Workshop on “*Pollutants in a changing ocean: Refining indicator approaches in support of coastal management*”;
- ¾-day POC/MONITOR/TCODE Workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES EAST-I Program*”.

The following business meetings are to be held at PICES-2011:

- ¼-day Science Board (SB) meeting (first Sunday) and 1½-day SB meeting (second Friday and Saturday);
- 1½-hour overture meetings and ½-day meetings of Scientific (BIO, FIS, MEQ and POC) and Technical (MONITOR and TCODE) Committees to be run concurrently;
- 1-day meeting of the POC/BIO Section on *Carbon and Climate* (CC-S);
- 1-day meeting of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S);

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- 1½-day meeting of the MEQ Working Group on *Non-indigenous Aquatic Species* (WG 21), immediately after a 4-day PICES Rapid Assessment Survey (RAS-2011);
- ½-day meeting the BIO Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim* (WG 23);
- 1-day meeting of the MEQ/FIS Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24);
- 1-day meeting of the PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS);
- 1-day meeting the BIO Working Group on *Jellyfish Blooms around the North Pacific Rim* (WG 26);
- 1-day meeting the POC Working Group on *North Pacific Climate Variability and Change* (WG 27), if this Working Group is approved prior to PICES-2011;
- ½-day meeting the MEQ/BIO Working Group on *Ecosystem Responses to Multiple Stressors* (WG 28), if this Working Group is approved prior to PICES-2011;
- ½-day meeting the SB Study Group on *Human Dimensions for Environmental Change* (SG-HD)
- ½-day meeting of the BIO Advisory Panel on *Marine Birds and Mammals* (MBM-AP);
- ¼-day meeting of the MONITOR Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific* (CPR-AP);
- ¼-day meeting of the POC/MONITOR Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* (CREAMS-AP);
- ½-day meetings concurrent meetings of the FUTURE Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems* (AICE-AP), *Climate, Oceanographic Variability and Ecosystems* (COVE-AP) and *Status, Outlooks, Forecasts, and Engagement* (SOFE-AP);
- ½-day joint meeting of AICE-AP, COVE-AP and SOFE-AP.

2010/S/3: Inter-sessional symposia/sessions/workshops/meetings

The following inter-sessional events are to be convened/co-sponsored in 2011 and beyond:

Symposia

- 5th International Zooplankton Production Symposium on “*Population connections, community dynamics and climate variability*” (primary international sponsors: PICES and ICES), March 14–18, 2011, Pucón, Chile (approved in 2008);
- Second ESSAS (Ecosystem Studies of Sub-Arctic Seas) Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” (organizational support and travel support for early career scientists by PICES), May 22–26, 2011, Seattle, U.S.A. (approved in 2009);
- 7th International Conference on Marine Bioinvasions (co-sponsored by PICES), August 23–25, 2011, Barcelona, Spain;
- 2nd International Symposium on “*Effects of climate change on the world’s oceans*” (primary international sponsors: PICES, ICES and IOC) as one of the official events related to Ocean Expo-2012, May 14–18, 2012, Yeosu, Korea (approved in 2009).

Joint Theme Sessions at the 2011 ICES Annual Science Conference (September 19–23, 2011, Gdansk, Poland)

- *Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*, with Drs. Emanuele Di Lorenzo (U.S.A.) and Ichiro Yasuda (Japan) serving as PICES co-convenors;
- *Atlantic redfish and Pacific rockfish: comparing biology, ecology, assessment and management strategies for *Sebastes* spp.*, with Dr. Paul Spenser (U.S.A.) serving as a PICES co-convenor;
- *Recruitment processes: Early life history dynamics – from eggs to juveniles*, with Dr. Richard Brodeur (U.S.A.) serving as a PICES co-convenor;
- *Surplus production models: Quantitative tools to manage exploited fisheries and compare the productivity of marine ecosystems*, with Drs. Jennifer Boldt and R. Ian Perry (Canada) serving as PICES co-convenors.

Workshops and meetings

- FUTURE Workshop on “*Indicators of status and change within North Pacific marine ecosystems*”, April 26–28, 2011, Honolulu, U.S.A.;
- Inter-sessional Science Board meeting (ISB-2011), April 29–30, 2011, Honolulu, U.S.A.;
- Meeting of the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*, April 2011, Honolulu, U.S.A., in conjunction with ISB-2011;
- Meeting of the Study Group on *Updating the PICES Strategic Plan (SG-USP)*, May 1, 2011, Honolulu, U.S.A., in conjunction with ISB-2011;
- ICES/PICES workshop on “*Reaction of northern hemisphere ecosystems to climate events: A comparison*”, May 2–6, 2011, Hamburg, Germany, with Drs. Sukgeun Jung (Korea) and Yoshiro Watanabe (Japan) serving as PICES co-convenors;
- ICES/PICES workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*”, May 22, 2011, Seattle, U.S.A., in conjunction with the 2nd ESSAS Open Science Meeting, with Dr. Anne Hollowed (U.S.A.) serving as a PICES co-convenor;
- Workshop on “*Comparative analyses of marine bird and mammal responses to climate change*”, May 22, 2011, Seattle, U.S.A., in conjunction with the 2nd ESSAS Open Science Meeting;
- Meetings of the PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS), in conjunction with the 2nd ESSAS Open Science Meeting and the 2011 ICES Annual Science Conference;
- Meeting of the Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas*, spring 2011, Hangzhou, China;
- 45th CMOS (Canadian Meteorological and Oceanographic Society) Congress on “*Ocean, atmosphere and the changing Pacific*”, June 6–9, 2011, Victoria, Canada (co-sponsored by PICES);
- International workshop on “*Development and application of Regional Climate Models*”, October 11–12, 2011, Incheon, Korea, immediately prior to PICES-2011;
- 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.

Capacity development events

- 3rd PICES/MAFF Harmful Algal Bloom training course for the South Pacific Island community, spring 2011, Fiji;
- PICES/MAFF Rapid Assessment Survey Demonstration Workshop for Southeastern Asian countries, late spring or early summer 2011, Bangkok, Thailand;
- 5th SOLAS Summer School (co-sponsored by PICES), August 29–September 10, 2011, Cargèse, Corsica, France;
- NOWPAP/PICES/WESTPAC training course on “*Remote sensing data analysis*”, October 8–12, 2011, Vladivostok, Russia, immediately prior to PICES-2011;
- 2nd ICES/PICES “*Oceans of Change*” Conference for Early Career Scientist, April 2012, Majorca, Spain.

2010/S/4: Travel support

PICES will provide/arrange travel support for:

2011 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;
- Two invited speakers for each of the following workshops: BIO Workshop on “*MEMIP-IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems--humble pie or glee?*” and POC/MONITOR/TCODE Workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES EAST-I Program*”;
- One invited speaker for each of the following workshops: MEQ Workshop on “*Remote sensing techniques for HAB detection and monitoring*” and MEQ Workshop on “*Pollutants in a changing ocean: Refining indicator approaches in support of coastal management*”.

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Inter-sessional events

- TCODE representative to attend the 21st Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XXI; March 23–26, 2011, Liege, Belgium);
- Three invited speakers for the FUTURE Workshop on “*Indicators of status and change within North Pacific marine ecosystems*” (April 26–28, 2011, Honolulu, U.S.A.);
- Two PICES convenors for the ICES/PICES workshop on “*Reaction of Northern Hemisphere ecosystems to climate events: A comparison*” (May 2–6, 2011, Hamburg, Germany);
- Two scientists to attend the ICES/PICES workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*” (May 22, 2011, Seattle, U.S.A.);
- Two Asian early career scientists to participate in the 2nd ESSAS Open Science Meeting (May 22–26, 2011, Seattle, U.S.A.);
- PICES plenary speaker for the 45th Canadian Meteorological and Oceanographic Society Congress on “*Ocean, atmosphere and the changing Pacific*” (June 6–9, 2011, Victoria, Canada);
- PICES representative to attend the 2011 IOC General Assembly (June 22–30, 2011, Paris, France);
- PICES SSC member and early career scientists to attend the 7th International Conference on Marine Bioinvasions (August 23–25, 2011, Barcelona, Spain);
- Three early career scientists to attend the 5th SOLAS Summer School (August 29–September 10, 2011, Cargèse, Corsica, France);
- PICES representative to attend the 2011 SCOR Executive Committee Meeting (September 12–15, 2011, Helsinki, Finland);
- PICES representative and convenors for the joint sessions on “*Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*”, “*Atlantic redfish and Pacific rockfish: comparing biology, ecology, assessment and management strategies for *Sebastes* spp.*” and “*Recruitment processes: Early life history dynamics – from eggs to juveniles*” to participate in the 2011 ICES Annual Science Conference (September 19–23, 2011, Gdansk, Poland);
- Two invited speakers for the international workshop on “*Development and application of Regional Climate Models*” (October 11–12, 2011, Incheon, Korea);
- Three trainees from the Northwest Pacific region and 1 lecturer for the NOWPAP/PICES/WESTPAC training course on “*Remote sensing data analysis*” (October 8–12, 2011, Vladivostok, Russia);
- PICES representative to attend the 2011 NPAFC Annual Meeting (October 24–28, 2011, Nanaimo, Canada);
- PICES SSC member for the NPAFC-led workshop on “*Production trends of pink and chum salmon: Why they can retain high abundance?*” (October 30–31, 2011, Nanaimo, Canada);
- MONITOR representative to attend the 2011 meeting of the ICES Working Group on *Operational Oceanographic Products for Fisheries and Environment* (dates and venue are unknown) – subject to fund availability;
- MONITOR representative to attend the 2011 meeting of the ICES Working Group on *Oceanic Hydrography* (dates and venue are unknown) – subject to fund availability;
- MONITOR representative to attend the 2011 meeting of the ICES Working Group on *The Northwest Atlantic Regional Sea* (dates and venue are unknown) – subject to fund availability;
- MEQ representative to attend the 2011 meeting of ICES/IOC Working Group on *Harmful Algal Bloom Dynamics* (dates and venue are unknown) – subject to fund availability.

2010/S/5: Publications

The following publications are to be produced in 2011–2012:

Primary journals

- Special section in a regular issue of *Journal of Oceanography* based on selected papers from the PICES-2009 Topic Session on “*Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific*” (Guest Editors: T. Ono, K. Lee, C. Sabine and T. Saino) to be published in June 2011 (approved in 2009);
- Special issue of *ICES Journal of Marine Science* based on selected papers from the 2010 PICES/ICES/FAO Symposium on “*Forecasting climate change impacts on fish and shellfish: Forecasting impacts,*

assessing ecosystem responses, and evaluating management strategies” (Guest Editors: A. Hollowed, S.-I Ito, S. Kim, H. Loeng and M. Peck) to be published in June 2011, with sufficient time to be considered by review panels responsible for the next assessment report (AR5) of the Intergovernmental Panel on Climate Change (approved in 2009);

- Special issue of *Fisheries Research* based on selected papers from the PICES-2009 Topic Session on “*Ecosystem-based approaches for the assessment of fisheries under data-limited situations*” (Guest Editors: P. Livingston, G. Kruse and L. Richards) to be published in September 2011 (approved in 2009);
- Review paper on “*The decline of Fraser River sockeye salmon in relation to marine ecology*” in *Reviews in Fish Biology and Fisheries* to be published in late 2011 or early 2012 (Lead Author: S. McKinnell);
- Special issue of *ICES Journal of Marine Science* based on selected papers from the 2011 PICES/ICES Zooplankton Production Symposium on “*Population connections, community dynamics and climate variability*” (Guest Editors: J. Keister, C. Johnson and D. Bonnet) to be published in late spring or early summer of 2012;
- Special issue of a peer-reviewed journal (*Aquaculture Economics and Management, Aquaculture, Reviews in Aquaculture, or Fishery Research*) based on selected papers from the PICES-2010 Topic Session on “*Economic relation between marine aquaculture and wild capture fisheries*” to be published in 2012.

PICES Scientific Report series

- Final report of the POC Working Group (WG 20) on *Evaluations of Climate Change Projections* (Editors: M. Foreman and Y. Yamanaka);
- Final report of the BIO Working Group (WG 22) on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (Editors: F. Chai and S. Takeda);
- Final report for the Climate Change and Carrying Capacity Program (Editor: H. Batchelder and M. Kishi);
- Interim report of the POC/FIS Working Group (PICES/ICES WG/FCCIFS) on *Forecasting Climate Change Impacts on Fish and Shellfish* (Editors: A. Hollowed, M. Barange, S. Kim and H. Loeng).

PICES Press – newsletter

- Two regular issues to be published in winter (Vol. 19, No. 1) and summer (Vol. 19, No. 2) of 2011.

Other publications

- PICES Advisory Report to the Cohen Commission on “*The decline of Fraser River sockeye salmon in relation to marine ecology*” as Cohen Commission Technical Report (Editor: S. McKinnell);
- Review paper from the PICES-2009 workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*” (Lead Authors: S. Minobe and E. Di Lorenzo);
- Synthesis paper from the 2010 PICES/ICES/FAO Symposium on “*Forecasting climate change impacts on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (Coordinators: A. Hollowed, M. Barange, S. Kim and H. Loeng);
- Brochure and slide show based on the final report of the MEQ Working Group (WG 19) on *Ecosystem-based Management Science and its Application to the North Pacific* (PICES Scientific Report, September 2010, No. 37, 166 pp.) – summary for policy makers, managers, commercial stakeholders and other interested members of society;
- Brochure and slide show based on the Second North Pacific Ecosystem Status Report (PICES Special Publication, September 2010, No. 4, 393 pp.) – summary for policy makers, managers, commercial stakeholders and other interested members of society;

2010/S/6: Future of current PICES expert groups

- i. The following two expert groups completed their terms of reference and should be disbanded:
 - POC Working Group on *Evaluations of Climate Change Projections* (WG 20; 2006–2010);
 - BIO Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22; 2007–2010).

Final reports of these expert groups will be published in the PICES Scientific Report series in 2011.

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- ii. Following a 5-year review by the parent committees, the lifespan of the POC/BIO Section on *Carbon and Climate* (CC-S) was extended for a 3-year term (until October 2013).
- iii. The lifespan of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S) was extended for 1 year (until October 2011), with the required review of past activities and future directions by the parent committee at PICES-2011 for a possible continuation.
- iv. The lifespan of the BIO Advisory Panel on *Marine Birds and Mammals* (MBM-AP) was extended for 1 year (until October 2011), with the required review of past activities and future directions by the parent committee at PICES-2011 for a possible continuation.
- v. The life span of the Science Board Study Group on *Human Dimensions for Environmental Change* (SG-HD) was extended for 1 year (until October 2011). The SG-HD draft report has to be presented at the 2011 inter-sessional Science Board meeting and the final report has to be completed by PICES-2011.
- vi. The life span of the Study Group on *Updating the PICES Strategic Plan* (SG-USP) was extended for 6 months (until April 2011). The final report of this group has to be presented at the 2011 SG-USP meeting to be held in conjunction with ISB-2011.

2010/S/7: New PICES expert groups

A Working Group on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequence* (WG 26) was established, under direction of the Biological Oceanography Committee (BIO), with the following terms of reference:

1. Review past and ongoing studies on the reproductive biology of jellyfish species that cause problematic blooms.
2. Compile existing data on temporal variations in jellyfish abundance in the North Pacific and its marginal seas, and analyze them in relation to regional environmental and climate changes in order to identify causes of increasingly recurrent jellyfish blooms.
3. Elucidate the role of jellyfish in coastal and oceanic marine food webs and assess the impacts of jellyfish blooms on marine ecosystems and socio-economies such as fisheries and aquaculture.
4. Evaluate methodologies for predicting blooms and for diminishing their impact on marine and human systems, including bloom forecast modeling and the modification of fishing gears.
5. Promote international collaboration among PICES member countries for exchanging available information on jellyfish, and encourage joint research surveys on jellyfish among PICES member countries.
6. Provide jellyfish metrics as indicator of ecosystem change and resiliency in cooperation with FUTURE AICE-AP and SOFE-AP and FUTURE related expert groups.
7. Publish a final report summarizing the results, including recommendations to policy makers for reducing impacts of jellyfish blooms in the North Pacific.

2010/S/8: Chairmen and Vice-Chairmen for standing committees and *ad hoc* expert groups

The following reflects changes in Chairmanship/Vice-Chairmanship and new appointments for Scientific and Technical Committees and *ad hoc* expert groups:

- Dr. Sinjae Yoo (Korea) became Science Board Chairman to replace Dr. John Stein (U.S.A.);
- Dr. Thomas Therriault (Canada) was elected Science Board Vice-Chairman;
- Dr. Atsushi Tsuda (Japan) was elected BIO Chairman to replace Dr. Michael Dagg (U.S.A.);
- Dr. Michael Dagg (U.S.A.) was elected BIO Vice-Chairman;
- Dr. Kyung-Il Chang (Korea) was elected POC Chairman to replace Dr. Michael Foreman (Canada);
- Dr. Michael Foreman (Canada) was elected POC Vice Chairman to replace Dr. Ichiro Yasuda (Japan);
- Dr. Hiroaya Sugisaki (Japan) was elected MONITOR Chairman for a second 3-year term;
- Dr. Phillip Mundy (U.S.A.) was elected MONITOR Vice-Chairman for a second 3-year term;
- Dr. Toru Suzuki (Japan) was elected TCODE Chairman to replace late Dr. Bernard Megrey (U.S.A.);
- Dr. Hernan Garcia (U.S.A.) was elected TCODE Vice-Chairman to replace Dr. Kyu-Kui Jung (Korea);
- Dr. Changkyu Lee (Korea) was appointed Co-Chairman of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* to replace Dr. Hak-Gyoon Kim (Korea);

- Drs. James Christian (Canada) and Toshiro Saino (Japan) were re-appointed as Co-Chairmen of the POC/BIO Section on *Carbon and Climate*;
- Dr. Brett Dumbauld (U.S.A.) was appointed as Co-Chairman of the FIS/MEQ Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24) to replace Dr. Kevin Amos (U.S.A.);
- Drs. Rolf Ream (U.S.A.) and Yutaka Watanuki (Japan) were appointed as Co-Chairmen of the BIO Advisory Panel on *Marine Birds and Mammals* to replace Drs. Hidehiro Kato (Japan) and William Sydeman (U.S.A.);

2010/S/9: Relations with other organizations and programs

Council approved the revised *Standing List of International and Regional Organizations and Programs* developed by Science Board at ISB-2010 and agreed with the identified priorities for interaction in 2010–2011.

REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE

The Finance and Administration (hereafter F&A) Committee met from 09:00–13:00 hours on October 27 and from 09:00–11:30 hours on October 28, 2010, 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 draft agenda without modification (*F&A Endnote 2*).

AGENDA ITEM 3

Audited accounts for FY 2009

The FY 2009 financial statements were submitted to *Flader, Hale & Hughesman* (formerly *Flader and Hale*, PICES external auditor for 2009–2011) on March 31, 2010, and the Auditor's Report was completed on May 12, 2010. The report (*F&A Endnote 3*) was electronically circulated to all Contracting Parties on May 21, 2010. In the auditor's opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2009, and the results of its operations and changes in the fund balances are in accordance with Canadian generally accepted accounting principles. The Committee noted that the auditing process was in line with the PICES Financial Regulations (see *Regulation 11(ii)* and *Regulation 13*) and recommended that the Auditor's Report be approved by Council.

AGENDA ITEM 4

Annual contributions

As stated in *Regulation 5(ii)* of the PICES Financial Regulations, 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 reported on the 2010 annual fee payment dates, and provided information on the payment of national contributions from 2005 to 2010 (*Endnote 4*).

The Committee noted that all Contracting Parties met their financial obligations for FY 2010. Even though only Japan and the United States paid prior to the due date (January 1, 2010), the timeliness of payment from most other Contracting Parties is stable. The Committee again recommended that Council instruct the Executive Secretary to send a letter to Contracting Parties commending their performance in submitting annual contributions for FY 2010.

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 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.

AGENDA ITEM 5

Fund-raising activities

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. In 2010, the amount of funds from voluntary contributions, grants, and

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partnerships for various activities initiated or sponsored by PICES exceeded, for the first time, the total annual contribution by Contracting Parties. All types of contributions are equally valuable to PICES.

The Executive Secretary reported on fund-raising efforts for the period since PICES-2009 (*F&A Endnote 5*). Last year it was noted that there was a shortfall in meeting the target funding level of \$250,000 for the North Pacific Continuous Plankton Recorder (NP CPR) program. However, it now appears that this program is close to be fully funded through 2013. It was recommended that an annual status report on the NP CPR program be prepared and presented at future meetings so that the results and benefits to Contracting Parties would be more apparent. Maintaining full funding of this program beyond 2013 will require communication of its benefits and should be placed on the agenda of the F&A Committee meeting at PICES-2011.

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* 2010, 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 F&A 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 2007/A/3(v)). In 2008, additional funds for both these activities became available. Given current plans, the North Pacific Ecosystem Status Report appears to have sufficient financial support. However, the balance remaining for the development of *FUTURE* activities is small. There was some discussion about the financial needs of *FUTURE*. Last year it was suggested that it would be useful for Contracting Parties to receive a short list of desired activities for *FUTURE* that may require funding. However, to date it appears that only an inter-sessional workshop and two topic sessions at PICES-2011 have been identified by Science Board. It was recommended that a 3-year workplan be developed for *FUTURE* in order to assist the F&A Committee with making funding recommendations to Council and to assist Contracting Parties in identifying activities for which they may wish to provide additional funding. The Committee recommended that Council direct the Executive Secretary to send a letter to all Contracting Parties which contains the 3-year workplan of *FUTURE* activities and a request to make contributions to these activities.

Given the current lack of funding allocated specifically to *FUTURE*, the Committee recommended that the funds in the PICES High Priority Projects Fund (\$21,966) be allocated specifically to *FUTURE* in order to partially support a 3-day inter-sessional workshop proposed for 2011. There was discussion in the Committee about providing specific funding support in this PICES High Priority Projects Fund for *FUTURE* topic sessions to be held as part of the PICES Annual Meeting. F&A recommended that such funding be provided out of the regular PICES budget for the Annual Meeting.

Capacity-building activities requiring additional funding support were discussed. The 2012 PICES/ICES Conference for Early Career Scientists (ECS) still needs additional funding of about \$75,000 in order to have participation comparable to the last ECS conference in 2007. The Committee recommended that the remainder of the unused funds from the 2010 PICES/ICES/FAO symposium on “*Climate change effects on fish and fisheries*” (estimated at approximately \$25,000) be allocated to the 2012 ECS conference. The Committee also recommended that approximately \$20,000 out of the PICES budget be used for PICES SSC members and a coordinator to attend the conference.

The Committee reviewed the status of the Intern Program. It is estimated that at the end of *FY* 2010, the Organization will be holding about \$22,000 for the Intern Program. With the current stipend level of \$2,000 per month (Decision 2007/A/6(iii)), this amount is sufficient to maintain the Program for only 8 months in 2011. At the meeting, Contracting Parties were invited to provide voluntary contributions to support the Intern Program in 2011, however, they were not in a position to make commitments at this time. The Committee recommended that the new PICES intern, currently expected to begin on March 1, 2011, be offered only a 6-month term. The intern's term could be extended, pending additional contributions from Contracting Parties that might be received. There was some discussion about using registration fees for this purpose, and it was decided that these only be used to extend the term through the period of PICES-2011 if no other contributions were received.

The Committee also recommended that Council instruct the Executive Secretary to invite Contracting Parties to provide voluntary contributions to support the Intern Program for 2011 and beyond.

The Committee discussed the funding requested for two capacity building activities in 2011, the joint NOWPAP/PICES/WESTPAC training course on "*Remote sensing data analysis*" and the 5th International SOLAS Summer School. The Committee recommended that a total of \$15,000 be allocated out of the PICES budget to support these activities, with Science Board providing the recommendation with respect to the amounts to be allocated to each event.

AGENDA ITEM 8

Schedule, structure and financing of future Annual Meetings

PICES-2011 will be held in Khabarovsk, Russia. The Russian delegation confirmed that \$40,000 will be requested from PICES to partially cover meeting costs. The F&A Committee supported provision of this amount from the PICES budget. Potential meeting dates for PICES-2011 are either October 14–22 or October 7–15. Discussion on the feasibility of these two dates showed that there appeared to be no problems with either week. However, it was noted that Russia should attempt to provide notification to the Secretariat of the final dates by mid-November in order to facilitate preparation of meeting materials, advertisements, and planning of other international organizations such as ICES and NPAFC.

Japanese representatives presented the status of planning for PICES-2012. Hiroshima is the site presently under consideration and proposed dates are October 12–21, 2012, a return to the more traditional time frame of the Annual Meeting. Planning appears to be well underway for this meeting, and Japan will be asked next year about their needs with respect to additional funding from PICES that may be required in order to host the meeting. The Committee recommended that Council accept the offer of Japan to host PICES-2012 from October 12–21, 2012 in Hiroshima. The proposed theme of the meeting is "*Scientific challenge to the North Pacific ecosystem: Understanding and mitigation of the effects of natural and anthropogenic stress*" will be considered by Science Board.

The Committee recommended that, in keeping with the 6-year rotation cycle (Decision 1994/A/6), Council invite Canada to explore the possibility of hosting PICES-2013, and inform the Secretariat on this matter by March 31, 2011.

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)). It was agreed that the fees have to be collected by the Secretariat and used to support high priority projects and the Intern Program, and to cover costs associated with Annual Meetings; the allocation among these three purposes should be flexible and decided by the Executive Secretary (Decision 2004/A/5(iv)). The Committee reviewed 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 these for 2011.

Type of registration fee	2010 CDN \$
Regular	275
Early	200
Student	50
Spousal	50

There was some discussion about adding a 1-day registration fee or a non-attendee fee. The Committee does not recommend either of these two fees be instituted. Allowing a 1-day registration fee would: (1) not provide much savings to individuals attending the meetings, (2) fragment participation at meetings, and (3) possibly result in reduced registration fee revenue for the Organization. With respect to the non-attendee fee, some Contracting Parties noted that it would be difficult for scientists to obtain reimbursement from their institutions for such a fee.

At PICES-2005 (Vladivostok, Russia), Council re-iterated its support for the concept of inter-sessional Science Board (ISB) 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 2010.

Science Board has already indicated the importance of having an inter-sessional meeting in April 2011, in conjunction with the FUTURE workshop on “*Ecological indicators for ecosystem structure, function, resilience and vulnerability.*” The Committee supported this request and recommended that Council approve the 2-day inter-sessional Science Board meeting in conjunction with the workshop. United States indicated a willingness to host ISB-2011, with potential meeting location being Honolulu.

AGENDA ITEM 9

Financial issues related to the Pension Plan for PICES employees

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 this. It was recommended that additional employer contributions to the IFC Pension Plan in 2010 and beyond be made in advance in order to reduce future payments that will be required to remove the deficiency. The Committee also recommended that an additional lump sum employer contribution of \$20,000 to the IFC Pension Plan be made from the PICES 2011 budget to pay down unfunded liabilities.

The Committee also acknowledged that PICES will be required to pay any pension benefits accruing in excess of those that can be paid under the IFC Pension Plan because of Canadian Income Tax Act limitations. These benefits would become payable at the time of retirement and beyond of the individual working at the Secretariat.

AGENDA ITEM 10

Budget

Estimated accounts for FY 2010 (Agenda Item 10a)

The Committee reviewed the estimated accounts for FY 2010 and recommended their acceptance by Council, noting that the expenses for “foreign exchange loss” are only estimated at this time.

Interest and other income (Agenda Item 10b)

In FY 2009, the total income was \$552,456. This amount includes \$340,304 in voluntary contributions and grants (\$298,749 credited to the Working Capital Fund and \$41,555 credited to the Trust Fund). In FY 2010, the estimated total income is \$980,690. This amount includes \$799,985 in voluntary contributions and grants

(\$753,717 credited to the Working Capital Fund and \$46,268 credited to the Trust Fund). The amount of interest earned in 2010 continues to decline from previous years.

Relocation and Home Leave Fund (Agenda Item 10c)

At PICES-2007, Council approved the F&A Committee recommendation that the level of the Relocation and Home Leave Fund (RHLF) 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 \$92,746 on December 31, 2010, a transfer of approximately \$7,254 was recommended to restore the fund balance to the level of \$100,000 on January 1, 2011. This should provide sufficient funds to maintain the balance in the next two years, after home-leave expenses will be utilized in 2012.

Trust Fund (Agenda Item 10d)

In FY 2010, the total Trust Fund (TRF) income and expenses are estimated at \$46,300 and \$70,850, respectively. The Committee recommended that Council approve a transfer from the Working Capital Fund to recover the 2010 expenses and restore the Trust Fund to the level of \$110,000.

Japanese Trust Fund (Agenda Item 10e)

The Committee reviewed the financial report for *Year 3* (April 1, 2009 to March 31, 2010) of the project on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” supported by the voluntary contribution from the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan. This report was submitted to the Fisheries Agency of Japan on July 26, 2010, and the notice on report acceptance was received on July 29.

The status of the MAFF account, for the period from April 1 to December 31, 2009, was assessed during the regular PICES audit for FY 2009. In the auditor’s opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2009, and the results of its operations and changes in the fund balances are in accordance with the Canadian generally accepted accounting principles. The financial statements for the rest of *Year 3* of the MAFF project will be evaluated during the regular PICES audit for FY 2010.

Working Capital Fund (Agenda Item 10f)

After all approved inter-fund transfers, the amount of funds available in the Working Capital Fund (WCF) on January 1, 2010, was \$574,770. This includes \$376,168 in encumbered funds and \$198,602 in “reserve operating” funds. In FY 2010, the total WCF income and expenses are estimated at a level of \$924,038 (\$740,657 are in extra-budgetary contributions and grants) and \$792,749, respectively. After the recommended inter-fund transfers, the amount of funds available in WCF at the fiscal year end will be \$547,590. This includes \$352,844 in encumbered funds, and \$194,746 in “reserve operating” funds.

Budget for FY 2011 and forecast budget for FY 2012 (Agenda Item 10g)

The Committee reviewed the proposed FY 2011 budget of \$814,000 (*F&A Endnote 6*) and recommended its approval by Council. The Committee also recommended a transfer of \$116,800 from WCF to balance the budget, setting the total annual contribution at \$697,200, and the 2011 fees at \$116,200 per Contracting Party. These are a 1.5% higher than in FY 2010, and the increase rate was based on the increase in the annual Total Consumer Price Index (June/July indexes were used) reported by Statistics of Canada.

It was also noted that this is the third time in PICES history that the WCF transfer has reached the \$110,000 level, and this may continue if mandatory salary increases persist while annual fees remain constant.

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The Executive Secretary presented the forecast *FY* 2012 budget of \$830,000 and indicated that this budget is prepared based on preliminary information available as of August 1, 2010, and is approximately 2% higher than the *FY* 2011 budget.

AGENDA ITEM 11

U.S. proposal on new membership category in PICES

The Committee discussed the proposal regarding the new “corresponding” membership category in PICES and noted that the current Rules of Procedure do not prevent such membership. Therefore, the Committee does not recommend amendment of the Rules of Procedure to explicitly add this category of membership.

AGENDA ITEM 12

Changes in PICES Rules of Procedure

Proposed changes to the Rules of Procedure were provided with respect to a specific review period and a clause on the Chairmanship for Sections. The Committee reviewed the suggested amendments and recommended that Council approve the changes as proposed, with the exception of changing the time period for review and Co-Chairmen terms to be three years instead of the proposed five years (changes are shown in red in boxes below):

- Including a specific review period for a Section by the parent Scientific Committee [*Rule 13(iii)(d)*]

Section

(d) shall be responsible to and reviewed regularly (every three years) by the parent Scientific Committee.

- Adding a clause on the chairmanship for a Section [*Rule 17*]

For Sections, Co-Chairmen are selected from the membership by the Science Board for approval by the Council to serve for a term of three years, and shall be eligible for re-appointment;

AGENDA ITEM 13

Report on PICES Publication Program Action Plan

The Committee reviewed the progress on implementing the Action Plan for the PICES Publication Program and indicated the notable progress being made on the Plan, especially with respect to (1) PICES branding on the article level in special issues of primary journals, and (2) enhancing access to PICES publications by establishing agreements with professional indexers and by developing a PICES digital document library using geo-network software. The Committee looks forward to seeing further progress in the coming year.

AGENDA ITEM 14

Administrative matters

The Committee was pleased to note the progress reported on the status of negotiations regarding the possibility of obtaining an *ex gratia* grant to PICES equal to the amount of the provincial personal income taxes remitted.

AGENDA ITEM 15

Space, facilities and services for the PICES Secretariat office

PICES has the 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.

AGENDA ITEM 16

Appointment of F&A Committee Chairman

Ms. Livingston indicated her willingness to serve a second term as Committee Chairman, pending no other nominations. The Committee recommended that Council re-appoint Ms. Livingston to a second term of office as F&A Committee Chairman, to begin November 1, 2010.

AGENDA ITEM 17

Other business

The Committee discussed the intent of the Intern Program and reviewed the description of the Program. It was recommended that the first sentence in the introduction of the Program description be altered to read as follows: *“A PICES Intern Program will allow early career individuals from PICES member countries to gain experience in operations of intergovernmental scientific organizations and coordination of multidisciplinary international ecosystem research programs by working in the PICES Secretariat for periods of up to one year.”*

The Committee was informed of an issue that is of concern to the operation of the PICES Secretariat in the future. The terms of the Executive Secretary and Deputy Executive Secretary are now scheduled to end in the same year, 2014. Discussion is needed regarding how to ensure continued smooth operations of the Organization well in advance of this date. This may require the hiring of a replacement for the Executive Secretary in advance of this date in order to allow a sufficient training period. There are significant financial implications of such a decision.

AGENDA ITEM 18

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

The draft report was circulated and approved by all F&A Committee members. All recommendations were brought forward by Ms. Livingston at the first session of Council on October 30, 2010.

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F&A Endnote 1

F&A participation list

Canada

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

Japan

Taro Ichii (F&A member)
Yukimasa Ishida (advisor)

People's Republic of China

Yingren Li (alternate F&A member)

Republic of Korea

Chungmo Jung (advisor)
Hyun-Young Kim (advisor)

Chul Park (F&A member)

Russian Federation

Ekaterina Kurilova (advisor; October 27 only)
Vladimir Radchenko (advisor)
Igor Shevchenko (F&A member)

U.S.A.

Elizabeth J. Tirpak (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* 2009
4. Annual contributions
5. Fund-raising activities
6. Encumbered funds
7. Financing of PICES high priority activities
 - a. PICES integrative science program, FUTURE
 - b. North Pacific Ecosystem Status Report
 - c. Capacity building
8. Schedule, structure and financing of future Annual Meetings
9. Financial issues related to the Pension Plan for PICES employees
10. Budget
 - a. Estimated accounts for *FY* 2010
 - 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* 2011 and forecast budget estimates for *FY* 2012
11. U.S. proposal on a new membership category in PICES
12. Changes in PICES Rules of Procedure
13. Progress report on implementation of the PICES Publication Program Action Plan
14. Administrative matters
15. Space, facilities and services for the Secretariat office
16. Appointment of F&A Committee Chairman
17. Other business
 - a. Description of the Intern Program
 - b. Future of the PICES Secretariat
18. 2010 F&A Committee report and recommendations to Governing Council



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AUDITORS' REPORT

To the Council of the
North Pacific Marine Science Organization

We have audited the statement of financial position of the North Pacific Marine Science Organization as at December 31, 2009 and the statement of operations and changes in fund balances for the year then ended. These financial statements are the responsibility of the Organization's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by the Organization's management, as well as evaluating the overall financial statement presentation.

In our opinion, these financial statements present fairly, in all material respects. The financial position of the Organization as at December 31, 2009 and the results of its operations and changes in fund balances for the year then ended are in accordance with Canadian generally accepted accounting principles.

Flader Hale Hughesman

CHARTERED ACCOUNTANTS

Sidney, B.C.
May 12, 2010

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF FINANCIAL POSITION
AS AT DECEMBER 31, 2009**

ASSETS

	2009	2008
CURRENT ASSETS		
Cash and short term deposits (note 4)	\$ 1,271,519	\$ 1,109,880
Accounts receivable	46,182	7,034
Prepaid expenses	3,215	2,734
	\$ 1,320,916	\$ 1,119,648

LIABILITIES

CURRENT LIABILITIES

Accounts payable	\$ 119,426	\$ 38,899
Funds held for Contracting Parties (note 3)	229,000	229,000
	348,426	267,899

FUND BALANCES

WORKING CAPITAL FUND (note 4)	684,770	563,021
TRUST FUND	110,000	110,000
RELOCATION AND HOME LEAVE FUND	101,529	100,862
MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES FUND	76,191	77,866
	972,490	851,749
	\$ 1,320,916	\$ 1,119,648

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF OPERATIONS AND CHANGES IN FUND BALANCES
FOR THE YEAR ENDED DECEMBER 31, 2009**

	General Fund	Working Capital Fund	Trust Fund	Relocation and Home Leave Fund	Ministry of Agriculture, Forestry and Fisheries Fund	2009 Total	2008 Total
FUND BALANCES, beginning of year	\$ -	\$ 563,021	\$ 110,000	\$ 100,862	\$ 77,866	\$ 851,749	\$ 823,165
SOURCES OF FUNDS							
Contributions from Contracting Parties	687,000	8,525	-	-	-	695,525	657,475
Budgeted transfer to General Fund (note 5)	98,000	(98,000)	-	-	-	-	-
Voluntary contributions and grants (note 6)	-	298,749	41,555	-	187,505	527,809	374,169
Interest and other income (note 7)	-	210,758	727	667	255	212,407	329,171
Foreign exchange gain (note 10)	-	-	-	-	-	-	28,831
	785,000	420,032	42,282	667	187,760	1,435,741	1,389,646
FUND BALANCES, before expenditures	785,000	983,053	152,282	101,529	265,626	2,287,490	2,212,811
EXPENDITURES							
Personnel services	512,494	13,811	-	-	-	526,305	500,080
Annual Meeting	40,119	11,436	-	-	-	51,555	51,991
Special meetings/travel	117,628	9,976	37,135	-	-	164,739	191,910
Publications	61,110	4,521	-	-	-	65,631	54,489
Communication	30,000	3,289	-	-	-	33,289	25,927
Office and administration	18,705	-	-	-	-	18,705	18,206
Projects (note 8)	-	215,617	-	-	-	215,617	237,575
Intern program	-	-	30,587	-	-	30,587	30,998
Relocation	-	-	-	-	-	-	10,471
MAFF Fund expenditures (note 9)	-	-	-	-	189,435	189,435	239,415
Foreign exchange loss (note 10)	19,137	-	-	-	-	19,137	-
	799,193	258,650	67,722	-	189,435	1,315,000	1,361,062
NET FUNDS AVAILABLE	(14,193)	724,403	84,560	101,529	76,191	972,490	851,749
TRANSFER TO							
WORKING CAPITAL FUND (note 4)	14,193	(14,193)	-	-	-	-	-
INTERFUND TRANSFERS (note 5)	-	(25,440)	25,440	-	-	-	-
FUND BALANCES, end of year	\$ -	\$ 684,770	\$ 110,000	\$ 101,529	\$ 76,191	\$ 972,490	\$ 851,749

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2009

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 and are prepared in accordance with Canadian generally accepted accounting principles. 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 \$17,353 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, 2009

(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

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

(g) Use of Estimates

The preparation of financial statements in conformity with Canadian generally accepted accounting principles 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. FUNDS HELD FOR CONTRACTING PARTIES

The funds held for Contracting Parties are advance contributions from Japan in the amount of \$114,500 and U.S.A. in the amount of \$114,500.

4. WORKING CAPITAL FUND

Of the total amount in the Working Capital Fund, \$376,168 of cash and short term deposits is restricted for specific designated projects.

Pursuant to decision 09/A/3(ii) of the Governing Council, \$110,000 of the funds held in the Working Capital Fund will be transferred to the General Fund at the beginning of the 2010 fiscal year to balance the budget, setting the total annual contribution at \$687,000, and the 2010 annual fee at \$114,500 per Contracting Party.

In 2008 all Contracting Parties met their financial obligations, except the United States. The arrears payment of \$8,525 was received from the United States during 2009. This amount has been included in Contributions from Contracting Parties in the Working Capital Fund.

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

5. INTERFUND TRANSFERS

The Governing Council approved the transfer of \$98,000 at the beginning of 2009 from the Working Capital Fund to the General Fund (Decision 08/A/3/ii) to balance the budget, setting the total annual contribution at \$687,000, and the 2009 annual fee at \$114,500 per Contracting Party.

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2009**

5. INTERFUND TRANSFERS, continued

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 2009 (Decision 09/A/3/iii). The amount of the transfer was \$25,440.

6. VOLUNTARY CONTRIBUTIONS AND GRANTS

	Working Capital Fund	Trust Fund
Contributions for the 2010 Climate Forecasting Symposium:		
IPHC	\$ 6,491	\$ -
KORDI (Korea)	2,704	-
NOAA (U.S.A.)	57,545	-
NPAFC	6,000	-
NPRB (U.S.A.)	32,454	-
PSF (Canada)	5,000	-
Contributions for the North Pacific CPR Project		
DFO (Canada)	75,000	-
NPRB (U.S.A.)	37,640	-
Contributions for PICES 2010:		
Department of State (U.S.A.)	55,354	-
NMFS (U.S.A.)	20,561	-
Contributions for the Intern Program:		
DFO (Canada)	-	10,000
NMFS (U.S.A.)	-	15,816
TINRO (Russia) for the 2010 term	-	5,298
SCOR travel grant for 2009 Summer School and PICES 2009	-	10,441
	\$ 298,749	\$ 41,555

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2009

7. INTEREST AND OTHER INCOME

	Working Capital Fund	Trust Fund	Relocation and Home Leave Fund	Ministry of Agriculture, Forestry and Fisheries Fund
Interest income	\$ 4,972	\$ 344	\$ 667	\$ 255
Income tax levies	79,670	-	-	-
GST, PST & WCB rebates	6,948	-	-	-
Overhead from MAFF project	40,522	-	-	-
Registration Fees:				
PICES 2009	74,440	-	-	-
2010 Climate Change Symposium	4,206	-	-	-
Other income	-	383	-	-
	\$ 210,758	\$ 727	\$ 667	\$ 255

8. PROJECTS

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

	2009	2008
2008 Climate Change Symposium	\$ 16,681	\$ 197,013
2010 Climate Change Symposium	4,498	-
Development of FUTURE	30,515	24,337
North Pacific CPR Project	109,706	500
North Pacific Ecosystem Status Report	51,029	8,846
PICES 2010	3,188	-
Publications (2006 CCCC Symposium special issue)	-	6,879
	\$ 215,617	\$ 237,575

9. MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES FUND EXPENDITURES

	2009	2008
Special meetings	\$ 68,693	\$ 65,817
Contractual services	65,205	105,832
Equipment	14,915	49,108
Overhead to PICES	40,522	18,500
Miscellaneous	100	158
	\$ 189,435	\$ 239,415

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2009

10. FOREIGN EXCHANGE GAIN / LOSS

At year end all funds held in foreign currency (US \$152,641) 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 (2009 = 1.0466, 2008 = 1.2246), and not by the actual purchase or sale of any foreign currencies.

11. UNFUNDED PENSION LIABILITY

The Organization holds a pension plan for its employees with the International Fisheries Commissions Pension Society. An actuarial valuation report was prepared as at January 31, 2008 and showed an unfunded pension liability for PICES of \$208,000. This liability is being paid in monthly installments over a period of 15 years. The total amount payable in each of the next five years is \$25,200.

12. 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.

F&A Endnote 4

Payment schedule of annual contributions, 2005 to 2010¹

	<i>Canada</i>	<i>China</i>	<i>Japan</i>	<i>Korea</i>	<i>Russia</i>	<i>U.S.A.</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

¹ payments made later than the first quarter of the PICES fiscal year 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

F&A Endnote 5

External funding and voluntary contributions received since PICES-2009

For the period since PICES-2009, 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), contributed \$187,505 CAD for *Year 4* (to be completed by March 31, 2011) of the PICES project on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*”. The anticipated duration of the project is 5 years (from April 1, 2007 to March 31, 2012), with a total funding at the level of approximately \$900,000.
- The Canadian Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River requested PICES’ advice in the form of a technical report on “*Marine ecology of Fraser River sockeye salmon*” and approved a contract of \$100,275 CAD for the development of the report to be completed by the end of 2010.
- In October 2007, PICES initiated a funding consortium to support the North Pacific Continuous Plankton Recorder (NP CPR) program. For full advantage of the information available in the data, funding at the level of \$250,000 per year (direct funding or in-kind support) is required. The following organizations have currently committed their resources:
 - Fisheries and Oceans Canada (DFO) joined the consortium in 2008 and provided \$75,000 CAD for operations of the NP CPR project in 2008–2009 and \$50,000 CAD for 2009–2010. This support is intended to continue into the future at the level of \$50,000 per year.
 - The North Pacific Research Board (NPRB, U.S.A.) joined the consortium in 2009 and committed support for operations of the NP CPR program at the level of \$50,000 US per year for 5 years (project #903 from June 1, 2009 to May 31, 2010; and project #1001 from June 1, 2010 to May 31, 2014).
 - The *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) approved funding of \$188,600 US for operations of the NP CPR program in 2010–2013 (project on “*Measuring interannual variability in the herring’s forage base from the Gulf of Alaska*”), with the amount of \$56,800 US for 2010.
 - The Japanese Society for Promotion of Science (JSPS) provided a 5-year (2009–2013) grant equivalent to about \$400,000 US to analyze samples collected by the program for the western Pacific.
 - The Sir Alister Hardy Foundation for Ocean Science (SAHFOS, UK) covered salaries for a Principle Investigator (PI) and a technician for the NP CPR program in 2008 and 2009, to ensure that as much money as possible go into sampling. SAHFOS continued to cover the PI salary in 2010.

PICES integrative science program, FUTURE

- The Korea Ocean Research and Development Institute (KORDI) hosted and provided \$35,000 US for the inter-sessional FUTURE workshop held August 16–18, 2010, in Seoul, Korea.

Symposia/sessions/workshops

- The Fisheries Research Agency of Japan co-sponsored and hosted the 2010 inter-sessional Science Board meeting held April 23–24, in Sendai, Japan.
- The Food and Agriculture Organization of the United Nations (FAO) and the World Bank (WB) both increased their sponsorship to \$20,000 US (from initially committed \$10,000 US) for the PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” held April 26–29, 2010, in Sendai, Japan. The complete list of all organizations/agencies/institutions that provided financial support for this symposium is included below (funds marked by * were handled by PICES):
 - Australia’s National Climate Change Adaptation Research Facility’s Marine Biodiversity and Resources Network (NCCARF/MBRN) – \$3,656 CAD*
 - Fisheries and Oceans Canada (DFO) – \$20,000 CAD*
 - Fisheries Research Agency of Japan (JFA) – JPY 1,500,000
 - Food and Agriculture Organization of the United Nations (FAO) – \$20,000 US*
 - Hokkaido University Global Center of Excellence Program (HUGCOE) – JPY 1,500,000
 - International Council for the Exploration of the Sea (ICES) – 10,000 €+ publication in *IJMS*
 - International Pacific Halibut Commission (IPHC) – \$6,000 US* (paid in 2009)
 - Intergovernmental Oceanographic Commission of UNESCO (IOC) – \$7,500 US*
 - Korea Ocean Research and Development Institute (KORDI) – \$2,700 CAD* (paid in 2009)
 - National Institute of Environmental Studies of Japan (NIES) – \$7,000 US
 - National Marine Fisheries Service of NOAA (NMFS) – \$50,000 US* (paid in 2009)
 - North Pacific Anadromous Fish Commission (NPAFC) – \$6,000 CAD* (paid in 2009)
 - North Pacific Research Board (NPRB) – \$30,000 US* (paid in 2009)
 - Pacific Salmon Foundation (PSF) – \$5,000 CAD* (paid in 2009)
 - Scientific Committee on Oceanic Research (SCOR) – \$5,000 US*
 - Sendai Tourism and Convention Bureau (STCB) – US\$8,000
 - University of Hamburg Integrated Climate System Analysis and Prediction (CLiSAP) – 4,000 €
 - The World Bank (WB) – \$20,000 US*
- The PACIFICA Workshop on “*Carbon data synthesis II*” was supported by grants from the Ministry of Environment (Global Environment Research Fund) of Japan and the Japanese Society for the Promotion of Science, and hosted by JAMSTEC from June 2–3, 2010, in Tokyo, Japan.
- The U.S. Department of State provided \$60,000 US for the 2010 PICES Annual Meeting (PICES-2010) to be held October 22–31, 2010, in Portland, Oregon, U.S.A. [In 2009, the Department of State and National Marine Fisheries Service of NOAA provided \$51,000 US and \$50,000 US, respectively, for PICES-2010.]
- ICES (International Council for the Exploration of the Sea), IMBER (Integrated Marine Biogeochemistry and Ecosystem Research), CoML (Census of Marine Life), and SOLAS (Surface Ocean Low Atmosphere Study) accepted PICES’ invitation to co-sponsor relevant sessions/workshops at PICES-2010 by covering travel of additional invited speakers and/or convenors for these events.
- DFO (Fisheries and Oceans Canada), NMFS (National Marine Fisheries Service of NOAA, U.S.A.) and NPRB (North Pacific Research Board, U.S.A.) provided \$10,000 CAD, \$50,000 US and \$4,000 US, respectively, for the Fifth Zooplankton Production Symposium on “*Population connections, community dynamics, and climate variability*”, to be held March 14–18, 2011, in Pucon, Chile.
- NPRB (North Pacific Research Board, U.S.A.), ADFG (Alaska Department of Fish and Game, U.S.A.) and NPFMC (North Pacific Fisheries Management Council, U.S.A.) contributed \$30,000 US, \$5,000 US and \$7,500 US, respectively, for the Second ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ecosystems: Progress in observation and prediction*”, to be held May 22–26, 2011, in Seattle, U.S.A.

- The World Ocean Expo-2012 Organizing Committee committed 100,000,000 KRW for the Second PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*”, to be held May 14–18, 2012, in Yeosu, Korea, as one of the official events related to the World Ocean Expo-2012. The first payment of 50,000,000 KRW (\$44,549 CAD) was received in 2010.

Capacity building

- Several contributions were received/committed for the Trust Fund in support of the PICES Intern Program:
 - Pacific Research Institute of Fisheries and Oceanography (TINRO-Center), Russia – \$5,000 US;
 - Fisheries and Oceans Canada – \$10,000 CAD;
 - Ministry of Land, Transport, and Maritime Affairs, Korea – \$10,000 US;
 - National Marine Fisheries Service of NOAA, U.S.A. – \$15,000 US;
- 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 PICES-2010.
- The North Pacific Fishery Management Council (NPFMC, U.S.A) provided \$5,000 US to support participation of early career scientists from PICES Contracting Parties in PICES-2010.
- National Marine Fisheries Service of NOAA (U.S.A.) contributed \$50,000 US for the Second PICES/ICES Early Career Scientists Conference on “*Oceans of change*” to be held in spring 2012, in Spain.

Operations of the PICES Secretariat

- A 13% overhead (\$24,375 CAD) of the *Year 4* budget (\$187,505) for the PICES project on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” was retained to offset expenses related to the Secretariat’s involvement in the project.
- A 13% overhead for the Cohen Commission project (on the personal services category) will be retained by PICES to offset expenses related to the Secretariat’s involvement in the project.

F&A Endnote 6

Proposed FY 2011 budget

Sources for General Fund (GNF)		Amount
National contributions		697,200
Transfer from Working Capital Fund		116,800
Total		814,000

Category	GNF Allotment	WCF Allotments
Personnel Services	540,000	35,000 (benefits adjustments and additional contribution to the IFC Pension Plan)
Annual Meeting	40,000	registration fee revenue as needed/available
Special Meetings/Travel	116,000	encumbered funds as needed/available
Publications	55,000	
Communications	39,000	
Office/Administrative	24,000	encumbered funds as needed/available
Projects		
Total	814,000	

Guaranteed revenue	101,000
Net income tax levies	75,000
Overhead from MAFF project	21,500
Tax (GST, PST) rebate	3,000
Interest	1,500
Additional income	60,000
Registration fees for PICES-2011	60,000

REPORT OF THE 2010 INTER-SESSIONAL SCIENCE BOARD MEETING

The Science Board met on the first day from 9:00–6:00 pm on April 23, 2010 in Sendai, Japan, then again on April 24, 2010 from 9:00–5:30 pm to discuss any items not covered at the first meeting. Science Board Chairman, Dr. John Stein, welcomed new Advisory Panel members, Drs. Tom Therriault, Hiroaki Saito, and Mr. Robin Brown, Science Board members, and guests to the meeting (*see ISB Endnote 1*), and special recognition was given to Japanese colleagues present who organized the symposium and meeting. The agenda was discussed and it was agreed to add to Agenda Item 15 a Request for Advice from the Cohen Commission of Inquiry (Canada) into the Decline of Sockeye Salmon in the Fraser River which was received from the PICES Chairman shortly before the inter-sessional meeting. No changes were made to the agenda for Day 2. The agenda was then adopted as presented in *ISB Endnote 2*.

April 23, 2010

AGENDA ITEM 2

Status of planning for PICES-2010

Executive Secretary, Dr. Alexander Bychkov, apprised Science Board of the status of planning for the Annual Meeting in Portland, U.S.A. October 22–31, 2010. He complimented the convenors for having all invited speakers determined. The majority of speakers are from Japan and the U.S. and two are from outside of the PICES member countries. Other organizations (SOLAS, COML, IMBER, NPFMC and ICES) have agreed to co-sponsor topic sessions. Presenters will have an opportunity to have papers published in time for citation in the Intergovernmental Panel on Climate Change Assessment Report No. 5, scheduled for 2013. Deputy Executive Secretary, Dr. Skip McKinnell, will act as the corresponding editor who will contact the editor of Deep-Sea Research II to clarify the scope for submissions. POC Committee Chairman, Dr. Michael Foreman, will act as assistant editor. Any papers whose topics are beyond the interests of DSR II, such as those related to coastal themes, can consider submitting their work to other journals, such as Fishery Research or Continental Shelf Research.

Dr. Bychkov announced that the North Pacific Fishery Management Council has provided PICES with \$5,000 to use at its discretion for PICES-2010. He recommended that part of the money be used to provide full support for an invited speaker at the Science Board Symposium, with any remaining funds to be used for early career scientists to attend the Annual Meeting.

Action

- Secretariat to use NPFMC funds to support invited speaker/and early career scientists to attend PICES-2010.
- Dr. McKinnell to contact Deep-Sea Research editor to clarify scope of topics for publication.

AGENDA ITEM 3

Mid-year reports from Scientific and Technical Committees

Committee Chairmen presented their Committee reports on activities taking place since the 2009 Annual Meeting in Jeju, Korea (see the full Committee reports in this Annual Report). BIO will review the Advisory Panel on *Marine Birds and Mammals* whose second 5-year term is due to expire, and will make recommendations to Science Board at PICES-2010 whether or not to extend its lifetime. The term of Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22) will end at PICES-2010. It was noted that SOLAS has co-sponsored a number of iron workshops at PICES Annual Meetings and that it and GESAMP are both interested in collaborating with PICES on the topic of iron supply. BIO recommended not extending the Working Group for another term, although Science Board noted

ISB-2010

that some component of the group might be able to be re-constituted. There was a proposal for a new working group on jellyfish, whose formation was discussed at the Workshop on “*Standardizing methods for estimating jellyfish concentration and development of an international monitoring network*” at PICES-2009 in Jeju, Korea. The title of the proposed working group and terms of reference will be circulated to Science Board prior to PICES-2010. In the meantime, the Secretariat will look for co-chairmen from China, Korea and Japan. The Chinese representative on Science Board, Dr. Fangli Qiao, will discuss the China component with colleagues and make recommendations to BIO.

Since PICES-2009, Prof. Yasuzumi Fujimori (Japan) has replaced Prof. Masahide Kaeriyama as FIS member, and Dr. Jacquelyne King (Canada) has replaced Dr. Richard Beamish.

Science Board unanimously approved the appointment of Dr. Brett Dumbauld, supported by FIS and MEQ, to replace Dr. Kevin Amos who is stepping down as Co-Chairman of the Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24). Several MEQ members have expressed interest about the possible formation of a new PICES study group that will focus on anthropogenic contaminants in the North Pacific marine environment. MEQ will discuss the proposal and the issue of marine contaminants in further detail at PICES-2010 before making a recommendation. The Section on *Harmful Algal Blooms* was established in 2003 and it was recommended by Science Board that HAB-S undergo a review by MEQ to see if another term is warranted. The normal review period for a Section is every 5 years. The Coastal and Estuarine Research Federation (CERF) is currently engaged in strategic planning that includes the development of formal and informal relationships with international organizations that share scientific interests in shorelines and coastal zones. Due to the similar interests between MEQ and CERF, MEQ requested that PICES explore a working relationship with the Federation. Dr. Masaya Katoh, member of the Working Group on *Non-indigenous Aquatic Species* (WG 21) gave notice that he is stepping down due to other commitments, and will be replaced by Dr. Takeo Kurihara. He is willing to continue, unofficially, to offer his expertise to WG 21. When preparing a work plan for year 4 of the MNIS sub-project (funded by the Ministry of Agriculture, Forestry, and Fisheries (MAFF), Japan) that includes rapid assessment surveys in PICES member countries, Dr. Thomas Therriault, plans to incorporate Dr. Kurihara’s services.

Working Group on *Evaluations of Climate Change Projections* (WG 20) is in its final year, and will not be renewed for another term. The Section on *Carbon and Climate* completes its first 5-year term at PICES-2010. Anticipating a request from its Co-Chairmen with possible changes to its terms of reference, POC and BIO will probably recommend renewal of CC-S for another term.

MONITOR reported that the Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific* currently had funds to continue sampling in the short term, but further funding opportunities were limited.

TCODE has funding to purchase a multi-core computational computer to run models to be used in the Marine Ecosystem Model Inter-comparison Project (proposed at PICES-2007). The core modellers are seven PICES members from Canada, China, Japan and the U.S. who will run the same version of ROMS and the embedded lower trophic-level model on three test beds: the Newport Line and Seward Line off the U.S. coast and the A Line off Japan.

The second terms of BIO Committee Chairman, Dr. Michael Dagg, and POC Committee Chairman, Dr. Michael Foreman, expire after PICES-2010. Both have discussed the need for elections with their Committees at PICES-2010. Dr. Dagg stated that a Vice-Chairman position will be officially created, but until it is in place, he will unofficially act as one after his term. TCODE Chairman, Dr. Bernard Megrey, announced he would not stand for election for a second term. Election of a new chairman will be conducted before PICES-2010. MONITOR Chairman, Dr. Hiroya Sugisaki, informed Science Board that he was discussing elections with his Vice-Chairman, Dr. Phillip Mundy.

Science Board discussed two proposals made to it by U.S. delegate, Dr. George Boehlert. One was to examine a new membership category (Corresponding Member) for people who cannot attend PICES meetings, but can

contribute by correspondence. Science Board viewed the category as unnecessary and did not support the proposal. The second proposal called for Committee Chairmen to evaluate the contributions and performance of its members, annually. The majority of Science Board felt this would alienate members, and would not give a clear picture of why members did not attend or contribute. The Board felt this would put Chairmen in an awkward managerial role, rather than one of providing guidance to their members in science issues; Science Board did not support this proposal.

Decisions/Recommendations

- Complete reviews of expert groups, MBM-AP, HAB-S, and CC-S by PICES-2010.
- Appoint Dr. Brett Dumbald as Co-Chairman of WG 24.
- No support for proposals made by U.S. delegate.
- Add CERF to the standing list of international and regional organizations and programs with which PICES has relations.

Action

- Drs. Dagg (BIO), Rumrill (MEQ), and Foreman (POC) to review MBM-AP, HAB-S, and CC-S and have recommendations ready by PICES-2010.
- Dr. Fangli Qiao (China) to provide a name for co-chairmanship of proposed working group on jellyfish.
- Dr. Therriault (WG 21, AICE) to contact ex-WG 21 member, Dr. Takeo Kurihara for the next MNIS rapid assessment survey.
- Secretariat to invite CERF to attend PICES-2010 as an observer.

AGENDA ITEM 4

Report on Study Group on *Human Dimensions*

The Chairman of the Study Group on *Human Dimensions* (SG-HD), Dr. Mitsutaku Makino, was not able to attend the meeting but did provide a written update. China appointed its second member in April; one of Russia's appointed members has resigned, so an alternate will be appointed prior to SG-HD's first inter-session meeting from June 24–25, 2010. Science Board had no comments on revisions to the terms of reference that were proposed by Dr. Makino.

AGENDA ITEM 5

Status of proposed publications

Dr. Bychkov provided an update on the status of various PICES publications. A Korean translation of Special Publication 3 (Guide to Best Practices for Ocean CO₂ Measurements, 2007) is slated for publication in 2010, but there is no update on the Chinese version. The merits of paper or electronic copy for the Book of Abstracts for future PICES Annual Meetings were debated. There was no overwhelming preference for either form; the Secretariat will add a mandatory check box for electronic/hard copy preference on its website registration page for PICES-2010.

Action

- Mr. Gongke Tan to contact Dr. Liqi Chen on status of translation.
- Secretariat to include a check box field for Annual Meeting registrants to choose Book of Abstracts as electronic or hard copy.

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AGENDA ITEM 6

Status of proposed inter-sessional workshops/symposia

It was agreed to postpone the date for the Rapid Assessment Survey workshop of the Working Group on *Non-indigenous Aquatic Species* until Science Board had time to discuss the activities of the FUTURE Advisory Panels on Day 2 (April 24) of Science Board's meeting.

Science Board reviewed the list of invited speakers for potential travel support from PICES provided by IMBER for the second IMBER IMBIZO on "*Integrating biogeochemistry and ecosystems in a changing ocean: Regional comparisons*" from October 10–14, 2010, in Crete. Science Board agreed to support Drs. Jing Zhang (China), Shin-ichi Ito (Japan), and Chris Sabine (U.S.A.).

Science Board recommended Drs. James Christian and Keith Criddle to be SSC members for the second PICES/ICES/IOC Symposium on "*Effects of climate change on the world's oceans*" scheduled for May 14–18, 2012 in Yeosu, Korea.

The Secretariat agreed to provide organizational support for the second ESSAS Open Science Meeting on "*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*" scheduled from May 22–26, 2011 in Seattle, U.S.A.

Science Board supported the idea of co-sponsoring a GIS Europole Mer Workshop on "*Addressing the Model–Experiment Gap*" in 2011, as this would allow PICES to benefit from mesocosm experiments of MEECE and MESOAQUA. PICES is prepared to contribute a NEMURO/mesocosm expert(s), but requires more information from the proposal.

Decisions/Recommendations

- Drs. James Christian and Keith Criddle to be appointed members of SSC for the second PICES/ICES/IOC Symposium "*Effects of climate change on the world's oceans*"

Action

- Secretariat to contact Drs. James Christian and Keith Criddle to confirm willingness to act as SSC members.
- Secretariat to provide organizational support for the second ESSAS Open Science Meeting in Seattle.
- Dr. Megrey to contact GIS Europole Mer Workshop organizers to determine the level of participation they anticipate from PICES.

AGENDA ITEM 7

North Pacific Ecosystem Status report: Production and the future

Dr. Skip McKinnell, PICES Deputy Executive Secretary, and Co-Editor of the second North Pacific Ecosystem Status Report (NPESR), apprised Science Board on the progress of the chapters. Target date for going to press is June 2010, and the Secretariat anticipates printing 1,000 copies, but will print more if there is a need. Science Board congratulated the Co-Editors (Drs. McKinnell and Dagg) for their efforts and dedication, and asked if they would consider preparing a set of guidelines for editors/authors for future NPESRs.

Action

- Committee Chairmen to check with their Committees/subsidiary bodies to determine if there is a demand for additional NPESR copies.

AGENDA ITEM 8

Capacity building

A proposal from NOWPAP CEARAC (Northwest Pacific Action Plan of the Special Monitoring and Coastal Environmental Assessment Regional Activity Centre) for PICES to co-sponsor a summer school on remote sensing was discussed by Science Board. The event is planned for Vladivostok, Russia, in association with PICES-2011. It will differ from the Third PICES Summer School on *Satellite Oceanography*, held in Korea in 2009, in that it will focus on practical applications, such as red tide detection, oil spill monitoring, and eutrophication. It will aim at more international participation and a broader cross-section of participants. PICES supports the summer school concept and believes the cost for funding should be shared equally between PICES, NOWPAP, and WESTPAC.

At the request of IMBER, PICES agreed to co-sponsor their summer school on “*Oceans, marine ecosystems, and society facing climate change*” scheduled for August 23–27, 2010. PICES agreed to support one student from each member country. The Secretariat will approach delegates from Canada, Russia and Japan for contributions, and Science Board Chairman-elect, Dr. Sinjae Yoo, will approach the other member countries. PICES has \$10,000 for local expenses of two participants from each PICES member country. As yet, there are no nominations for students from Canada or Russia, although one Canadian has applied independently.

Decisions/Recommendations:

- to provide support for a PICES/NOWPAP/WESTPAC co-sponsored summer school on remote sensing in 2011

Action

- Secretariat to discuss with IOC and NOWPAP how to use the funds for supporting the summer school.
- Secretariat and Dr. Yoo to request funding for early career scientist support from PICES member countries.
- Mr. Robin Brown to contact University of Victoria Professor, Jay Cullen, about travel support for students.

AGENDA ITEM 9

Interactions with other organizations

Due to shared similar interests, guest observer, Dr. John Calder, representing SAON (Sustaining Arctic Observing Networks), participated at MONITOR’s meeting at PICES-2009 and MONITOR Chairman, Dr. Sugisaki, participated at the SAON meeting in March 2010. Science Board agreed that the relationship between the two groups will be potentially very fruitful, and agreed to a more formal association between MONITOR and SAON by recommending Dr. Calder to be an *ex-officio* member of MONITOR.

In a continuing relationship between SCOR and PICES, BIO Chairman, Dr. Dagg participated at the Third SCOR Project Summit (April 2009, Newark, U.S.A.) to discuss common opportunities and challenges regarding the interactions between large-scale international ocean research projects and the organizations that sponsor such projects. Several recommendations to provide additional opportunities for PICES to increase collaboration with SCOR came from the Summit:

- Consider adding the PICES list of cooperating agencies/organization to the PICES web page with links to each;
- Consider collaborating with SOLAS or IMBER on summer schools;
- Consider requiring that any large research project requesting PICES endorsement to have a Data Management policy in place beforehand;
- Consider requesting TCODE to review the Research Cruise Information System (www.pogo-oceancruises.org/) to assure that cruises in the PICES region are being incorporated into this database.

It was noted that, at the invitation of IMBER, PICES will co-sponsor a summer school on “*Oceans, marine ecosystems, and society facing climate change*” (LimECO2), from August 23–27, 2010 in Brest, France. Science Board agreed that the last two items were important topics to be considered by the TCODE Committee.

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The decision to establish a post-conference working group to consider the outcomes of the OceanObs09 conference was strongly supported by PICES at PICES-2009. At the recommendation of MONITOR, Science Board and Council nominated Dr. David Checkley (Scripps Institution, U.S.A.) to represent PICES on this working group. Since then Dr. Checkley, as member of the *Integrated Framework for Sustained Ocean Observations* Task Team (IFSS-TT), has participated in two teleconferences in which IFSS-TT has been charged with providing inputs on top-level governing conventions that need ocean observations, a draft outline for the framework, and a list of principles for the framework. Questions arising from the framework for Science Board discussion were:

- What do our sponsors (e.g., PICES) expect from the framework?
- Is there an inventory of observing system(s) for the sponsors?

Science Board agreed that PICES should play a co-ordinating role in this framework; MONITOR will prepare an inventory of PICES-related ocean observing systems.

Decisions/Recommendations

- Science Board recommends SAON member, Dr. John Calder, as *ex-officio* member of MONITOR.

Action

- Dr. Megrey to discuss Data Management policy and Research Cruise Information System items with his Committee and report outcome at PICES-2010.
- Dr. Stein/Mr. Brown to consult with Dr. Checkley and to prepare a short synopsis about the expectations of PICES regarding the framework for sustained ocean observations.

AGENDA ITEM 10

PICES Study Group on a Framework for Scientific Cooperation

Science Board reviewed the final terms of reference of the joint PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Science*, proposed at PICES-2009. Given the timeline options presented in the draft terms of reference, Science Board elected to have the Study Group proceed at a slower pace in view of the workload the PICES SG members were already committed to. The slower schedule would also allow the SG to act on the outcomes of the Study Group on *Updating the PICES Strategic Plan*. Science Board nominated Dr. Thomas Therriault (Chairman, AICE-AP) and Dr. Hiroaki Saito (Chairman, COVE-AP) to be members responsible for Fisheries and Aquaculture, and Climate, respectively.

Decisions/Recommendations

- Science Board nominates Drs. Therriault (AICE-AP) and Saito (COVE-AP) as members of PICES/ICES Study Group on a *Framework for Scientific Cooperation*.

AGENDA ITEM 11

Implementation of Science Board recommendations and Governing Council decisions

Science Board agreed that no changes were necessary to the implementation of Science Board recommendations and Council decisions from PICES-2009.

AGENDA ITEM 12

Wooster and POMA Awards

Science Board met *in camera* to discuss and select a recipient from two nominations for the 2010 Wooster Award and a recipient from four nominations (two rolled over from 2009) for the POMA. The recipient for each award will be announced on October 25 at the Opening Session of PICES-2010 in Portland, U.S.A. The

remaining nominations will be rolled over to the next year for consideration at the next inter-sessional Science Board meeting.

AGENDA ITEM 13

Status of PICES-2011

As requested by Science Board at PICES-2009, Dr. Dagg presented a revised description of the PICES-2011 theme, “*Mechanisms of marine ecosystem reorganization in the North Pacific Ocean*” for consideration. The theme was further edited for clarity at the meeting by Dr. Therriault. Dr. Bychkov informed Science Board that the Khabarovsk government appears to be well prepared to host the Annual Meeting; however, space for parallel sessions will be an issue. He will inspect the venue for space and logistics following the inter-sessional Science Board meeting.

AGENDA ITEM 14

Selection of PICES-2011 topic sessions

The Science Board Chairman reminded members to have suggestions for topic sessions for PICES-2011 ready for discussion for at PICES-2010.

AGENDA ITEM 15

Other business

A request for advice from Canada’s Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River (a judicial inquiry headed by Justice Bruce Cohen; see *IBS Endnote 3*) was tabled for discussion. The North Pacific Ecosystem Status Report, to be published this summer, has information on Pacific salmon and the state of their marine habitats already in place that could aid in the development of a report for the Cohen Commission. There was consensus that this request would provide PICES with an opportunity to offer its expertise and further enhance its profile among stakeholders. It also would play well in the development of FUTURE. Science Board supported the project and identified Dr. McKinnell to develop an outline of the report with the Cohen Commission and to recommend co-authors. He will communicate with Dr. David Levy, the Commission’s Fishery Consultant, to discuss the details of the requirement and the approach to developing the report. (For further discussion and decisions, see Day 2 FUTURE SSC Agenda Item 3.)

Decisions/Recommendations

- Science Board recommends that PICES accept the invitation to provide advice to Canada’s Cohen Commission and recommends that Dr. McKinnell lead the development of the report.

April 24, 2010

The second day of the inter-sessional Science Board meeting was devoted to matters of FUTURE. The agenda was adopted (*ISB Endnote 4*).

FUTURE SSC AGENDA ITEM 1

Overview of FUTURE Implementation Plan

Science Board Chairman, Dr. Stein, reviewed the FUTURE Implementation Plan, its research themes and objectives, and the organizational structure of FUTURE, composed of three Advisory Panels: AICE (FUTURE Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems*), COVE (FUTURE Advisory Panel on

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Climate, Oceanographic Variability and Ecosystems) and SOFE (FUTURE Advisory Panel on *Status, Outlooks Forecasts, and Engagement*).

FUTURE SSC AGENDA ITEM 2

Presentation and discussion of work plans for the FUTURE Advisory Panels

Chairmen of the FUTURE Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems* (AICE-AP; Dr. Therriault), *Climate, Oceanographic Variability and Ecosystems* (COVE; Dr. Saito) and *Status, Outlooks Forecasts, and Engagement* (SOFE; Mr. Robin Brown) presented their Panel's work plans to the Scientific Steering Committee for FUTURE (Science Board) for review and comments. It was decided that those expert groups whose terms are coming up for review are required to produce their reports and new work plans at least one month in advance of PICES Annual Meetings to ensure that their parent Committee(s) and the relevant FUTURE Advisory Panel have adequate time to review. The FUTURE SSC recommended that the FUTURE Advisory Panels initiate these reviews using existing mechanisms. Expert group Chairmen will be expected to attend the relevant FUTURE Advisory Panel meetings at the Annual Meeting in order to address any issues regarding their report before final submission at Committee meetings.

Regarding specific items on work plans, it was suggested that:

- AICE item 7 be revised from "Initiate reviews and synthesis of information to address FUTURE goals" to "Review progress on roles and make recommendations to address FUTURE goals";
- COVE item 7 be revised from "Review the progress of FUTURE sciences and update..." to "Review the progress of work plans and update...";
- COVE item 8 to be revised from "Support the SOFE activity of representing COVE-related FUTURE products" to "Initiate reviews and synthesis of information to address FUTURE goals."

The FUTURE SSC discussed the urgency of an outreach strategy for such timely publications as NPESR and the Cohen Commission advisory report. It was agreed that a way to ensure the impact of a PICES product, especially in countries where English is not the first language, PICES should publish a brochure and produce high-quality power point presentations targeted to managers and broader community. For NPESR, the FUTURE SSC agreed:

- on the preparation of a standard power point presentation and brochure,
- that each PICES member country (where relevant) would produce a translation (with SOFE to ensure quality control),
- to do outreach and provide feedback to SOFE for metrics on success,
- to purchase 1,000 copies of the report,
- that SOFE will seek translators, but will confirm first with the Secretariat,
- that SOFE will be responsible for extracting information from NSPER for the brochure.

The FUTURE SSC discussed the possibility of producing a 4-page leaflet similar in style to that made for the symposium on "*Climate change effects on fish and fisheries*" (Sendai, Japan from April 26–29, 2010) for PICES-2010.

Decisions/Recommendations

Science Board recommends production of a quality power point presentation and brochure as an outreach product to complement the publication of NPESR.

Action

- HAB-S, CC-S and MBM-AP to submit their reports and work plans to their Committees and relevant FUTURE Advisory Panels one month in advance of the PICES Annual Meeting.
- Secretariat to contact the chairmen of expert groups for their reports one month prior to the PICES Annual Meeting.

- SOFE-AP to identify members in PICES countries who will distribute brochures and make presentations to relevant parties, and determine how many copies of NPESR to order for distribution to relevant countries.
- Dr. McKinnell to provide the synthesis chapter of NPESR for SOFE-AP to extract information for a brochure.
- SOFE-AP members to discuss the merits of producing a leaflet for PICES-2010

FUTURE SSC AGENDA ITEM 3

Complete any business for the morning's agenda

From Day 1, Agenda 13 was revisited and Science Board accepted the revised theme for PICES-2011 (*ISB Endnote 5*). For Agenda 15, Science Board discussed the strategy for addressing the Cohen Commission's request for advice.

Authors of the report will be selected by Science Board, based on the recommendations of Dr. McKinnell. The initial content of the report and the questions it would address will be developed jointly by PICES and the Cohen Commission and submitted to Science Board for approval. The results contained in the draft report will be presented to Science Board at PICES-2010 prior to their release to the Cohen Commission, subject to approval by Governing Council. Science Board delegated the review process and selection of reviewers of the draft to SOFE-AP.

Decisions/Recommendations

- Revised theme for PICES-2011 was endorsed
- Science Board will identify a research and writing team to respond to the request for advice by the Cohen Commission. The list of co-authors and statement of work will be forwarded to Council for approval.

Action:

- Science Board to form a writing team based on recommendations of Dr. McKinnell.
- Dr. McKinnell to respond to the Cohen Commission accepting their invitation, to seek clarification on requirements of the report, and to produce a draft table of contents for the report jointly with the Cohen Commission, before seeking approval to proceed.

FUTURE SSC AGENDA ITEM 4

Process for final approval of Advisory Panel work plans

Science Board reviewed and agreed to the following steps of a proposal for FUTURE Advisory Panel work plans:

- Advisory Panels to complete the final draft of a work plan,
- Advisory Panels to submit the work plan to Science Board (FUTURE SSC) for approval,
- Science Board to review and approve by email,
- Distribute to Committees and post on the PICES website,
- Complete entire process by the mid-July.

FUTURE SSC AGENDA ITEM 5

Process for nominating and approving new expert groups in Committees

Science Board adopted a process to establish new expert groups:

- Proposals to establish new expert groups can be brought to the attention of Science Board from various sources including, but not limited to, the Scientific and Technical Committees and FUTURE Advisory Panels,
- Committees will review all proposals (of interest to their discipline) to establish new expert groups, to ascertain the nature of the relationship of the goals of the expert group with the goals of the FUTURE

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Scientific Program and/or to determine the relation of the goals of the expert group to the Action Plans of the Committee(s), before making a decision to recommend approval to Science Board.

FUTURE SSC AGENDA ITEM 6

Study Group on Updating the PICES Strategic Plan

The Chairman of PICES, Dr. Tokio Wada, described points to consider in preparing a work plan for updating the PICES Strategic Plan. They included the need for improved understanding of the effect of climate on ecosystem dynamics of the North Pacific Ocean, with a focus on impacts of anthropogenic origin, and the need to incorporate social science. He also drew attention to the Implementation Plan of FUTURE, increased capacity building to ensure recruitment of young scientists into the field of marine science, and the need to align the PICES Strategic Plan with other international organizations such as ICES.

Dr. Wada reviewed the terms of reference approved at PICES-2009 and requested selected people to take action on various items. In addition, he requested each Science Board member to submit their views of the PICES Strategic Plan to Dr. Stein.

A tentative schedule for completing the tasks is given:

- April 24 Assignment of tasks to SG-USP members
- May 31 Deadline for comments and recommendations on the tasks from the members
- July 15 Distribution of the 1st draft of the revised Strategic Plan to SG-USP members
- August 15 Deadline for comments and recommendations of the 1st draft
- Sept. 15 Distribution of the 2nd draft of the revised Strategic Plan to SG-USP members
- Sept. 30 Deadline for comments and recommendations of the second draft
- October 15 Circulation of the final draft of the revised Strategic Plan to SG-USP, Science Board and Council members for their consideration
- October 30 Submission of the revised Strategic Plan to Science Board and Council at PICES-2010 for their discussion and approval

Action:

- Dr. Stein to provide comments and recommendations on TOR#1 for the revision of the Strategic Plan, based on discussions at ISB-2010 and incorporate outcomes from discussion PICES/ICES SG on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*.
- Dr. Vera Alexander to provide comments and recommendations on TOR#2.
- All SG-USP members to prepare comments and recommendations on TOR#3, in addition to #1 and 2.
- Dr. Wada to prepare first draft of revised Strategic Plan.

FUTURE SSC AGENDA ITEM 7

Other business

Science Board discussed the need for the FUTURE Advisory Panels to meet in Korea before PICES-2010 to discuss their work plans and to coordinate them with FUTURE. There will be a separate, then joint meeting of the Advisory Panels and relevant Working Group chairmen will also be invited to attend. A Korean speaker will be invited for the science component. Meeting times: prior to WG 21's Rapid Assessment Survey workshop, July 19–21, or August 19–21 were viewed as the best windows for the meeting.

Action:

- Secretariat to prepare a preliminary message for FUTURE Advisory Panel Chairmen to send to members, discussing potential meeting times, venue and any travel support for participants.
- FUTURE Advisory Panel Chairmen to provide feedback by mid-May.

Dr. Stein thanked everyone for their participation and gave special thanks to Dr. Yukimasa Ishida, alternate delegate (Japan) for organizing and managing three events in Sendai (inter-sessional Science Board meeting, FUTURE SSC meeting and symposium on “*Climate change effects on fish and fisheries*”).

ISB-2010 Endnote 1

List of ISB-2010 participants

Members

Robin Brown (Chairman, SOFE-AP)
 Michael Dagg (Chairman, BIO)
 Michael Foreman (Chairman, POC)
 Bernard Megrey (Chairman, TCODE)
 Fangli Qiao (representative of China)
 Steven Rumrill (Chairman, MEQ)
 Hiroaki Saito (Chairman, COVE-AP)
 John Stein (Chairman, Science Board)
 Mikhail Stepanenko (Chairman, FIS)
 Hiroya Sugisaki (Chairman, MONITOR)
 Sinjae Yoo (Chairman-elect, Science Board;
 representative of Korea)
 Thomas Therriault (Chairman, AICE-AP)

Invited Guests

Tokio Wada (PICES Chairman)
 Taro Ichii (alternate delegate, Japan)
 Yukimasa Ishida (alternate delegate for Japan)
 Samuel Pooley (delegate for U.S.A.)
 Igor Shevchenko (alternate delegate for Russia)
 Gongke Tan (alternate delegate for China)

PICES Secretariat

Alexander Bychkov (Executive Secretary)
 Skip McKinnell (Deputy Executive Secretary)

ISB-2010 Endnote 2

ISB-2010 meeting agenda

1. Welcome and adoption of agenda
2. Status of planning for PICES-2010, Portland, OR, U.S.A.
3. Mid-year reports from Scientific and Technical Committees
4. Report on SG on Human Dimensions
5. Status of proposed publications
6. Status of proposed inter-sessional workshops/symposia
7. North Pacific Ecosystem Status Report: Production and the future
8. Capacity building
9. Interactions with other organizations
10. P/ICES Study Group on a Framework for Scientific Cooperation
11. Implementation of Science Board recommendations and Governing Council decisions from PICES-2009, Jeju
12. Wooster and POMA Awards
13. Status of PICES-2011, Russia theme and venue
14. Selection of PICES-2011 topic sessions
15. Other business

Request for Advice to PICES

Commission of Inquiry
into the Decline of
Sockeye Salmon in the Fraser River



Commission d'enquête
sur le déclin des populations
de saumon rouge du fleuve Fraser

April 15, 2010

Via email: mckinnell@pices.int and bychkov@pices.int

Dr. Alexander S. Bychkov
Executive Secretary
North Pacific Marine Science Organization (PICES)
P.O. Box 6000
Sidney, BC V8L 4B2

Dear Dr. Bychkov:

Re: Cohen Commission - Research

I understand that the North Pacific Marine Science Organization (PICES) is about to publish a comprehensive report on the status and recent trends of marine ecosystems in the North Pacific, and that the report will include an evaluation of Pacific salmon and state of their marine habitats. For the past three years, Canadian and United States fishing opportunities on the normally large sockeye salmon runs to the Fraser River have been virtually non-existent because of low abundance returning from the sea.

Considering the gravity of the situation, the Prime Minister of Canada established a judicial inquiry headed by Justice Bruce Cohen (formally the *Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River*). In December 2009, a "Think Tank" was convened by Simon Fraser University to consider the issue and it concluded that "*the weight of evidence suggests that the problem of reduced productivity [in 2009] occurred after the juvenile fish began their migration toward the sea.*" This suggests an oceanic cause.

Considering your organization's broad interests and expertise in climate variability, oceanography, and marine ecology, would PICES be interested in preparing a scientific report for the Commission on the status and trends of marine ecosystems where Fraser River sockeye are known to occur and on the potential effects of recent ecosystem

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www.cohencommission.ca

Canada

Commission of Inquiry
into the Decline of
Sockeye Salmon in the Fraser River



Commission d'enquête
sur le déclin des populations
de saumon rouge du fleuve Fraser

Page 2

variability on their survival, distribution, and migration? Special reference should be given to the ocean environment during the recent period of low survival of Fraser River sockeye salmon, especially during the period when the 2009 return was at sea. To the extent that the information is available, the nature and expectations for future ecosystem states will be an important consideration. Please note that no management advice or policy issues are to be considered in the report.

Dr. David Levy, the Commission's Consultant, Fisheries Research, will contact you to discuss the details of the requirement and the approach to developing the report, should your response be positive. The Commission is prepared to enter into a contract with PICES after the scope of the project is decided and necessary approvals are reached. We anticipate requiring the report from PICES by December 2010.

Yours sincerely,

Brian J. Wallace, Q.C.
Senior Commission Counsel

ISB-2010 Endnote 4

FUTURE SSC meeting agenda

1. Brief overview of FUTURE Implementation Plan
2. Presentation and discussion of work plans of the FUTURE Advisory Panels
 1. AICE (Therriault)
 2. COVE (Saito)
 3. SOFE (Brown)
3. Complete any business from the morning's agenda
4. Process for final approval of AP work plans
5. Process for nominating and approving new expert groups in Committees
6. Study Group on Updating the PICES Strategic Plan (SG-USP) – Alignment with FUTURE
7. Other business

ISB-2010 Endnote 5

Theme for PICES-2011 in Khabarovsk, Russia

Mechanisms of marine ecosystem reorganization in the North Pacific Ocean

Marine ecosystem variation often is attributed to natural or anthropogenic stressors, especially climatic or hydrological forcing. These studies typically show correlations among ecosystem characteristics and indices of global warming or climatic oscillations. Also, changes in biological communities often are described in terms of their correlative relationships to these large-scale indices. While these studies have produced interesting results, the underlying mechanisms responsible for ecosystem change have not been totally identified, especially when it comes to understanding how populations, communities, and ecosystems are reorganized, sometimes dramatically, over short time periods. Complexity, arising from varying influences of biotic and abiotic factors on multiple spatial and temporal scales, challenges our understanding of these processes. Because of our insufficient understanding of ecological mechanisms for oceanic regions, it is not unusual to find that what has happened in the past cannot adequately predict what will happen in the future. Thus, the focus of this Science Board symposium will be on describing mechanisms of ecosystem change and reorganization. The influence of factors operating at various temporal and spatial scales will be considered. This symposium will lead to a better understanding of factors that control species composition and ecosystem structure in the North Pacific Ocean, and improve our ability to predict system responses to future stressors, including climate change.

REPORT OF SCIENCE BOARD

Science Board met in Portland, USA on October 24, 2010 (from 12:30–15:00 h) to adopt the draft agenda and to discuss those items set for discussion at the luncheon meeting. Science Board Chairman, Dr. John Stein, welcomed invited observers, Drs. Emilie Brévière (SOLAS), Harald Loeng and Jürgen Alheit (ICES), Luis Valdés (IOC) and Science Board members to the meeting and called it to order (*SB Endnote 1*). The agenda item on “Report of the PICES/ICES SG on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*”, originally scheduled for discussion at the luncheon meeting, was postponed until the meeting on October 30 to permit more time for discourse and the addition of Agenda Item 9a, “Report on the SG on *Human Dimensions*” (*SB Endnote 2*). Science Board adjourned at 15:00 h and reconvened on October 30, 2010, meeting from 9:00–18:00 h.

October 24, 2010

AGENDA ITEM 2

Review of procedures for Science Board Symposium and Session awards, and Closing Session

Procedures and protocols for determining best presentations for the Science Board Symposium and Topic/Paper sessions sponsored by each Committee/FUTURE Advisory Panel were discussed. Each Committee was responsible for judging its own sponsored session/workshop for the best oral or poster presentation. For multiple-sponsored sessions/workshops, the Science Board Chairman assigned one of the co-sponsoring Committees or FUTURE Advisory Panels to be responsible. Assignments for judging were developed from what had been proposed in the Science Board briefing book. Each chairman was responsible for judging (or delegating to judges) the eligible presentations made at the sessions/workshops relevant to his Committee or FUTURE Advisory Panel. Science Board agreed that, should the pool of eligible oral and poster presentations be small, or not of sufficient quality, there was no obligation to select a presentation for an award.

AGENDA ITEM 3

Implementation of Science Board recommendations and Governing Council decisions from PICES-2009 and the 2010 inter-sessional Science Board meeting

Science Board reviewed previous recommendations and decisions from PICES-2009 and ISB-2010 meetings and noted that while Council had accepted all requests from Science Board, not all recommendations had been successful or completed. Potential reasons for failures were discussed and it was emphasized that Committees need to be clearer about the nature of their requests in future.

Action: Science Board will assess, during PICES-2010, the merits of having the Science Board Symposium begin on the first day and continue on the last day of the Annual Meeting.

Subsequently, at the Science Board meeting on October 31, there was general agreement that splitting the Science Board Symposium did not work well.

AGENDA ITEM 4

Relations with specific international programs/organizations

The Chairman invited the representatives from SOLAS, ICES and IOC to speak to Science Board on areas of potential collaboration with PICES. An invitation was made by Dr. Emilie Brévière, (Executive Officer, SOLAS) to co-sponsor the 5th SOLAS Summer School in Corsica, France in 2011.

SB-2010

Dr. Harald Loeng (representing ICES) presented a list of theme sessions for potential co-sponsorship by PICES, that will be convened at the ICES Annual Science Conference in Poland in 2011. Dr. Loeng also expressed a desire by ICES for closer collaboration with PICES on Arctic issues and on ocean–climate initiatives, notably through the establishment of a joint P/ICES expert group emerging from ICES’ Strategic Initiative on Climate Change and P/ICES WG on *Forecasting Climate Change Impacts on Fish and Shellfish*.

Dr. Valdés (Chief, Ocean Science Section, IOC) noted the close cooperation that IOC has with PICES through HAB-S, GOOS, and IOCCP and invited PICES to express any requests in these initiatives. He pledged IOC support for the 5th International PICES/ICES Zooplankton Production Symposium in Pucón, Chile, in March 2011 and for the 2nd PICES/ICES/IOC International Symposium on “*Effects of climate change on the world’s oceans*” in Yeosu, Korea in 2012. In turn, he welcomed PICES to participate in an IOC/UNESCO workshop on geoengineering, given the expertise of PICES in iron fertilization in the North Pacific, and to collaborate with IOC in research on pollutants (especially microplastics) in the marine environment. He also expressed the desire by IOC to be involved in northern hemisphere studies with PICES and ICES, noting the urgent necessity for an international framework of cooperation for both ocean research and governance in the Arctic. To continue close links between the two organizations, it was noted that *ex officio* status was in effect for some PICES expert groups and it was suggested that the same status for IOC’s International Oceanographic Data Exchange (IODE) be discussed at the TCODE Committee business meeting.

At the Science Board meeting on October 30, Science Board agreed to co-sponsor the SOLAS 5th International Summer School in Cargèse, Corsica, France in August 2011, a number of theme sessions at the ICES Annual Science Conference in Gdansk, Poland in September 2011 (see Agenda Item 12 for list), and to conduct 1-day workshop proposed by MEQ on “*Trends in marine contaminants and their effects in a changing ocean: Refining indicator approaches in support of coastal management*” at PICES-2011 (later, IOC agreed to co-sponsor this workshop).

AGENDA ITEM 5

Advisory report to the Cohen Commission

Deputy Executive Secretary, Dr. Skip McKinnell, reported that a draft of the PICES Advisory Report to the “*Commission of enquiry into the decline of Fraser River sockeye salmon*” was sent to the Science Board Chairman and Chairman-elect on September 15. After comments from peer reviewers were addressed, the report was endorsed by Science Board. The next step will be to seek Council approval to release the draft to the Cohen Commission by November 15 and the final report by December 15, 2010. Results of the report will be presented to the public in February 2011 (subsequently cancelled by the Cohen Commission) followed by a paper to be submitted to *Reviews in Fish Biology and Fisheries*.

Recommendation: Science Board recommends releasing the draft report to the Cohen Commission following approval by Council, by November 15, 2010 with a cover letter stating PICES is prepared only to correct errors and/or points of clarification that the Commission’s reviewers may find before the final report is submitted on December 15, 2010.

Saturday, October 30, 2010

AGENDA ITEM 6

Report of the PICES/ICES SG on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*

Science Board Chairman-elect, Dr. Sinjae Yoo, updated Science Board on the progress of the Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* (SG-SP). The objective of the Study Group is to develop a formal framework for cooperation between ICES and PICES

which will serve as a basis for the linkage of science plans and longer-term strategic planning. An informal Study Group meeting took place at the ICES ASC in Nantes, France in September 2010 during which a list of common interests between the two organizations, leading to potential areas of cooperation, was drawn up. Among these were climate change, and improved forecasting, ecosystem resilience and vulnerability, spatial planning, and ocean acidification. Also discussed was a method for developing a process in which PICES would have a chance to consider joint ICES/PICES theme session proposals for the ICES ASC at its ISB meeting in order for this information to be available in a timely manner for decisions to be made at the annual ICES SCICOM meeting. Another issue discussed was the merging of ICES Strategic Initiative on Climate Change (ending in December 2010) with the joint P/ICES WG on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS) into a new entity called the “ICES/PICES Strategic Initiative on Climate Change”. Science Board agreed that the TORs of this strategic initiative proposed by ICES were very broad and included many more aspects of climate change than PICES would be prepared to handle by its expert group. Another concern was the potential for the proposed strategic initiative to overlap with the initiatives of PICES’ FUTURE program. Due to the different structure and procedures of the two organizations, another challenge in aligning ICES and PICES lay with the different methods employed to run an expert group since the scopes of expert groups on each side do not match exactly. To reconcile these issues, the SG-SP will use ISB-2011 as an opportunity to meet.

Action:

- Provide an update on SG-SP report prior to ISB-2011 in time for discussion at the meeting;
- Circulate a draft of the proposed expert group, “ICES/PICES Strategic Initiative on Climate Change”, before ISB-2011 in time for discussion at the meeting.

AGENDA ITEM 7

Report of elections of Committee Chairmen

Changes or continuations in chairmanship are given in the following:

- Dr. Sinjae Yoo to replace Dr. John Stein as Science Board Chairman,
- Dr. Atsushi Tsuda to replace Dr. Michael Dagg as BIO Committee Chairman,
- Dr. Kyung-II Chang to replace Dr. Michael Foreman as POC Committee Chairman,
- Dr. Hiroya Sugisaki to serve a second term as MONITOR Technical Committee Chairman,
- Dr. Toru Suzuki to replace Dr. Bernard Megrey as TCODE Technical Committee Chairman,
- Dr. Dagg elected as BIO Committee Vice-Chairman,
- Dr. Foreman elected as POC Committee Vice-Chairman,
- Dr. Phillip Mundy elected as MONITOR Technical Committee Vice-Chairman,
- Dr. Hernan Garcia elected as TCODE Technical Committee Vice-Chairman.

Science Board expressed its appreciation to Dr. Suzuki for taking up the TCODE chairmanship and preparing for the Annual Meeting on short notice due to the sudden death of Dr. Bernard Megrey.

AGENDA ITEM 8

Election of Science Board Vice-Chairman

SOFE-Chairman, Mr. Robin Brown, nominated Dr. Thomas Therriault as Vice-Chairman of Science Board. Dr. Therriault accepted and was unanimously endorsed for the position by Science Board.

AGENDA ITEM 4 (CONTINUED)

Relations with specific international programs/organizations

Science Board discussed an idea that a newly established Regional Fisheries Management Organization (RFMO) in the North Pacific may request that PICES provide strategic scientific advice on North Pacific

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marine ecosystems. The formation of the RFMO is anticipated in response to the UN General Assembly's Resolution 61/105, paragraph 83 calling on RFMOs to protect vulnerable marine ecosystems from bottom fishing activities that would have a significant adverse impact on such ecosystems. Science Board felt it was in a good position to have an advisory role. However, since detailed information on RFMO is lacking, further decision on the engagement with RFMO is deferred until such information is provided.

North Pacific Anadromous Fish Commission (NPAFC) extended an invitation to PICES to co-sponsor an international workshop on the "*Production trends of pink and chum salmon*" (see Agenda Item 12).

Recommendations:

- Science Board is, in principle, prepared to serve as an advisor on strategic science matters to a new RFMO. However, any decision on a potential association with a new RFMO must wait until better information is available.
- Accept the invitation from NPAFC, subject to being granted a role in organizing the workshop.

AGENDA ITEM 9A

Report by Study Group on *Human Dimensions*

SG on *Human Dimensions* Chairman, Dr. Mitsutaka Makino, reviewed the progress the SG has made to date. He noted that all SG members participated and made positive contributions. The SG will produce a draft final report that will include recommendations by January 2011. Because the issue of human dimensions is important and relevant to FUTURE, especially SOFE-AP and a number of other PICES expert groups, the SG felt it was important to circulate the report to these groups for comments and suggestions. A revised draft final report will then be submitted to Science Board for review at ISB-2011, and the final report and recommendations will be presented at PICES-2011. Because of the revised timeline for making revisions and finalization, Science Board agreed to extend the Study Group's life by one year, which also would allow the establishment of a Working Group to coincide with potential funding from the next Japanese Trust Fund budget (2012–2016).

Recommendation: Extend the life of SG-HD by one year to allow for revisions and completion of the report and recommendations, and the establishment of a Working Group at PICES-2011.

AGENDA ITEM 10

Reports from FUTURE Advisory Panels and of the 2010 inter-sessional FUTURE workshop

Chairmen of the FUTURE Advisory Panels (Thomas Therriault, AICE; Hiroaki Saito, COVE; Robin Brown, SOFE) presented their reports to Science Board. The AP Chairmen and Science Board held their first FUTURE SSC meeting in April 2010 in Sendai, Japan, to review draft workplans of the APs and to clarify the process for revising terms of reference for existing expert groups and approving new expert groups to be in alignment with FUTURE's goals. The APs met again for an inter-sessional meeting in Seoul, Korea, August 16–18, 2010 to identify priorities and activities for the next two years and to discuss the means for existing and future expert groups to align their terms of reference with these priorities. At PICES-2010, the FUTURE APs held individual business meetings and then met jointly to discuss common goals and issues. Following the joint meeting, Dr. Therriault developed a survey that was distributed to Committee members to identify and prioritize stressors that could affect PICES ecosystems. The results of the survey will be presented at the proposed workshop on "*Indicators of status and change within the North Pacific marine ecosystems*" and will be used to help develop the terms of reference for the proposed Working Group on *Ecosystem Responses to Multiple Stressors* (see below). An outreach strategy for the second version of the North Pacific Ecosystem Status Report and Working Group 19 PICES Scientific Report on Ecosystem-based Management was discussed. A slide deck (power point presentation) and professional brochure for both products will be produced for a target audience of agencies/organizations dealing with management issues. To ensure high-

quality PICES reports, SOFE-AP was responsible for the peer-review of the Advisory Report to the “*Commission of enquiry into the decline of Fraser River sockeye salmon*”, slated to be released as a draft to the Cohen Commission mid-November. The AP also discussed the feasibility of holding a peer-review of PICES Scientific Reports.

Items of concern included how to strengthen the relationship between Science Board and the APs and how to establish a smoother means of communication between them; how to form joint sessions with Committees at Annual Meetings; and how to increase attendance in AP meetings having lower than expected turnout.

FUTURE APs proposed the establishment of a new Working Group on *Ecosystem Responses to Multiple Stressors*, and a 3-day FUTURE workshop on “*Indicators of status and change within the North Pacific marine ecosystems*” in conjunction with an inter-sessional Science Board meeting in 2011. They also supported proposals for new Working Groups on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences* (with minor changes to terms of reference) and *North Pacific Climate Variability and Change*.

Action:

- add AP Chairmen to Committee mailing lists or develop a forum for developing topic sessions on the PICES website;
- make all topic session proposals available to the APs at least two weeks in advance of the PICES Annual Meeting (partially formed proposals to be considered, but at a lower priority);
- continue to engage any non-responding AP members to attend FUTURE AP meetings at Annual Meetings and hold the meetings closer to the start of the Annual Meeting when most participants are expected to be present;

AGENDA ITEM 11

FUTURE SSC – Planning for ISB-2011

A proposal for a 3-day inter-sessional FUTURE workshop on “*Indicators of status and change within the North Pacific marine ecosystems*”, to be held in conjunction with the proposed ISB-2011, was supported by Science Board and FUTURE APs. It was felt that this workshop would provide valuable information for a proposed new expert group on multiple stressors. It was agreed that this would be an opportunity to extend an invitation to ICES to participate in the workshop to join forces with FUTURE in exploring this topic. Travel support was requested for three invited speakers to attend the workshop.

Recommendations:

- convene a 3-day Workshop on “*Indicators of status and change within the North Pacific marine ecosystems*”;
- support travel for 3 invited speakers to the Workshop;
- invite ICES to participate in the Workshop.

AGENDA ITEM 12

Summary of Science Board Recommendations to Governing Council

Proposed new expert groups

- Working Group on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences* (Parent Committee: BIO);
- Working Group on *Ecosystem Responses to Multiple Stressors* (Parent Committees: MEQ and BIO);
- Working Group on *North Pacific Climate Variability and Change* (Parent Committees: POC and MONITOR)

Inter-sessional symposia/sessions/workshops/meetings

Joint theme sessions at the ICES Annual Science Conference, September 19–23, 2011, Gdansk, Poland

- “*Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*”;
- “*Surplus production models: Quantitative tools to manage exploited fisheries and compare the productivity of marine ecosystems*” (recommended by the FIS Committee but not discussed at the Science Board meeting);
- “*Atlantic redfish and Pacific rockfish: comparing biology, ecology, assessment and management strategies for *Sebastes* spp.*” (recommended by the FIS Committee but not discussed at the Science Board meeting);
- “*Recruitment processes: Early life history dynamics – from eggs to juveniles*” (not discussed at the Science Board meeting);

Workshops/meetings

- FUTURE Workshop on “*Indicators of status and change within the North Pacific marine ecosystems*”, April 26–28, 2011, Honolulu, U.S.A.;
- Inter-sessional Science Board meeting, April 29–30, 2011, Honolulu, U.S.A.;
- Meeting of the PICES/ICES on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*, April 2011, Honolulu, U.S.A., in conjunction with ISB-2011;
- ICES/PICES Workshop on “*Reaction of northern hemisphere ecosystems to climate events (regime shifts): A comparison*”, May 2–6, 2011, Hamburg, Germany;
- ICES/PICES Workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*” at the second ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*”, May 22, 2011, Seattle, U.S.A.;
- 45th CMOS Congress: “*Ocean, atmosphere and the changing Pacific*”, June 5–9, 2011, Victoria, Canada;
- International Workshop on “*Development and application of regional climate models*”, October 11–12, 2011, Incheon, Korea;
- International Workshop on “*Climate and oceanic fisheries*”, October 3–5, 2011, Cook Islands;
- NPAFC-led workshop on “*Production trends of pink and chum salmon: Why can they retain high abundance?*”, October 30–31, 2011, Nanaimo, Canada.

Capacity building

- SOLAS 5th International Summer School, August 29–September 10, 2011, Corsica, France;
- NOWPAP/IOC-WESTPAC/PICES training course on “*Remote sensing data analysis*”, October 8–12, 2011, Vladivostok, Russia.

Priority items with funding implications

PICES-2011, October 14–22, 2011, Khabarovsk, Russia

- 2 US invited speakers for BIO’s 4th MEMIP workshop on quantitative model–model and model–data analysis and comparison of simulation results (later renamed as “*MEMIP-IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems—humble pie or glee?*”);
- 2 invited speakers for the CREAMS/PICES EAST 1 POC/MONITOR/TCODE workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5-years of CREAMS/PICES EAST-I Program*”, October 14–22, 2011, Khabarovsk, Russia;
- 1 convenor for the MEQ workshop on “*Incorporation of satellite remote sensing into monitoring of HABS*” (later renamed as “*Remote sensing techniques for HAB detection and monitoring*”; 1 convenor, subsequently changed to 1 invited speaker);
- 1 invited speaker for the MEQ workshop on “*Trends in marine contaminants and their effects in a changing ocean: Refining indicator approaches in support of coastal management*”;

Inter-sessional events

- 1 TCODE member to attend the 21st session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XXI), March 23–26, 2011, Liège, Belgium;
- 3 invited speakers for the FUTURE Workshop on “*Indicators of status and change within North Pacific marine ecosystems*”, April 26–28, 2011, Honolulu, U.S.A.;
- 2 Asian convenors for the International Workshop on “*Reaction of northern hemisphere ecosystems to climate events (regime shifts): A comparison*”, May 2–6, 2011, Hamburg, Germany;
- 1 PICES plenary speaker from Asia for the 45th CMOS Congress: “*Ocean, atmosphere and the changing Pacific*”, June 5–9, 2011, Victoria, Canada;
- 3 early career scientists from PICES member countries to attend the SOLAS 5th International Summer School, August 29–September 10, 2011, Cargèse, Corsica, France;
- 1 PICES convenor for the ICES/PICES session on “*Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*” at the ICES Annual Science Meeting, September 19–23, 2011, Gdansk, Poland;
- 1 PICES convenor for the ICES/PICES session on “*Atlantic redfish and Pacific rockfish: comparing biology, ecology, assessment and management strategies for *Sebastes* spp.*” at the ICES Annual Science Meeting, September 19–23, 2011, Gdansk, Poland;
- 1 PICES convenor for the ICES/PICES session on “*Recruitment processes: Early life history dynamics – from eggs to juveniles*” at the ICES Annual Science Meeting, September 19–23, 2011, Gdansk, Poland;
- 4 students or early career scientists to attend NOWPAP/IOC-WESTPAC/PICES training course on “*Remote sensing data analysis*”, October 8–12, 2011, Vladivostok, Russia (revised to 3 trainees and 1 lecturer by Governing Council);
- 2 invited speakers for an International Workshop on “*Development and application of regional climate models*”, October 11–12, 2011, Incheon, Korea;
- PICES SSC member for the NPAFC-led workshop on “*Production trends of pink and chum salmon: Why can they retain high abundance?*”, October 30–31, 2011, Nanaimo, Canada;
- 2 Asian scientists to attend Workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*” at the second ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*”, May 22, 2011, Seattle, U.S.A.;
- 4 Asian scientists (2 students or early career scientists) to attend the ESSAS Open Science Meeting, May 22–26, 2011, Seattle, U.S.A. (later revised to 2 Asian early career scientists by Governing Council);
- 1 PICES member to attend an International Workshop on “*Climate and oceanic fisheries*”, October 3–5, 2011, Cook Islands
- 1 MONITOR representative to attend the 2011 meeting of the ICES Working Group on *Operational Oceanographic Products for Fisheries and Environment* (WGOOFE) (dates and venue not known at this time) 2011;
- MONITOR representative to attend the 2011 meeting of the ICES Working Group on *Oceanic Hydrography* (dates and venue unknown at this time);
- 1 MONITOR representative to attend the 2011 meeting of the ICES Working Group on the *Northwest Atlantic Regional Sea* (WGNARS), (dates and venue not known at this time) 2011;
- MEQ representative to attend the 2011 meeting of ICES/IOC Working Group on *Harmful Algal Bloom Dynamics* (dates and venue unknown at this time);

Facilities

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

Publications

Special issues of primary journals (2011–2012)

- *Reviews in Fish Biology and Fisheries* (2011/12; Lead Author: S. McKinnell), review paper on “The decline of Fraser River sockeye salmon in relation to marine ecology”;

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- *ICES Journal of Marine Science* (2012; Guest Editors: J. Keister, C. Johnson, and D. Bonnet), special issue based on selected papers from the 2011 PICES/ICES Zooplankton Production Symposium on “*Population connections, community dynamics and climate variability*”;
- *Nature* (tentative) (2011; Coordinators: A. Hollowed, M. Barange, S. Kim and H. Leong). Synthesis paper from the PICES/ICES/FAO Symposium on “*Forecasting climate change impacts on fish and fisheries*”
- Journal TBD (2011; Lead authors: S. Minobe and E. Di Lorenzo). Review paper from PICES-2009 workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*”;
- *Aquaculture Economics and Management* (or *Aquaculture, Reviews in Aquaculture, or Fishery Research*) (2012; Guest Editors: TBD), selected papers for a special issue from the PICES-2010 Topic Session on “*Economic relation between marine aquaculture and wild capture fisheries*”;
- Journal TBD (2012; Guest Editors: TBD) selected papers from PICES-2011 Topic Session on “*Mechanisms of Physical-Biological Coupling Forcing Biological “Hotspots” in the Western North Pacific and Western North Atlantic*” (proposals for consideration in 2011);
- Journal TBD (2012; Guest Editors: TBD) selected papers from PICES-2011 Topic Session on “*Identification and characterization of environmental interactions of marine aquaculture in the North Pacific*” (proposals for consideration in 2011).

PICES Scientific Report series

- Final report of the POC Working Group on *Evaluations of Climate Change Projections* (WG 20) (Editors: M. Foreman and Y. Yamanaka);
- Final report of the BIO Working Group on *Iron supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22) (Editors: F. Chai and S. Takeda);
- Interim workshop report of Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS) (Editors: A. Hollowed, M. Barange, S. Kim and H. Leong);

Other publications

- PICES Advisory Report to the Cohen Commission on “*The decline of Fraser River sockeye salmon in relation to marine ecology*” as Cohen Commission Technical Report No. 1 (Lead author: S. McKinnell);
- Brochure and slide deck based on the second version of the North Pacific Ecosystem Status Report (PICES Special Publication No. 4, 2010)
- Brochure and slide deck based on final report of MEQ Working Group on *Ecosystem-based Management Science and its Application to the North Pacific* (WG 19) PICES Scientific Report No. 37, 2010);

AGENDA ITEM 13

Review of SG on *Restructuring of the PICES Annual Meeting* report

Based on the final report of SG on *Restructuring of the PICES Annual Meeting*, Science Board recommended:

- that workshops be held on the Friday before the Opening Session, in order to avoid distractions caused by running them concurrently with topic or paper sessions;
- scheduling FUTURE Advisory Panels to hold their individual meetings on Sunday morning prior to the Opening Session, to allow for chances of better participation, followed by a joint meeting in the afternoon in which Science Board (as SSC for FUTURE) would be invited to join;
- extending the Science Board meeting by ½ day on Friday afternoon after the Closing Session, in order to accommodate more business items that have arisen due to increased responsibilities;
- holding Science/Technical Committee overture meetings of up to 1½ hours at some time before normal business meetings to familiarize Committee members with the topics to be discussed;
- running up to four parallel sessions during the Annual Meeting (N.B. only three parallel sessions will be considered at PICES-2011 due to capacity of the venue).

AGENDA ITEM 14

PICES-2011, Khabarovsk, Russia, theme and description, draft schedule of scientific sessions and workshops

Science Board agreed, in principle, with the proposed theme for PICES-2011, “*Mechanisms of marine ecosystem reorganization in the North Pacific Ocean*”, to be held in Khabarovsk, Russia, from October 14–22, 2011 (SB Endnote 3). The following sessions and workshops, by order of Committee, were recommended to be convened.

¾-day Science Board Symposium

Mechanisms of marine ecosystem reorganization in the North Pacific Ocean

1-day BIO/POC Topic Session

Mechanisms of physical-biological coupling forcing biological “hotspots” in the western North Pacific and western North Atlantic (later renamed to “*Mechanisms of physical-biological coupling forcing biological “hotspots”*”)

1-day BIO Contributed Paper Session

1½-day BIO Workshop

Marine Ecosystem Inter-Comparison Project (MEMIP IV) (later renamed as “*MEMIP-IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems—humble pie or glee?*”)

½-day FIS Topic Session

Population dynamics, trophic interactions and management of cephalopods in the North Pacific ecosystems

1-day FIS/POC Topic Session

Recent changes of North Pacific climate and marine ecosystems: Implications for dynamics of the dominant species

1-day FIS Contributed Paper Session

½-day MEQ Topic Session

Harmful algal blooms in a changing world

½-day MEQ/FIS Topic Session

Identification and characterization of environmental interactions of marine aquaculture in the North Pacific

1-day MEQ/FUTURE Topic Session

Land-sea interactions and anthropogenic impacts on biological productivity of North Pacific Ocean coastal ecosystems

1-day MEQ Workshop (co-sponsored by NOWPAP)

Incorporation of satellite remote-sensing into monitoring of HABs (later renamed to “*Remote sensing techniques for HAB detection and monitoring*”)

1-day MEQ Workshop (co-sponsored by GESAMP and IOC)

Trends in marine contaminants and their effects in a changing ocean: Refining indicator approaches in support of coastal management (later renamed “*Pollutants in a changing ocean: Refining indicator approaches in support of coastal management*”)

½-day POC/FIS Topic Session (co-sponsored by ICES)

Linking migratory fish behavior to end-to-end models

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1-day POC Contributed Paper Session

1-day POC Workshop (reduced to ¾-day after the meeting)

Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES EAST-I Program

1-day MONITOR/POC/FUTURE Topic Session

How well do our models really work and what data do we need to check and improve them?

TCODE E-poster Session

Data and data systems for validation of numerical models

AGENDA ITEM 15

Selection of PICES-2012 Theme

Science Board agreed in principle with the theme of PICES-2012, entitled “*Scientific challenge to the North Pacific ecosystem: Understanding and mitigation of the effects of natural and anthropogenic stress*” to be held in Hiroshima, Japan October 12–21, 2012.

AGENDA ITEM 16

High priority activities

Science Board agreed to the proposal from SOLAS (presented at the Science Board meeting October 24) to support the travel for 3 early career scientists from PICES member countries to attend the SOLAS 5th International Summer School, August 29–September 10, 2011, in Cargèse, Corsica, France, as a capacity building activity.

Science Board also agreed to co-sponsor a NOWPAP/IOC-WESTPAC training course on “*Remote sensing data analysis*” by offering travel support for 4 students or early career scientists (later revised to 3 trainees and 1 lecturer by Governing Council) to attend October 8–12, 2011, in Vladivostok, Russia.

Science Board instructed the Advisory Panel for *CREAMS/PICES Program in East Asian Marginal Seas* (CREAMS-AP) to prepare a chapter not included in the published second version of the North Pacific Ecosystem Status Report (PICES Special Publication No. 4, 2010) by next Annual Meeting. It is expected that a review of the ecosystem status of the area focused on by this chapter will happen at the POC Workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5-years of CREAMS/PICES EAST-I Program*” to be held at PICES-2011.

AGENDA ITEM 17

Revision of the PICES Strategic Plan/Committee Action Plans

Little time was available to review and discuss the revision of the PICES Strategic Plan, so it was agreed to provide comments by e-mail to the Science Board Chairman for collation by January 1, 2011. This would allow time for Council to incorporate responses and prepare the Plan prior to the proposed 2011 inter-sessional Governing Council meeting.

AGENDA ITEM 18

Next inter-sessional Science Board meeting

Due to the increased responsibilities and number of business items to discuss, Science Board recommended holding an inter-sessional Science Board meeting in 2011, in conjunction with a 3-day FUTURE workshop on

“Indicators of status and change within North Pacific marine ecosystems”. The 1-day (tentative) Science Board meeting would be followed by a 1-day (tentative) FUTURE meeting. The United States agreed to host the meetings/workshop in Honolulu, U.S.A.

AGENDA ITEM 19

Other business

Recommendations:

- Science Board supports BIO and MEQ Committees’ recommendation to extend the Advisory Panel on *Marine Birds and Mammals* and Section on *Harmful Algal Blooms*, respectively, for one year in order for these expert groups to address a number of concerns by their parent Committees;
- Science Board gives full support to BIO and POC Committees’ strong recommendation to extend the Section on *Carbon and Climate* (CC-S) for another 5 years due to its extensive accomplishments and activities during its first term (due to changes in the PICES Rules of Procedures, the time until the next review has been revised to 3 years);
- recommended using CC-S’s five-year workplan as an example for the other two expert groups to note;
- recommended disbanding Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22) upon the completion of its three-year term in 2010;
- recommended disbanding Working Group on *Evaluations of Climate Change Projections* (WG 20) upon the completion of its three-year term in 2010.

SB Endnote 1

Science Board list of participants

Members

Robin Brown (SOFE)
 Michael Dagg (BIO)
 Michael Foreman (POC)
 Steve Rumrill (MEQ)
 Hiroaki Saito (COVE)
 John Stein (Chairman, Science Board)
 Mikhail Stepanenko (FIS)
 Hiroya Sugisaki (MONITOR)
 Toru Suzuki (TCODE)
 Thomas Therriault (AICE-AP)
 Sinjae Yoo (Chairman-elect, Science Board)
 Xuelei Zhang (alternate, China)

Observers

Jürgen Alheit (ICES)
 Emilie Brévière (SOLAS)
 Alexander Bychkov (PICES)
 Kyung-Il Chang (Chairman-elect, POC)
 Harald Loeng (ICES)
 Mitsutaka Makino (SG-HD)
 Skip McKinnell (PICES)
 Atsushi Tsuda (Chairman-elect, BIO)
 Luis Valdés (IOC)

SB Endnote 2

Science Board agenda

Sunday, October 24, 2010

1. Welcome and adoption of agenda
2. Review of procedures for Science Board Symposium and Session awards, and Closing Session
3. Implementation of Science Board recommendations and Governing Council decisions from PICES 2009 and the 2010 inter-sessional SB/GC meeting
4. Relations with specific international programs/organizations
5. Advisory Report to the “Commission of enquiry into the decline of Fraser River sockeye salmon”

Saturday, October 30, 2010

6. Report of the PICES/ICES SG on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science*
7. Report of elections of Committee Chairmen
8. Election of Science Board Vice-Chair
9. Relations with specific international programs/organizations (continued)
- 9a. Report by Study Group on *Human Dimensions*
10. Reports from FUTURE Advisory Panels and of the 2010 inter-sessional FUTURE Workshop
11. FUTURE SSC – Planning for ISB-2011
12. Recommendations for Part 1 - High Priority Items for SB Report to GC
13. Review of SG *Restructuring of the PICES Annual Meeting Report*
14. PICES-2011, Khabarovsk, Russia, theme and description, draft schedule of scientific sessions and workshops
15. Selection of PICES-2012 theme
16. High priority PICES activities
17. Revision of PICES Strategic Plan/Committee Action Plans – Align with FUTURE
18. Next inter-sessional Science Board meeting
19. Other business

SB Endnote 3

Theme for PICES-2011 (Khabarovsk, Russia)

Mechanisms of marine ecosystem reorganization in the North Pacific Ocean

Marine ecosystem variation often is attributed to natural or anthropogenic stressors, especially climatic or hydrological forcing. These studies typically show correlations among ecosystem characteristics and indices of global warming or climatic oscillations. Also, changes in biological communities often are described in terms of their correlative relationships to these large-scale indices. While these studies have produced interesting results, the underlying mechanisms responsible for ecosystem change have not been totally identified, especially when it comes to understanding how populations, communities, and ecosystems are reorganized, sometimes dramatically, over short time periods. Complexity, arising from varying influences of biotic and abiotic factors on multiple spatial and temporal scales, challenges our understanding of these processes. Because of our insufficient understanding of ecological mechanisms for oceanic regions, it is not unusual to find that what has happened in the past cannot adequately predict what will happen in the future. Thus, the focus of this Science Board Symposium will be on describing mechanisms of ecosystem change and reorganization. The influence of factors operating at various temporal and spatial scales will be considered. This symposium will lead to a better understanding of factors that control species composition and ecosystem structure in the North Pacific Ocean, and improve our ability to predict system responses to future stressors, including climate change.

REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

The Biological Oceanography Committee (BIO) held its meeting from 14:00–18:00 h on October 27, 2010 in Portland, U.S.A. The Chairman, Dr. Michael Dagg, 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

Reports from subsidiary bodies

Advisory Panel on Micronekton Sampling Inter-calibration Experiment (MIE-AP)

MIE-AP officially completed its tasks last year and submitted a Final Report in at PICES-2009 in Jeju, Korea, that was provisionally accepted, pending some minor revisions and additions. This report has been completed and was published in September 2010 as PICES Scientific Report Number 38. A brief review of MIE-AP activities was presented by Dr. Michael Seki.

Advisory Panel on Marine Birds and Mammals

MBM-AP is undergoing a 5-year review. A report (*BIO Endnote 3*) from Chairman, Dr. William Sydeman, was submitted to BIO on October 8 for Committee review. The report summarized activities conducted during the past 5 years including: annual business meetings; peer-reviewed publications; topic sessions; workshops; and outreach activities. BIO commented positively on these past activities and also noted that marine birds and mammals are vital and increasingly important components of PICES science. However, BIO was not supportive of the requested 5-year continuation for MBM-AP at this time. Concerns expressed included: (1) the proposed new directions were insufficiently developed to allow in-depth review by BIO; and (2) insufficient attention is given to linkages and integrations of MBM-AP activities with FUTURE. Also, (3) the proposed new Chairmen for the MBM-AP, Drs. Rolf Ream and Yutaka Watanuki, were not in attendance and therefore could not present their views and thoughts on the new directions for the MBM-AP. BIO recommends that the MBM-AP be given a 1-year extension to address these concerns, with final decision to be made at the next annual meeting of PICES in October 2011. In this regard, it was strongly suggested that the revised Terms of Reference and the proposed new directions be completed within 9 months and sent to the BIO Committee for review and possible further comment prior to the PICES Annual Meeting.

Section on Carbon and Climate (CC-S)

A CC-S report was submitted to BIO summarizing the past 5 years of activity and proposing new activities for the next 5 years (see *CC-S Endnotes 1, 3 and 4*). Highlights of this report were presented to BIO by one of the CC-S Co-Chairmen, Dr. James Christian. BIO commented positively on the extensive accomplishments and activities of CC-S and strongly endorsed its request for a 5-year continuation.

Working Group on Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean (WG 22)

WG 22, chaired by Drs. Fei Chai (U.S.A.) and Shigenobu Takeda (Japan) completed its activities at this Annual Meeting and plans to submit its final report in April 2011 (*WG 22 Endnote 4*). Its final business meeting report can be found elsewhere in the PICES 2010 Annual Report.

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 (U.S.A.) and Song Sun (China) has a 4-year term from 2007–2011. A written report of its activities during the current year was submitted to BIO on October 11 and the final business meeting report can be found elsewhere in the PICES 2010 Annual Report. A report was presented to the Committee by Dr. Peterson.

BIO-2010

Marine Ecosystem Inter-comparison Project (MEMIP)

A summary of the activities of MEMIP of the past year was provided to BIO on October 10, and a revised and expanded version, including a workplan for the next year, was presented to the Committee by Dr. Harold Batchelder (see *BIO Endnote 4*). BIO commented positively about the progress of MEMIP and fully endorsed its plan for the next year.

AGENDA ITEM 4

Updates on Symposia and meetings endorsed by BIO

- The 5th International Zooplankton Production Symposium on “*Population connections, community dynamics and climate variability*”, March 14–18, 2011, in Pucón, Chile. The BIO Chairman noted that the deadline for abstract submission has been extended until November 5, and referred all Committee members to the PICES web page for further information.
- The 2nd ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: progress in observation and prediction*” Seattle, U.S.A. in May 2011. Dr. George Hunt gave a short presentation about this meeting, distributed brochures, and referred the Committee members to the PICES web page for additional information.
- The 2nd International Symposium on “*Effects of climate changes on the World’s oceans*” will be held in Yeosu, Korea in May 2012. Dr. Sinjae Yoo gave a short update about this meeting, noting that a steering committee was recently formed, and that sessions will be finalized and a brochure prepared in January 2011.

AGENDA ITEM 5

Publications endorsed by BIO

Several important BIO-related publications were completed in the past year:

- Krill Biology and Ecology: Dedicated to Edward Brinton 1924–2010. (Guest Editors: S. Kawaguchi and W. Peterson) *Deep-Sea Research II*, 2010. Vol. 57, Issues 7–8, pp. 493–692.
- Ecosystem processes during the Oyashio spring bloom. (Guest Editors: A. Yamaguchi and C.B. Miller). *Deep-Sea Research II*, 2010, Vol. 27, Issues 17–18, pp. 1593–1742.
- SEEDS II: The Second Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study. (Guest Editors: M. Uematsu, M.L. Wells, A. Tsuda and H. Saito). *Deep-Sea Research II*, 2009. Vol. 56, Issue 26, pp. 2731–2958.
- PICES Special Publication 4. Marine Ecosystems of the North Pacific Ocean, 2003–2008. S.M. McKinnell and M.J. Dagg, (Eds.) 2010, 393 pp.
- PICES Scientific Report No 38. E. Pakhomov and O. Yamamura (Eds.) 2010. Report of the Advisory Panel on Micronekton Sampling Inter-calibration Experiment. 109 pp.

No new requests were proposed to the committee.

AGENDA ITEM 6

Topic sessions and workshops completed at PICES-2010

BIO

- S2: *Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean,*
- S3: *The Practical handbook at 50: A celebration of the life and career of Tim Parsons,*
- S4: *Census of Marine Life – Exploring ocean life: past, present and future,*

- BIO-P: BIO Paper session,
- W1: Marine ecosystem model inter-comparison (MEMIP) workshop.

Joint

- S6 (FIS/BIO): *Observations of ecosystem mixing under climate change,*
- S8 (FIS/POC/BIO): *Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting,*
- S13 (POC/BIO/MONITOR): *Comparing the two major gyres of the subarctic North Pacific – Seasonal and interannual variability and its predictability,*
- W5 (POC/BIO): Carbon Data Synthesis Workshop.

No oral reports were given to the Committee. Written reports will be submitted by the convenors of each session and workshop. Requests for written reports were sent by email to the convenors of all BIO sessions and workshops. These will be sent separately to the PICES Secretariat.

AGENDA ITEM 7

Proposed new working groups

(a.) A working group on “Jellyfish blooms around the North Pacific Rim: Causes and Consequences”

This WG was extensively discussed one year ago at the PICES Annual Meeting in Jeju, Korea, and has now been formally proposed to BIO. Background information and Terms of Reference were circulated to all three FUTURE-Advisory Panels for their input prior to the meeting, and ToRs have been slightly modified in response to the provided feedback (see *BIO Endnote 5*). AICE-AP and SOFE-AP are supportive of this working group. COVE-AP recognized the importance of this topic but notes it is more of a coastal and social issue than an open ocean one. A presentation describing this working group was given to BIO by Dr. Ric Brodeur. BIO strongly supports the formation of this proposed working group.

(b.) A working group on “Ecosystem Responses to Multiple Stressors”

This working group was proposed by COVE-AP to sponsoring committees MEQ and BIO. BIO recognized that this working group is not as fully developed as it should be for approval but BIO is supportive because it is desirable to get FUTURE activity moving forward as quickly as possible. BIO endorses the formation of this working group.

AGENDA ITEM 8

Proposed inter-sessional workshop

A presentation was given to BIO by Dr. Thomas Therriault, Chairman of AICE-AP, requesting BIO endorsement of a workshop titled “*Indicators of status and change within North Pacific marine ecosystems: A FUTURE workshop*”. For further details, see *BIO Endnote 6*. BIO supports this workshop.

AGENDA ITEM 9

Proposed workshop and Topic Sessions at PICES-2011

BIO supports the following workshop and sessions at PICES-2011:

- a 1½-day MEMIP 4 workshop (see *BIO Endnote 4*);
- a 1-day BIO Paper Session (*BIO Endnote 7*);

Three additional proposed sessions for BIO co-sponsorship were brought to BIO during the annual meeting:

BIO-2010

- a 1-day BIO/POC Topic Session on “*Mechanisms of physical-biological coupling forcing biological “hotspots” in the Western North Pacific and Western North Atlantic* [later shortened to “*Mechanisms of physical-biological coupling forcing biological “hotspots”*”] (*BIO Endnote 8*). Dr. Sydeman gave a brief presentation of this late request. BIO supports this topic session.
- a 1-day MONITOR/POC/BIO workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES East-I program*”. A paper copy of this late request was provided to BIO at the Committee meeting but no presentation was made. BIO will defer to MONITOR and POC on this issue.
- a 1-day FIS/BIO Topic Session on “*The impacts of hypoxia on the mesopelagic micronekton and its implications for marine food webs*”. No presentation was made to BIO regarding this late request. BIO (incorrectly) interpreted this proposal to be mainly focused on the east side of the Pacific and considered this theme too narrow. This session was not endorsed by BIO but if FIS is strongly supportive and there is space, BIO would consider co-sponsorship.

AGENDA ITEM 10

Additional financial requests

In addition to the financial requests associated with proposed workshops, a letter was received requesting support for the ESSAS meeting in Seattle in May 2011 (see *BIO Endnote 9*). BIO supports this request.

AGENDA ITEM 11

North Pacific Ecosystem Status Report II

This report (Marine Ecosystems of the North Pacific Ocean, 2003–2008) is published (PICES Special Publication 4, McKinnell, S.M. and Dagg, M.J. (Eds.) 2010, 393 pp.) and a copy was provided to all meeting participants. The BIO Chairman encouraged Committee members to provide comments to the Chairman of the SOFE-AP (Robin Brown), and especially to provide suggestions for formats and mechanisms for synthesizing and presenting future status and trends within the North Pacific.

AGENDA ITEM 12

Elections

The PICES Executive Secretary, Dr. Alexander Bychkov, led the election of a new BIO Chairman. Dr. Atsushi Tsuda was elected for a 3-year term. Dr. Tsuda requested that a Vice-Chair be elected. Previously, BIO did not have a Vice-Chairman but to provide efficient continuity in Committee activities, Dr. Michael Dagg, previous BIO Chairman, was elected to serve as Vice-Chairman.

AGENDA ITEM 13

Other items

A survey developed by the FUTURE Advisory Panels was circulated to Committee members and completed. The purpose of this short survey was to assist the FUTURE APs in setting priorities for their activities in the next few years.

AGENDA ITEM 14

Adjourn

The meeting was adjourned at 18:00 hr.

BIO Endnote 1

BIO participation list

Members

Michael Dagg (U.S.A., Chairman)
 Young-Shil Kang (Korea)
 Alexei Orlov (Russia)
 Angelica Peña (Canada)
 William Peterson (U.S.A.)
 Vladimir Radchenko (Russia)
 Hiroaki Saito (Japan)
 Michael Seki (U.S.A.)
 Atsushi Tsuda (Japan)
 Atsushi Yamaguchi (Japan)
 Sinjae Yoo (Korea)

Observers

Harold Batchelder (U.S.A.)
 Ric Brodeur (U.S.A.)
 James Christian (Canada)
 Joaquim Goes (U.S.A.)
 George Hunt (ESSAS)
 Stewart Johnson (Canada)
 Hidehiro Kato (Japan)
 Dahe Eerkes-Medano (U.S.A.)
 Josiane Mélançon (Canada)
 William Sydeman (U.S.A.)
 Tom Wainwright (U.S.A.)

BIO Endnote 2

BIO meeting agenda

1. Welcome, introductions
2. Meeting agenda
3. Reports from subsidiary bodies
4. Updates on Symposia and meetings endorsed by BIO
5. Publications endorsed by BIO
6. Topic sessions and workshops completed at PICES-2010
7. Proposed new working groups
8. Proposed inter-sessional workshop
9. Proposed workshop and Topic Sessions for the 2011 PICES Annual Meeting in Khabarovsk, Russia
10. Additional financial requests
11. North Pacific Ecosystem Status Report II
12. Elections
13. Other items
14. Adjourn

BIO Endnote 3

**Activities, accomplishments, and future of the
Advisory Panel on Marine Birds and Mammals (MBM-AP)**

A report to the Biological Oceanography (BIO) Committee
Prepared by Dr. William J. Sydeman, Co-Chairman; wsydeman@comcast.net
October 8, 2010

I. REVIEW OF APMBM ACTIVITIES AND ACCOMPLISHMENTS, 2005–2009

A. Business meetings of MBM-AP

27 October 2009, Jeju, Korea.
26 October 2008, Dalian, China
30 October 2007, Victoria, Canada
13 October 2006, Yokohama, Japan
5 October 2005, Vladivostok, Russia

All business meetings were attended and chaired by Drs. William Sydeman and Hidehiro Kato. Reports for each business meeting were prepared and archived with the PICES Secretariat. Reports through to 2007 are posted on the PICES website.

B. Peer-reviewed publications in the primary literature

1. *Marine Ecology Progress Series*, Theme Section. *Marine ecosystems, climate and phenology: Impacts on top predators* (Coordinator and Guest Editor: William J. Sydeman). **2009**. Volume 393, pp. 185–301. This peer-reviewed theme section in *MEPS* resulted from a Topic Session held at the 2007 PICES Annual Meeting in Victoria, Canada. The original Topic Session was entitled “*Phenology and climate change in the North Pacific: implications of variability in the timing of zooplankton production to fish, seabirds, marine mammals, and fisheries (humans)*”.
2. *Deep-Sea Research II, Special Volume. Top predator “hot spots” in the North Pacific* (Guest Editors: William J. Sydeman, Richard D. Brodeur, Alexander S. Bychkov, Churchill B. Grimes, Stewart M. McKinnell). **2006**. Volume 53, pp. 247–449. This peer-reviewed special volume in *DSR II* resulted from a Topic Session held at the 2004 PICES Annual Meeting in Honolulu, U.S.A. The original Topic Session was entitled “*Hot spots and their use by migratory species and top predators in the North Pacific*”.

C. Topic Sessions organized at PICES Annual Meetings by MBM-AP

1. Integration of marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in North Pacific and North Atlantic. **2009**.
2. Phenology and climate change in the North Pacific: implications of variability in the timing of zooplankton production to fish, seabirds, marine mammals, and fisheries (humans). **2007**.
3. Factors affecting the distribution and abundance of top predators in the Sea of Okhotsk and western North Pacific. **2005**.

D. Workshops organized at PICES Annual Meetings by MBM-AP

1. Integration of marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in North Pacific and North Atlantic. **2009**. Joint PICES/ICES workshop.
2. Responses of marine mammals and seabirds to large-scale and long-term climate change: Mechanisms of environmental forcing. **2006**. Sponsored by Hokkaido University Center of Excellence.

E. Outreach of MBM-AP

MBM-AP Co-Chair, Dr. Kato, has served as the PICES representative to the International Whaling Commission (IWC) for the past 5 years. In this capacity, Dr. Kato has attended IWC meetings and represented PICES interests during these proceedings.

II. FUTURE OF MBM-AP

A. Continuation of MBM-AP

- Action Item: MBM-AP provides unique information and perspective to the PICES community. MBM-AP has been scientifically and organizationally productive, including publication of 2 special volumes in the primary literature, and hosting 3 topic sessions and 2 workshops at PICES Annual Meetings over the past 5 years. Marine birds and mammals are not explicitly considered by any program or standing committee of the PICES community, yet can and should play an important role in PICES's new integrative scientific program, FUTURE. Therefore, MBM-AP strongly recommends that BIO and Science Board consider continuation of the AP for another 5-year period.

B. Leadership of MBM-AP

- Action Item: Co-Chairs Drs. Sydeman and Kato have been overseeing the activities of MBM-AP for 7+ years. Dr. Sydeman is a seabird specialist from the U.S.A., while Dr. Kato is a marine mammal specialist from Japan. New leadership of the AP is required. The AP nominates current members Dr. Yutaka Watanuki (seabirds, Japan) and Dr. Rolf Ream (mammals, U.S.A.) as new co-chairs for the AP. Dr. Douglas Bertram (Canada) has also expressed interest in serving on MBM-AP, and potentially as a chairperson.

C. Terms of Reference

The Terms of Reference (TOR) for MBM-AP are as follows:

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 in assessing the roles of marine mammals and seabirds in marine ecosystems;
 3. Assemble relevant information on the biology of marine mammals and seabirds and disseminate it to the PICES community through scientific reports and symposia;
 4. Develop strategies to improve collaborative, interdisciplinary research with marine mammal and seabird researchers and the PICES scientific community.
- Action Item: These TOR were revised in 2008. MBM-AP feels these TOR properly reflect the goals of the AP, and do not require further modification.

D. Integration of MBM-AP with FUTURE

The stated goals of FUTURE are to:

- (i) promote and increase understanding of climate change and anthropogenic impacts on marine ecosystems in the PICES region,
- (ii) enhance forecasting capabilities of future ecosystem change, and
- (iii) enhance communications with society.

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- Action Item: MBM-AP reiterates its primary mission is to provide advice to the PICES community about the role of marine birds and mammals in North Pacific marine ecosystems, and secondly to ensure that seabirds and marine mammals are included in PICES-related ecosystem research and communications, including FUTURE. At its last meeting in Jeju, Korea, the AP discussed that many long-term datasets on marine birds and mammals could and should be used in analyses (e.g., PICES Ecosystem Status Reports) and models of marine ecosystem change. Multi-decadal information on abundance, population variability, diet, prey consumption, and demographic attributes are available from numerous sites in the North Pacific for analysis. Marine birds and mammals are also excellent indicators of marine ecosystem structure and functions and could be used in this capacity. Changes in bird and mammal populations will also have an impact on the ocean as these predators consume large quantities of prey and may exert “top-down” control of food webs. MBM-AP seeks support from BIO and Science Board to continue efforts to coordinate and integrate marine bird and mammal datasets, contribute to PICES ESR and similar, and investigate the use of seabirds and marine mammals as indicators of ecosystem change in the North Pacific.

E. Issues facing MBM-AP

- Action Item: There has been excellent participation in APMBM over the years from the USA, Canada, and Japan. Korea and Russia have regularly provided delegates, but personnel have often changed. China has not provided delegates. APMBM requests that BIO encourage participation of all member nations in APMBM.

BIO Endnote 4

Marine Ecosystem Model Inter-Comparison Project

Bernard A. Megrey (U.S.A.), Harold (Hal) Batchelder (U.S.A.), Shin-ichi Ito (Japan) and Guimei Liu (China)

Summary provided by H. Batchelder

updated October 25, 2010

At PICES-2009 (Jeju, Korea) the PICES Marine Ecosystem Model Inter-comparison Project (MEMIP) Working Group met to discuss future activities. Several “active team” members for this project agreed to provide data and/or model configurations inter-sessionally (before PICES-2010) so that a workshop that was approved by Science Board for PICES-2010 could make substantial progress in comparing different ecosystem model configurations embedded in ROMS-2D sections in several locations of the North Pacific. Sections targeted for the 2010 workshop are those extending offshore of (1) Newport, OR [Newport], (2) Seward, AK [Seward], and (3) Northern Japan [A-Line]. All three lines have been sampled extensively for multiple components of the ecosystems in recent decades, and particularly in the early 2000s. The agenda of the PICES-2010 workshop is included below as Addendum 1.

Bernard Megrey arranged for MEMIP to conduct these simulations on a recently purchased computing cluster at the Alaska Fisheries Science Center (AFSC). Team members were provided login accounts. An IT technician at AFSC, John Miller, was very helpful in installing software and libraries on the system that is needed for compiling the Regional Ocean Modeling System (ROMS) code. One software code of value to the team, Matlab, is not available on the MEMIP server. Alternative public domain (free) alternatives are unsatisfactory. This means that model results will need to be transferred from the MEMIP computer to other machines at the workshop for plotting simulation results and comparisons with data sets.

Significant inter-sessional progress was made to allow model intercomparisons within well defined (and constant across simulations) physical simulations for two locations: Newport and Seward. In mid-summer, the Newport 2D domain was compiled and run in test mode and evaluated by Yvette Spitz (USA) of the active team. The code produced simulations that agreed with simulations done by Dr. Spitz on other computers elsewhere. Bernard Megrey, working with Wei Cheng of the University of Washington, provided the code and forcing files for Seward in July 2010. However, the 2D Seward ROMS transect does not exactly overlap the Seward Line from which the observations were made by US GLOBEC. Consequently, Wei agreed to

reconfigure a new domain (done) and forcing files (being done now) so that the Seward model domain exactly overlaps the Seward Line observation stations. Wei is optimistic that the forcing files for Seward will be available for our workshop. If they are not, we will use the other (non-overlapping domain for the PICES-2010 MEMIP workshop. Progress on the model for the A-Line has stalled, and it is uncertain that a model will be configured for that region for the upcoming workshop.

Data sets for temperature and salinity (Newport and Seward), nutrients (Newport and Seward), chlorophyll (Newport and Seward), PON and DON (Newport), and zooplankton biomass (Seward and Newport) are already, or will be, available on the MEMIP computer “observations” directories for the workshop. This third MEMIP workshop will be technical and hands-on, and will focus on parameterizing, executing and calibrating Newport and Seward versions of several biogeochemical lower trophic level (LTL) marine ecosystem models. Three to six ecosystem models will be run at each test bed. Specific ecosystem models (*i.e.*, NPZD, NEMURO and CoSINE) will be executed. Some ecosystem models will be tuned to hindcast data from a specific region and be tested by application other available North Pacific test beds. An important aspect of MEMIP is that the physical model for each test bed location will be a fixed scenario simulation, so that comparisons of ecosystem model to data, or model to model, will eliminate variability due to differently tuned physical models. Model skill will be assessed quantitatively.

In summary, the MEMIP project will, through this series of workshops, utilize a consistent ocean physics model (using 2D version of ROMS) at each site, use early 2000’s forcing (2001–2003 in each site), provide qualitative and quantitative skill assessment concerning the models ability to represent *in situ* data, identify mechanisms that are important controls on the level and variability of secondary production at each test bed site, and bound the levels of uncertainty in model predictions by calculating ensemble statistics. The models will be used to identify processes that are important in controlling secondary production, zooplankton biomass and variability, to bound the levels of uncertainty in model predictions, and to identify processes that are particularly sensitive to change and thereby susceptible to potential future climate variability and change. Comparisons at multiple locations will provide information on the spatial–temporal robustness of particular model structures and parameterizations. The products of the comparison will contribute to FUTURE by estimating the uncertainty and the limits of forecasting.

Update following the PICES-2010 workshop

Eighteen scientists from seven countries (all six PICES member countries plus Norway; Addendum 2) participated in some or all of the 3rd MEMIP workshop that was held Saturday–Sunday, October 23–24, 2010. After reviewing the current status of MEMIP and describing the general goals and objectives, we heard an interesting invited talk by Guimei Liu of China on a nowcast/forecast model in the South China Sea. Hal Batchelder and Shin-ichi Ito described the datasets that are available and the data that have been prepared and place on the “orion” server at the Alaska Fisheries Science Center. Following a question regarding the continued availability of “orion”, which was provided by Bernard Megrey, Batchelder agreed to contact the appropriate people at AFSC to determine if it would be possible to continue MEMIP use of “orion” for another two years. Jeff Napp was contacted and indicated that he would approve such use following a written request from the MEMIP group. Batchelder agreed to prepare such a request shortly, following the conclusion of PICES-2010. In addition, the group will request an additional user account be established for a new active member of MEMIP, Jerome Fiechter of the U.S.A.

Our original goal was to have at least one, and hopefully two, regional 2D models configured to provide a well defined and consistent physical test bed for the testing of multiple ecosystem models. Toward that end, Dr. Spitz configured a domain for the Newport Line prior to the meeting, and expected to have a domain configured for the Seward (GAK) Line shortly, following the meeting. We had agreed at the MEMIP-2009 workshop to freeze the ROMS code based on a November 2009 version. However, two participants during the workshop (Angelica Peña and Jerome Fiechter) indicated that the biological codes in ROMS had been extensively reconfigured in summer 2010. This was the first major reorganization of the biological codes in ROMS in more than 5 years. The changes were so significant and would simplify the addition of new models, thus the MEMIP team agreed to update to the most recent version. The adoption of this will greatly simplify

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the addition of new ecological models. More importantly, the new version has a more accurate advection-diffusion code for biological tracers. We retrieved the new ROMS code from the ROMS repository and installed it on “orion”. Thanks to the concerted work of Peña and Spitz during the workshop, test codes were successfully compiled and run. Unfortunately, it was not possible to recode the Spitz model of the Newport system (our working test bed) into the new version during the workshop.

During the final two hours of the workshop, the group held a broad-ranging discussion of MEMIP’s future directions (short- and long-term), products and deliverables, and a timeline for completing the outlined tasks. The group agreed that MEMIP should focus on activities that will advance the main deliverables of the project, namely:

- Parameterize, execute (and optionally calibrate) multiple ecosystem models (3–6) in each of three test bed regions;
- Perform a quantitative skill assessment;
- Identify mechanisms that are important controls on the level and variability of secondary production (= zooplankton biomass) at each test bed site;
- Bound the levels of uncertainty in model predictions by calculating ensemble statistics.

We believe the above list is in priority order (highest to lowest), mostly because the activities logically proceed from the first to the last.

MEMIP recognizes that comparisons must include both model-data and model-model. Model-model comparisons are simpler because more complete information is provided by models. Model-data comparisons are more difficult because models and observations are often in different units, required conversion and assumptions (*e.g.*, models provide phytoplankton biomass, but field data are usually chlorophyll concentrations). Also, the real ocean has additional variability due to three-dimensional processes that are not represented in the 2D models employed by MEMIP. There was discussion of the relative value of *in situ* observations and satellite observations as the data for comparison to model output. It was suggested that we might consider using 3D model fields (archived at frequent intervals) using newly developed offline biological-physical coupling of ROMS physical fields. Given the desire of MEMIP to conclude the projects activities by PICES-2012, we felt that it would be best to continue with the planned 2D comparisons of the A-Line, GAK and Newport Lines. We agreed that we should attempt multiple simulations to generate ensembles of outputs using different ecosystem models, parameter values and different forcing years.

Although substantial work was done inter-sessionally to reformat data and transfer the data from the GAK and Newport Lines to “orion”, there is still additional work needed. A desire for “rate” data was expressed. Not much rate data are available from the GLOBEC investigations in Newport, some (primary productivity; limited microzooplankton grazing rates) are available for the GAK Line, and a mix of different rate data is available for the A-Line, though often from different years.

Recognizing that 2D models may have difficulty adequately hindcasting the physics of the GAK and A-Lines, we agreed to a timeline of inter-sessional milestones that must be met to make the progress desired in the next year:

- Jan. 10, 2011: GAK and A-Line physical models established and minimally evaluated to observations; evaluating will include:
 - T/S properties across shelf; T-S diagrams for each year/month AND monthly climatology,
 - MLD (spatially and seasonally),
 - Use of interannual variability in surface forcing for each region to assess the models ability to simulate physics in different years.
- Mar. 1, 2011: All ecosystem models coded and debugged in ROMS,
- May 1, 2011: All ecosystem models tuned to a parameter set that will be used cross regionally,
- June 1, 2011: Runs completed,
- July 1, 2011: Plots and sharing of results accomplished.

This ambitious timeline was established so that all of the model simulations are completed before the PICES-2011 in Khabarovsk, Russia. Batchelder will send appropriate reminders about deadlines 1 month and 2 weeks prior to the above target dates. The January 10, 2011 target date for confirming that suitable 2D physical models are available for the GAK and A-Lines is the key. If we have confirmed that those physical test beds are available (as is the Newport Line now), then we expect that the other tasks and target dates will be feasible.

Proposal for 1½-day Workshop: MEMIP IV at PICES-2011

[later renamed as “*MEMIP IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems—humble pie or glee?*”]

The focus of this 4th MEMIP workshop will be quantitative model-model and model-data analysis and comparison of the results of the simulations.

Proposed convenors: Harold (Hal) Batchelder, Shin-ichi Ito, Yvette Spitz, and Angelica Peña.

Specific tasks to be completed during this workshop are:

- Within model domain comparisons of different ecosystem models. The list of models (and responsible MEMIPer) that will be configured and simulations run includes NPZD+ (Pena), NAPZD+ (Spitz), Nemuro (Ito), UMaine (Liu), NPZD_Fe (Fiechter), Nemuro_Fe (Fiechter), NemuroK5 (Batchelder), and (perhaps) Biology (Spitz).
- The goal is that BEFORE the proposed workshop, each model will have simulated the following periods for each 2D domain:
 - Newport: 2000, 2001, 2002 (Apr-Sep)
 - GAK: 2000, 2001, 2002 (Apr-Sep)
 - A-Line: 2001, 2002, 2003, 2007 (Mar-Sep)
- The combination of different years and up to 6 or so different models for the three regions should provide sufficient runs to provide ensemble-based estimates of the uncertainty of ecosystem hindcasts, which will provide information needed for assessing FUTURE coupled ecosystem-physical forecast products.

Request: travel for 2 scientists from the U.S.A. (Yvette Spitz and Jerome Fiechter).

MEMIP Addendum 1: Agenda for 2010 Workshop

W1 – BIO Workshop: Marine ecosystem model inter-comparisons (III)

Saturday, October 23 (9:00–18:00), Day 1

9:00	<i>Workshop Convenors</i> <i>Welcome, Introductions and General MEMIP Goals</i>
9:30	Guimei Liu, Hui Wang and Fei Chai (Invited) Developing Nowcast/Forecast Ecosystem Model in the South China Sea
10:00	Harold Batchelder Data types and availability for the CCS (Newport) and GOA (Seward) test bed locations
10:30	Coffee/Tea Break
10:50	Shin-ichi Ito Data types and availability for Western Subarctic (A-Line) test bed location
11:05	Harold Batchelder (with input from all) Test beds, Ecosystem Models Available, Computer Platforms for MEMIP
11:25	Yvette Spitz Demonstration: How to merge/modify an ecological model into ROMS/Compiling Example

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- 11:55 Small group activity
Whet your modeling appetite before lunch; identify biological models to implement
- 12:30 **Lunch**
- 14:00 Implement new ecosystem models into ROMS and run existing codes
- 15:30 **Coffee/Tea Break**
- 15:50 Meet in plenary to discuss problems/troubleshoot
- 16:10 Continue implementation of models
- 18:00 **Session Ends**

Sunday, October 24 (9:00-18:00), Day 2

- 9:00 *Introduction by Session Convenors*
- 9:05 Yvette Spitz
Demonstration: Running a model; an example from the Oregon Shelf; BC's, IC's, surface forcing
- 9:25 Continue implementation of models/run models if ready/debugging
- 10:30 **Coffee/Tea Break**
- 10:50 More debugging; also informal viewing of contributed posters
- 12:30 **Lunch**
- 14:00 More debugging, and hopefully some successful model runs
- 15:30 **Coffee/Tea Break**
- 15:50 Debugging, debugging, debugging...
- 17:30 Progress Review, Timetable, Next steps incl. post-simulation analyses, Action Item Identification (Session Convenors)
- 18:00 **Workshop Ends**

MEMIP Addendum 2: Participation in 2010 Workshop

Canada: Angelica Peña

China: Guimei Liu

Japan: Shin-ichi Ito
Michio J. Kishi

Korea: Chan Joo Jang
Jung Jin Kim
Sinjae Yoo

Russia: Vladimir Kulik
Elena Ustinova

USA: Harold Batchelder
Brian Burke
Jerome Fiechter
David Fluharty
Brie Lindsey
Yvette Spitz
Tom Wainwright

Norway: Ken Drinkwater
Trond Kristiansen

BIO Endnote 5

**(a.) Proposal for a new Working Group on
“Jellyfish Blooms around the North Pacific Rim: Causes and Consequences”**

Co-Chairs: Shin-ichi Uye (Japan), Richard Brodeur (U.S.A.), Young-Shil Kang (Korea)

Duration: 3 years (2011–2013)

Terms of Reference

1. Review past and ongoing studies on the reproductive biology of jellyfish species that cause problematic blooms;
2. Compile existing data on temporal variations in jellyfish abundance in the North Pacific and its marginal seas, and analyze them in relation to regional environmental and climate changes in order to identify causes of increasingly recurrent jellyfish blooms;
3. Elucidate the role of jellyfish in coastal and oceanic marine food webs and assess the impacts of jellyfish blooms on marine ecosystems and socio-economies such as fisheries and aquaculture;
4. Evaluate methodologies for predicting blooms and for diminishing their impact on marine and human systems, including bloom forecast modeling and the modification of fishing gears;
5. Promote international collaboration among PICES member countries for exchanging available information on jellyfish, and encourage joint research surveys on jellyfish among PICES member countries;
6. Provide jellyfish metrics as indicator of ecosystem change and resiliency in cooperation with FUTURE AICE-AP and SOFE-AP and FUTURE related WGs;
7. Publish a final report summarizing the results, including recommendations to policy makers for reducing impacts of jellyfish blooms in the North Pacific.

Potential members:

Canada: Mary Arai
Lucas Brotz
Evgeny Pakhamov

China: Song Sun

Japan: Hideki Akiyama
Haruto Ishii

Korea: Won-Duk Yoon
Changhoon Han
Kyoung-Soon Shin

Russia: Alexander Zavolokin

U.S.A.: Jenny Purcell
John Field
Lisa Eisner

**(b.) Proposal for a new Working Group on
“Ecosystem Responses to Multiple Stressors”**

Motivation

Marine ecosystems of the North Pacific are impacted by multiple emerging stressors, such as increase in temperature, change in iron supply, harmful algal bloom events, invasive species, hypoxia/eutrophication and ocean acidification. These multiple stressors can act synergistically to change ecosystem structure, function and dynamics in unexpected ways that differ from single stressor responses. The emerging stressors will vary by region, and critical stressors in PICES’ regional ecosystems should be identified. Comparative studies on North Pacific ecosystem responses to multiple stressors will help determine how ecosystems might change in the future, and also identify ecosystems that are vulnerable to natural and anthropogenic forcing. This working group can address emerging issues from WG 22 (iron chemistry in low pH ocean, anthropogenic dust flux), WG 23 (hypoxia impact on euphausiids), and WG 21 (non-indigenous marine species) thereby highlighting the need for integrative studies. The proposed Chair is Motomitsu Takahashi (Japan).

Terms of Reference

1. Review and identify critical stressors responsible for ecosystem-level changes, with an emphasis on North Pacific ecosystems;
2. Identify spatial extent/regional differences in anthropogenic (and natural) stressors among North Pacific ecosystems (possibly based on ecosystems identified in the Marine Ecosystems of the North Pacific Ocean status report);
3. Identify potential sources of data/information available from national/international programs on ecosystem responses/anthropogenic stressors;
4. Provide metrics of ecosystem change, resiliency and vulnerability for implementation within the PICES FUTURE program as per recommendations from the inter-sessional FUTURE workshop on ecosystem indicators;
5. Convene workshops and sessions to compare the ecosystem responses by regions and to evaluate results;
6. Publish a final report summarizing results.

BIO Endnote 6

**Proposal for an inter-sessional workshop on
“Indicators of status and change within North Pacific marine ecosystems: A FUTURE workshop”**

Duration: 3 Days

Time: Spring of 2011 (possibly linked to the inter-sessional Science Board meeting)

Location: TBD

Convenors: Thomas Therriault, AICE-AP (Canada), Jacquelynne King, COVE-AP (Canada), Chang-Ik Zhang (Korea), Sachihiko Itoh (Japan)

Workshop description

Ecosystems are affected by a number of natural stressors and, more recently, an increased number of anthropogenic ones. Ultimately, these stressors result in changes to ecosystem structure and function, which in turn can affect their overall productivity and the societies that depend on them. Metrics of ecosystem status are required to measure impacts of stressors and monitor change. Ecosystem indicators also could be used to identify systems that are resilient or vulnerable to stressors.

One of the themes of the PICES FUTURE Science Plan focuses on ecosystem resiliency and vulnerability to stressors and how these attributes might change in the in the future. In order to ensure PICES scientists have the ability to detect ecosystem-level changes in a consistent and standardized way, common metrics must be

developed. Further, in an attempt to understand the amount of inherent variability in marine ecosystems, these metrics also need to incorporate measures of uncertainty that can be conveyed to end users, including managers and policy makers.

The goals of this workshop will be to:

- 1) identify means of determining ecosystem resilience or vulnerability;
- 2) identify ecosystem-level indicators of status and change, including but not limited to fisheries-based indicators;
- 3) identify methods to characterize uncertainty in these indicators;
- 4) identify common ecosystem indicators to be used for regional comparisons by the PICES' community.

Proposed workshop structure

We propose to have 3 keynote speakers and limited contributed oral presentations addressing the first 3 workshop goals (above). Following keynote addresses workshop participants will form breakout groups/group discussions (½ day goal 1, 1 day goal 2, ½ day goal 3). Participants will provide feedback on available data for determining common ecosystem indicators (½ day). Final product will be a workshop report with brief summary of keynote addresses, summary of discussions and recommendations for implementation/use within the PICES FUTURE program and revision to Terms of Reference for proposed working group on multiple stressors (½ day). In addition, we would host a contributed poster session on the application of ecosystem indicators.

Supporting information

This proposed workshop will consider progress since:

1. the 2004 IOC/SCOR/GLOBEC/ICES/PICES-sponsored symposium “Quantitative Ecosystem Indicators for Fisheries Management” with an emphasis on North Pacific ecosystems (papers published in the ICES Journal: <http://icesjms.oxfordjournals.org/content/62/3.toc>).
2. the Report of Working Group 19 on Ecosystem-based Management Science and its Application to the North Pacific. PICES Sci. Rep. No. 37, 166 pp. which provided some recommendations on fisheries-based ecosystem indicators for the PICES' regions

Request: support for 3 invited speakers

BIO Endnote 7

Proposal for a 1-day BIO Contributed Paper Session at PICES-2011

Co-convenors: Michael Dagg (U.S.A.) and Atsushi Tsuda (Japan)

Invited speakers: none

Description: Papers are invited on all aspects of biological oceanography and climate in the North Pacific and its marginal seas not covered in Topic Sessions sponsored by BIO.

BIO Endnote 8

Proposal for a 1-day BIO/POC Topic Session on “*Mechanisms of physical-biological coupling forcing biological “hotspots” in the Western North Pacific and Western North Atlantic*”

[later shortened to “*Mechanisms of physical-biological coupling forcing biological “hotspots”*”]

This topic session will examine the physical and oceanographic factors that result in biodiversity, ecological, or economic hotspots in the North Pacific. Spatially, this session will focus on the Kuroshio/Oyashio extensions and ecotone, the intersection of the Sea of Okhotsk and the western North Pacific (Kuril Islands region), and the Western Bering Sea. For the Atlantic, this session will focus on the intersection of the Gulf

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Stream and Labrador Current in addition to tidally driven systems such as the Gulf of Maine and Gulf of St. Lawrence.

“Hotspots” can broadly be defined as areas encompassing a high number of species, a high abundance of an indicator species, or an area of high economic value. More specifically, we seek interdisciplinary contributions on physical-biological coupling and resulting seasonal or year-round “hotspots” in primary to tertiary productivity. This includes data on physics, phyto- and zooplankton, forage fish, and upper trophic level predators (*e.g.* fish, seabirds, mammals, humans). We are particularly interested in multi-species and multi-use hotspots (*e.g.* the overlap between human and ecological importance) and potential changes in hotspots under future climate change scenarios. Modeling and empirical studies are encouraged. We would solicit a special publication in the primary literature pending subscription to the session.

Co-convenors: Elliott Hazen, Robert Suryan (U.S.A.; confirmed)

Suggested: Yutaka Watanuki (MBM Co-Chair), Ichiro Yasuda (Japan); Oleg N. Katugin, Vladimir Radchenko (Russia); (ICES – TBD)

Potential invited speakers: Sei-Ichi Saitoh (Japan, confirmed), Jum Nishioka (Japan), Yuri Artukin (Russia), Gail Davoren (Canada/ICES), Per Fauchald (Norway/ICES), Andrew Pershing (U.S.A./ICES)

BIO Endnote 9

Letter requesting PICES support for ESSAS Open Science Meeting in May 2011

21 October 2010

Dr. Alex Bychkov
Executive Secretary
North Pacific Marine Science Organization (PICES)
c/o Institute of Ocean Sciences
P. O. Box 6000, Sidney, B.C
Canada. V8L 4B2

Dear Dr. Bychkov:

On behalf of the Science Steering Committee of the IMBER Regional Program, Ecosystem Studies of Sub-Arctic Seas (ESSAS), my Co-Chair, Dr. Ken Drinkwater, and I would like to request that PICES consider Co-sponsoring, with ICES, the North Pacific Research Board, and others the travel of PICES members and students to the up-coming ESSAS Open Science Meeting to be held 22-26 May 2010 in Seattle Washington. PICES has already agreed to allow the PICES Secretariat to provide support for the OSM on a cost reimbursed basis. ESSAS is now requesting support of the travel of two scientists from PICES countries in Asia, and the support of two students or young scientists from Asia. The expected costs for this travel support, at \$3,500 per person, would be \$14,000.

The OSM will be supporting a one day workshop sponsored by the PICES/ICES Working Group WGFCCFIS, Sunday 22 May, on the **Biological Consequences of a decrease in sea ice in Arctic and Sub-Arctic Seas**. Additionally, during the OSM, there will be a number of sessions of direct relevance to PICES member nations including: 1) Comparative studies of polar and sub-polar seas, New observations of the eastern and western Bering Sea, Modeling marine ecosystem dynamics, New insights from the International Polar Year, and socio-economic aspects of sub-polar and polar ecosystems. More information is available at the ESSAS OSM website: www.pices.int/essas2011.aspx.

Co-sponsorship of the travel of Asian scientists and students to the ESSAS OSM would be a continuation of the strong past support provided to ESSAS by PICES. This support has included hosting the initial ESSAS / GLOBEC Symposium, "*Climate Variability and Sub-arctic Marine Ecosystems*", held in Victoria in May 2005 and providing travel support for several of the speakers. This symposium resulted in a special volume of Deep-Sea Research II, the *Effects of Climate Variability on Sub-Arctic Marine Ecosystems*, published in 2007. PICES also helped to organize and provide logistic support for the June, 2006, ESSAS St. Petersburg Workshop on *Developing Comparative Studies of Sub-Arctic Seas*, and again provided travel support so that Russian scientists were able to participate in the workshop.

In turn, ESSAS has supported the goals of PICES. ESSAS has sponsored or co-sponsored workshops during PICES meetings including: two workshops at the 2008 Annual Meeting and one in 2009. During the 2006 St. Petersburg workshop, the ESSAS community began seeking ways to strengthen future editions of the PICES Special publication, "*Marine Ecosystems of the North Pacific*", in particular by adding comparative material to the synthesis chapter. In 2009 and 2010, ESSAS took the lead in preparing the Bering Sea chapter for the 2010 update of the PICES publication "North Pacific Ecosystem Status Report", and contributed to a greatly strengthened synthesis chapter.

We hope that the PICES community will look favorably on this request to build upon these past successful collaborations between PICES and ESSAS, and that you will agree to provide financial support to aid Asian members of PICES to attend the ESSAS OSM.

Sincerely,

George L. Hunt, Jr.
Co-Chair ESSAS SSC



Ken Drinkwater
Co-Chair, ESSAS SSC

REPORT OF FISHERY SCIENCE COMMITTEE

The meeting of the Fishery Science Committee (FIS) was held during 14:00–18:00 h on October 27, 2010. Chairman Mikhail Stepanenko and Vice-Chairman Gordon Kruse called the meeting to order and welcomed the participants. The meeting was attended by 13 FIS members plus 20 observers (*FIS Endnote 1*). All PICES member countries were represented. Dr. Kruse served as rapporteur. The agenda was adopted without modification (*FIS Endnote 2*).

AGENDA ITEM 3

2010 FIS Best Oral Presentation and Poster awards

Volunteers were sought for FIS awards to be given during PICES-2010. Drs. Stepanenko and Kruse agreed to serve as the awards committee for FIS Best Oral Presentation by an early career scientist. The PICES Best Oral Presentation award was given to Hye-Min Park (Pukyong National University, Korea) for her presentation, titled “*Vertical distribution and reproductive aspects of caridean shrimps in the deep-water of the East Sea, Korea*” (FIS Paper Session). Drs. John Field and Laura Brown agreed to serve as the awards committee for FIS Best Poster. The PICES Best Poster Presentation award was given to Yuichiro Kogura (Hokkaido University, Japan) for his presentation, titled “*Genetic population structure of lacustrine sockeye salmon, *Oncorhynchus nerka*, in Japan*” (FIS Paper Session). This year’s selections were chosen from FIS Topic Session S5, FIS/MEQ Topic Session S7, and the FIS Contributed Paper Session.

AGENDA ITEM 4

FIS Chairman’s report: Implementation of PICES-2009 decisions

PICES-2010 sessions

At PICES-2010, FIS sponsored the following sessions:

- ¾-day Science Board Symposium (October 25) on “*North Pacific ecosystems today, and challenges in understanding and forecasting change*” (S1),
- ½-day FIS Topic Session (October 27) on “*Oceanographic and demographic processes affecting the reproductive biology of exploited marine stocks*” (S5),
- 1-day FIS/BIO Topic Session (October 28) on “*Observations of ecosystem mixing under climate change*” (S6),
- 1-day FIS/MEQ Topic Session (October 26) on “*Economic relation between marine aquaculture and wild capture fisheries*” (S7),
- 1-day FIS Contributed Paper Session (October 29),
- 1-day FIS/POC/BIO Topic Session (October 26) on “*Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting*” (S8),
- ½-day MEQ/FIS Topic Session (October 29) on “*New and emerging technologies: Applications of genomics for marine ecosystem studies*” (S10),
- ½-day MEQ/FIS Topic Session (October 29) on “*Identifying vulnerable marine ecosystems in the North Pacific*” (S11),
- ½-day FIS Workshop (October 23) on “*Beyond Lagrangian: Modeling migratory fish behavior in Global Circulation models*” (W2).

Summaries of these sessions and workshop can be found in the *Session Summaries* chapter of the PICES Annual Report.

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International symposia

PICES is co-sponsoring the upcoming Lowell Wakefield Fisheries Symposium, titled “*Ecosystem 2010: Global progress on ecosystem based fisheries management*” to be held in Anchorage, Alaska (U.S.A.) from November 8–11, 2010. Dr. Kruse is chairing the Steering Committee and Dr. Chang-Ik Zhang is the PICES representative on the Steering Committee (FIS). FAO, ICES, PICES, NMFS, Alaska Department of Fish and Game, NPFMC and University of Alaska Sea Grant are co-sponsors. Drs. Zhang (FIS) and Mitsutaka Makino (MEQ) are invited speakers. The peer-reviewed proceedings will be published by Alaska Sea Grant.

The Joint PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS) convened a PICES/ICES/FAO Symposium, titled “*Climate change effects on fish and fisheries: Forecasting impacts, evaluating ecosystem responses, and evaluating management strategies*” in Sendai, Japan, from April 26–29, 2010. The response to this symposium exceeded the expectations of the Convenors, with 208 oral and 105 poster presentations from scientists from 40 countries.

Publications

The following FIS-related PICES publications are either under preparation or have been published:

- Jamieson, G., P. Livingston, and C.I. Zhang. 2010. *Report of Working Group 19 on Ecosystem-based Management Science and its Application to the North Pacific*. PICES Scientific Report 37. 166 p.
- Papers from a FIS Topic Session at PICES-2009, titled “*Ecosystem-based approaches for the assessment of fisheries under data-limited situations*”, are being reviewed for publication in a special issue of the journal, *Fisheries Research*. The editors are Pat Livingston, Gordon Kruse, and Laura Richards.
- Papers are currently under review from the Symposium on “*Climate Change Effects on Fish and Fisheries: Forecasting Impacts, Evaluating Ecosystem Responses, and Evaluating Management Strategies*” held in Sendai, Japan, from April 26–29, 2010. Selected papers will be published in a special issue of the *ICES Journal of Marine Science* in July 2011.
- *Marine Ecosystems of the North Pacific Ocean, 2003–2008*. 2010. S.M. McKinnell and M.J. Dagg, editors. PICES Special Publication 4, 393 p. FIS Committee members contributed to the Bering Sea and other chapters.

AGENDA ITEM 5

Status reports of FIS-sanctioned groups

Joint PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS)

Co-Chairman of ICES/PICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS), Dr. Suam Kim, provided a summary of the Working Group’s activities. This Working Group was extremely active in 2010. Highlights included the International Symposium on “*Climate Change Effects on Fish and Fisheries: Forecasting Impacts, Evaluating Ecosystem Responses, and Evaluating Management Strategies*” (Sendai, Japan, April 29–30, 2010). The symposium and a subsequent publication will advance understanding within the scientific community of the potential effects of climate change on fish and fisheries. Key findings from the meeting were summarized in PICES Press: (http://pices.int/publications/pices_press/volume18/v18_n2/PICES_Press18_FULL.pdf). Another major highlight included the 1-day FIS/POC/BIO Topic Session at PICES-2010 on “*Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting*” (S8).

WG-FCCIFS requested several actions of the FIS Committee:

1. Funding for two PICES scientists from Asian countries to attend a workshop on “*Biological consequences of decrease in sea ice in Arctic and Sub-Arctic Seas*” at the 2nd ESSAS Open Science Meeting in Seattle (May 22–26, 2011). Convenors: Harald Loeng (Norway) and Anne Hollowed (U.S.A.).
2. Two scientists to be funded to attend the an ICES 2011 ASC Theme Session on “*Atmospheric forcing of the Northern Hemisphere ocean gyres, and the subsequent impact on the adjacent marine climate and*

- ecosystems*” to be convened by Drs. Emanuele Di Lorenzo (U.S.A., PICES) Ichiro Yasuda (Japan, PICES) Hjálmar Hátún (Faroe Islands, ICES) and Jürgen Alheit (Germany, ICES).
3. PICES’ support and endorsement for a 1-day theme session during the International Symposium on “*Effects of climate change on the world’s oceans*” in Yeosu, Korea (May 15–19, 2012).
 4. PICES’ support for an ICES Symposium on “*Forage Fish Interactions and Ecosystem Approach to Fisheries Management*” to be held in Nantes, France, from September 10–14, 2012 to be convened by Dr. Myron Peck (ICES).
 5. WG-FCCIFS may consider an endorsement by ICES and PICES of the addition of 1–2 new working group members who would represent an emerging new South Pacific marine science organization.
 6. It was proposed to merge ICES SSICC (ends December 2010) and ICES-PICES WG-FCCIFS (ends December 2011) to address a joint ICES/PICES strategic initiative on climate effects.

Strategic Initiative on Stock Assessment Methods (SISAM)

During the summer of 2010, PICES was invited to join ICES in a Strategic Initiative on Stock Assessment Methods (SISAM). Two PICES members were nominated: Dr. William (Buck) Stockhausen (Alaska Fisheries Science Center, NMFS, U.S.A.) and Dr. Norio Yamashita (Hokkaido National Fisheries Research Institute, FRA, Japan). On behalf of Dr. Yamashita, Dr. Akihiko Yatsu provided a summary of the activities of SISAM. A Workshop on “*Reviews of recent advances in stock assessment models worldwide*”, chaired by Drs. Coby Needle (UK) and Chris Legault (U.S.A.), met at IFREMER, Nantes, France, from September 27 to 1 October 2010 to collate, review and comment on stock assessment methods currently in use around the world. The workshop included 32 participants, including 18 participants from the PICES member countries of Canada, Japan, Russia, and U.S.A. Following this initial workshop, planning will start for a world workshop in 2012 on stock assessment methods with invited and contributing scientists. The objective of the conference would be to determine the state-of-the art for stock assessment methods around the world. The final product will be a series of published papers in the *ICES Journal of Marine Science* and an ICES Cooperative Research Report review of state-of-the-art stock assessment methods and repository of stock assessment methods in 2013. The Initiative is a 3-year plan of wide-ranging work in which PICES can contribute.

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

WG 24 Co-Chairman, Dr. Brett Dumbauld, provided an oral report and written report (see WG 24 report elsewhere in the PICES 2010 Annual Report) on the activities of Working Group 24. During 2010, Dr. Dumbauld was appointed as Co-Chairman to replace retiring Dr. Kevin Amos. This Working Group began in 2008 and its first face-to-face meeting during PICES-2009 in Jeju, Korea resulted in all PICES member countries sharing information on the key production methods and species, upon which subsequent work is planned. This Working Group was not too active in 2010. A plan was discussed to achieve the objectives described in the Terms of Reference (TOR) by the end of WG 24’s term at PICES-2011. The first TOR addresses modeling and assessing interactions on marine aquaculture. This involves a review of long- and short-term, near- and far-field effects of aquaculture on benthic communities, including chemical and physical changes, and rate of ecosystem recovery. Co-Chairman, Dr. Katsuyuki Abo, is leading this effort. Each PICES member country is to review approaches related to their primary forms of culture. First drafts are due by April 1, 2011. The second TOR will address risk assessment methods. Work to be done includes updating and finalizing an overview of risk assessment approaches and relative legislative frameworks for sustainable marine aquaculture. The deadline for reports is November 30, 2010 (This date was extended to December 15, 2010; see WG 24 report.). Beyond this, there are no additional plans for work under this TOR. The third TOR addresses aquatic animal disease of aquaculture concern. This will involve listing the diseases of concern, description of diagnostic programs, identification and detection methods, former and ongoing research efforts, and ongoing issues and risks. Dr. Laurie Gustafson (U.S.A.) is leading this effort. Overviews will be developed for each member country, and drafts are due April 1, 2011. The need for ongoing participation from China was discussed, and FIS member, Dr. Xin (China), offered his assistance to securing appropriate participation from China. The FIS Committee looks forward to the successful completion of the TOR of WG 24, as well as their advice on approaches to incorporate aquaculture science into the PICES FUTURE program.

FIS-2010

WG 24 proposed a 1-day MEQ/FIS Topic Session on “*Environmental interactions of marine aquaculture in the North Pacific: Alterations and indicators of benthic effects and health of both cultured and wild stocks*” (later renamed “*Identification and characterization of environmental interactions of marine aquaculture in the North Pacific*” and set for a ½ day) for PICES-2011 (WG 24 Endnote 5). The Working Group seeks PICES funding for two invited speakers.

AGENDA ITEM 6

Relations with other programs and organizations

International Council for the Exploration of the Sea (ICES)

Dr. Harald Loeng presented a report from the International Council for the Exploration of the Sea (ICES). He discussed the new ICES Science Plan, which has three teams: understanding ecosystem function, understanding human activities with ecosystem function, and development of options for sustainable use of ecosystems. New strategic initiatives include climate change, biodiversity, area-based science and management, and stock assessment methods.

Two ICES/PICES workshops were proposed:

- “*Reaction of Northern Hemisphere ecosystems to climate events: A comparison*” (Hamburg, Germany, May 2–6, 2011).
- “*Biological consequences of decrease in sea ice in Arctic and Sub-Arctic Seas*” (Seattle, U.S.A., May 22, 2011).

Three joint ICES/PICES theme sessions were proposed for the ICES Annual Science Conference in Gdansk, Poland, in 2011:

- a. “*Atmospheric forcing of the Northern Hemisphere ocean gyres, and the subsequent impact on the adjacent marine climate and ecosystems*” with Convenors: Jürgen Alheit (Germany), Hjálmar Hátún (Faroe Islands), Emanuele Di Lorenzo (U.S.A.), and Ichiro Yasuda (Japan).
- b. “*Recruitment processes: Early life history dynamics – from eggs to juveniles*” with Convenors: Richard Nash (Norway) and Edward Houde (U.S.A.).
- c. “*Atlantic redfish and Pacific rockfish: Comparing biology, ecology, assessment and management strategies for *Sebastes* spp.*” with Convenors: Benjamin Planque (Norway), Paul Spencer (U.S.A.), Christoph Stransky (Germany) and Steve Cardin (U.S.A.).

International Pacific Halibut Commission (IPHC)

Dr. Juan Valero presented a report from the International Pacific Halibut Commission (IPHC). IPHC was established in 1923, and has been conducting an annual longline survey since 1925. The survey is used to develop an annual stock assessment for Pacific halibut. During the survey, IPHC collects bycatch and other data. It also conducts other research studies, such as pop-up tag studies, rockfish monitoring along U.S. west coast, bycatch studies, electronic monitoring, contaminants, and other special projects.

International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)

Dr. Jae Bong Lee presented a report of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). ISC was established in 1995 to provide advice on highly migratory species. The seven ISC member countries include five PICES countries: Canada, China, Japan, Korea, and U.S.A. ISC strives to enhance scientific research, international cooperation, and a scientific basis for management, and has established five working groups on sharks, billfish, albacore tuna, Pacific bluefin tuna, and statistics. Their activities tend to focus on calculation of BRPs and stock assessments. ISC intends to hold its next Plenary in the U.S. in July 2011. Collaborative work includes information for both PICES North Pacific Ecosystem Status Reports (PICES Special Publications 1 and 4) on tunas, provided by the ISC. PICES activities of interest to ISC include characterizing changes in oceanographic conditions and causal mechanisms, development of environmental time series, and development of bioeconomic reference points. An invitation was also extended to PICES scientists to become involved in stock assessments and workshops.

Northwest Atlantic Fisheries Organization (NAFO)

Dr. Vladimir Shibanov presented a report of the Northwest Atlantic Fisheries Organization (NAFO) and its history. Established in 1949, the International Commission for the Northwest Atlantic Fisheries (ICNAF) was replaced by NAFO 1979. The new organization stemmed from the establishment of the 200 mile limit. Fourteen member countries make up the Organization, and the area covered includes the NW Atlantic. The EEZ coastal states are comprised of Canada, U.S., Greenland, and France (St. Pierre/Miquelon). The NAFO Scientific Council is comprised of four standing committees.

North Pacific Anadromous Fish Commission (NPAFC)

Dr. Jin Yeong Kim presented a report from the North Pacific Anadromous Fish Commission (NPAFC). The NPAFC annual meeting was held in November 2009 in Niigata, Japan. NPAFC developed a new Science Plan for 2011–2015 which entails international cooperative research involving five research components: (1) migration and survival mechanisms of juvenile salmon in ocean ecosystems, (2) climate impacts on Pacific salmon production in the Bering Sea (BASIS) and adjacent waters, (3) winter survival of Pacific salmon in North Pacific Ocean ecosystems, (4) biological monitoring of key salmon populations, and (5) development and applications of stock identification methods and models for management of Pacific salmon. NPAFC is planning an International Workshop on “*Production Trends of Pink and Chum Salmon: Why They Can Retain High Abundance?*” [later renamed to “*Explanations for the high abundance of pink and chum salmon and future trends*”] for October 30–31, 2011 or April 22–23, 2012 in Nanaimo, Canada, and seeks PICES to be a co-sponsor.

North Pacific Research Board (NPRB)

Dr. Clarence Pautzke reported on the North Pacific Research Board (NPRB). He reported that the FIS Action Plan overlaps considerably with activities of NPRB. NPRB, funded by U.S. federal funds, focuses on pressing fishery management issues and marine ecosystem information needs. In general, funds are allocated as: 30% GOA, 60% BSAI, and 10% Arctic aligned with Large Marine Ecosystems. In addition, NPRB has developed integrated ecosystem research programs for the Bering Sea and Gulf of Alaska. A Request for Proposals is released each October and proposals are reviewed in spring. NPRB has funded studies on most topics in the FIS Action Plan. NPRB funds an average of \$3.5–4.0 million annually. In addition, NPRB has funded scientists to attend the Symposium on “*Climate Change Effects on Fish and Fisheries: Forecasting Impacts, Evaluating Ecosystem Responses, and Evaluating Management Strategies*” held in Sendai, Japan (April 26–29, 2010) as well as ESSAS Open Science Meetings. Annual RFP is \$3.5 million going up to \$4.0 million. Every summer NPRB looks for ideas for research priorities. Ideas for collaboration include opportunities for international collaboration with U.S. scientists on NPRB research, identification of research priorities, coordination of the annual Ecosystem Considerations Chapter prepared annually for the NE Pacific, with periodic updates of the PICES Ecosystem Status Report.

Pacific Fishery Management Council (PFMC)

Mr. Michael Burner presented a report on the Pacific Fishery Management Council (PFMC). The PFMC is a fishery management organization for federal fisheries off the U.S. west coast. In addition to single-species FMPs, PFMC is developing an ecosystem-based fishery management plan. This plan is loosely patterned after the Aleutian Islands Fishery Ecosystem Plan of the North Pacific Fishery Management Council, except that it may have some regulatory actions associated with it to protect rockfish. The PFMC routinely puts out a document on its research and data needs, which is available from the PFMC website (www.pcouncil.org/resources/research-and-data-needs). Other items of interest include the desire to develop an approach to evaluate benefits of management tools to achieve ecosystem-based fishery management objectives, an annual ecosystem status report, identification of key indicators to predict salmon early ocean survival and groundfish recruitment, development of indices of ecosystem state, and the need for models of environmental variability and human effects to establish harvest strategies and assess risk.

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AGENDA ITEM 7

Proposals for FIS Topic Sessions and workshops at PICES-2011, theme sessions at ICES ASC 2011, and inter-sessional workshops

PICES-2011 Topic Sessions

The following Topic Sessions were proposed for PICES-2011:

- *Identification and characterization of environmental interactions of marine aquaculture in the North Pacific* (MEQ/FIS, ½ day). Papers submitted to this session may be considered for a special publication. (WG 24 Endnote 5)
- *Population dynamics, trophic interactions and management of cephalopods in the North Pacific ecosystems* (FIS, ½ day). (FIS Endnote 3)
- *Recent changes of North Pacific climate and marine ecosystems: Implications for dynamics of the dominant species* (FIS/POC, 1 day). (FIS Endnote 4)
- *Linking migratory fish behavior to End-to-End models* (POC/FIS, ½ day). (FIS Endnote 5)
- *Impacts of hypoxia on the mesopelagic micronekton and its implications for marine food webs* (FIS/BIO, ½ day). Convenors: Tony Koslow (U.S.A.) and Chiyuki Sassa (Japan). Invited speakers TBD.
- FIS Contributed Paper Session (1 day)

The FIS Committee decided that the top priority was the FIS Paper Session, followed by the proposal of the FIS-sanctioned group, WG 24, on “*Identification and characterization of environmental interactions of marine aquaculture in the North Pacific*”. FIS also gave high priority to the proposal for a Topic Session on “*Population dynamics, trophic interactions and management of cephalopods in the North Pacific ecosystems*”. There was strong support for this Topic Session by FIS members from the western North Pacific.

For the next lower level of priority, the FIS Committee supported the idea of a fishery-climate session as a joint FIS/POC Topic session. Among the choices proposed, “*Recent changes of North Pacific climate and marine ecosystems: Implications for dynamics of the dominant species*” received the most support.

Regarding the proposal on micronekton, FIS members noted that the proposal was not so well structured and that hypoxia was not a common phenomenon in the western Pacific. The proposed topic session on migratory fish behavior did not attract much discussion among the FIS Committee.

ICES 2011 ASC theme sessions

The FIS Committee discussed three proposals for ICES/PICES joint theme sessions at the 2011 ICES ASC in Gdansk, Poland:

- *Surplus production models: Quantitative tools to manage exploited fisheries and compare the productivity of marine ecosystems*. Convenors: Bernard Megrey (U.S.A.), Ken Drinkwater (Norway), Jason Link (U.S.A.). Either Ian Perry (Canada) or Jennifer Boldt (U.S.A.) are willing to serve in lieu of Bern Megrey, or an alternative PICES Convenor is welcome.
- *Atmospheric forcing of the Northern Hemisphere ocean gyres, and the subsequent impact on the adjacent marine climate and ecosystems*. Convenors: Jürgen Alheit (Germany), Hjálmar Hátún (Faroe Islands), Emanuele Di Lorenzo (U.S.A.), and Ichiro Yasuda (Japan).
- *Atlantic redfish and Pacific rockfish: Comparing biology, ecology, assessment and management strategies for *Sebastes spp.** Convenors: Benjamin Planque (Norway), Paul Spencer (U.S.A.), Christoph Stransky (Germany and Steve Cardin (U.S.A.).

The FIS Committee supports all three ICES/PICES sessions at ASC 2011. Among these, the Committee ranked the redfish/rockfish session as top priority, followed by the surplus production session, and last, the session on gyres, noting that the gyre session may be of higher priority to the POC Committee owing to the emphasis on physical oceanography.

Inter-sessional workshops

- “*Production trends of pink and chum salmon: Why they can retain high abundance?*” [later renamed to “*Explanations for the high abundance of pink and chum salmon and future trends*”] planned by NPAFC for October 30–31, 2011 or April 22–23, 2012 in Nanaimo, British Columbia, Canada. NPAFC seeks PICES to be a co-sponsor.

The FIS Committee noted that this workshop would not attract much PICES participation if it is held in October 2011 because of the overlap with PICES-2011. The FIS Committee recommends that PICES should agree to be a co-sponsor, only if the meeting is held in April 2012.

- “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic seas*”. Convenors: Harald Loeng (Norway) and Anne Hollowed (U.S.A.). This 1-day workshop is proposed to be held on May 22, 2011 in conjunction with the 2nd ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” held from May 22–26, 2011, in Seattle, U.S.A. WG-FCCIFS requests PICES funding for two Asian scientists to participate in the workshop. Coincidentally, Dr. Kenneth Drinkwater (ESSAS) also requested funding for two senior scientists plus two early career scientists for the ESSAS OSM.

A question was asked whether the two Asian scientists for the proposed workshop could also fill the needs for two senior scientists of the ESSAS OSM. The response was that this may not necessarily be the case, as it depends on the skills and expertise of the scientists chosen. It was also noted that PICES is providing logistical support for the ESSAS OSM.

The FIS Committee endorsed the request by WG-FCCIFS to support two Asian scientists to attend the workshop proposed by WG-FCCIFS. Regarding the separate ESSAS request for support for two additional scientists from Asia plus two students or early career scientists from those countries, FIS thinks that this is reasonable. However, the Committee noted that it is already recommending support for two Asian scientists to the proposed workshop. Given funding limitations, FIS supports the funding request for travel by two early career Asian scientists to the ESSAS OSM if adequate funds are available.

- “*Reaction of Northern Hemisphere ecosystems to climate events: A comparison*”. Convenors: Jürgen Alheit (Germany), Christian Möllmann (Germany), Sukgeun Jung (Korea), and Yoshiro Watanabe (Japan). This ICES/PICES workshop is proposed for Hamburg, Germany from May 2–6, 2011. The request is for travel by two PICES scientists.

The FIS Committee is supportive of this request.

- “*Climate and oceanic fisheries, and development of climate tools for fisheries*”. This workshop is being organized by the World Meteorological Society and is planned for the Cook Islands from October 3–5, 2011.

The FIS Committee noted that this workshop has an emphasis on the Pacific region extending south of the PICES region. For this reason, this workshop proposal was rated as a lower priority than the other workshop proposals.

AGENDA ITEM 8

Proposals for new FIS working groups and study groups

The FIS Committee received no new proposals for working groups. However, in the report from ICES, it was noted that the ICES SSICC will conclude in December 2010, whereas the PICES/ICES WG-FCCIFS will end in October 2011. Also, ICES is implementing a strategic science initiative for a standing body to function on activities akin to WG-FCCIFS. It was brought to the FIS Committee’s attention that there is a mismatch

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between the standing committees in ICES *versus* the PICES working groups that have a 3-year term. The FIS Committee supports the efforts of WG-FCCIFS and requests that Science Board should explore ways to extend the life of this Working Group in some form to pursue such climate-related activities jointly with ICES into the future.

WG-FCCIFS sought ICES and PICES endorsement for the addition of 1–2 new Working Group members who would represent an emerging new South Pacific marine science organization. The FIS Committee did not take action on this item, but it is raised to the attention of Science Board.

AGENDA ITEM 9

Proposals for new meetings with PICES as co-sponsor

None.

AGENDA ITEM 10

High priority projects

None.

AGENDA ITEM 11

Other priority items with funding implications

It was noted that there may be extra page charges associated with the special issue of the *ICES Journal of Marine Science* associated with the PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, evaluating ecosystem responses, and evaluating management strategies*” held in Sendai, Japan in April 2010. ICES and PICES should explore ways to cover these additional funding needs.

WG-FCCIFS also is exploring the possibility of publishing their 83-page workshop report as a PICES Scientific Report. The FIS Committee is supportive of this effort.

AGENDA ITEM 12

Proposed publications

No new publications beyond those already planned.

AGENDA ITEM 13

Inter-sessional activities, meetings and requests for travel support

ICES seeks PICES support for an International Symposium on “*Forage fish interactions and ecosystem approach to fisheries management*” to be held in Nantes, France, November 8–12, 2012 to be convened by Dr. Myron Peck (ICES). The FIS Committee understands that this request is premature and should be considered for action at PICES-2011.

Likewise, PICES was asked for support and endorsement of a 1-day theme session during the Symposium on “*Effects of climate change on the world’s oceans*” in Yeosu, Korea in 2012. The FIS Committee understands that this request is premature and should be considered at the PICES-2011 meeting.

AGENDA ITEM 14

Review of FIS Action Plan

The FIS Action Plan has not been reviewed since 2007 and needs to be reviewed and updated consistent with the new FUTURE program. The FIS Committee agreed to review and revise the Action Plan once the PICES Strategic Plan has been revised.

AGENDA ITEM 15

Other business

None.

FIS Endnote 1**FIS participation List**Members

Laura Brown (Canada)
 John Field (U.S.A.)
 Yosuzumi Fujimori (Japan)
 Toyomitsu Horii (Japan)
 Xianshi Jin (China)
 Sukgeun Jung (Korea)
 Jin Yeong Kim (Korea)
 Jacquelynne King (Canada)
 Gordon Kruse (U.S.A., Vice-Chairman)
 Libby Logerwell (U.S.A.)
 Laura Richards (Canada)
 Mikhail Stepanenko (Russia, Chairman)
 Akihiko Yatsu (Japan)
 Chang-Ik Zhang (Korea)

Observers

Heui Chun An (Korea)
 Michael Burner (PFMC)
 Miriam Doyle (U.S.A.)
 Ken Drinkwater (ESSAS)
 Brett Dumbauld (U.S.A.)
 Doug Hay (Canada)
 Jim Irvine (Canada)
 Yukimasa Ishida (Japan)
 Masahide Kaeriyama (Japan)
 Suam Kim (Korea)
 Jae Bong Lee (ISC)
 Harald Loeng (ICES)
 Erlend Moksness (Norway)
 Jay Parsons (Canada)
 Clarence Pautzke (NPRB)
 Ian Perry (Canada)
 Vladimir Shibanov (NAFO)
 Paul Spencer (U.S.A.)
 Ed Trippel (Canada)
 Juan Valero (IPHC)

FIS Endnote 2**FIS meeting agenda**

1. Welcome, attendance, rapporteur
2. Adoption of agenda
3. 2010 FIS Best Oral Presentation and Poster awards
4. FIS Chairman's report: Implementation of PICES-2009 decisions
 - PICES-2010 sessions
 - International symposia
 - Publications
5. Status reports of FIS-sanctioned groups

- 1.) WG-FCCIFS Joint PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*
- 2.) Strategic Initiative on Stock Assessment Methods (SISAM)
- 3.) (MEQ/FIS) Working Group on *Environmental Interactions Marine Aquaculture* (WG-24)
6. Relations with other programs and organizations
 - International Council for the Exploration of the Sea (ICES)
 - International Pacific Halibut Commission (IPHC)
 - International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)
 - Northwest Atlantic Fisheries Organization (NAFO)
 - North Pacific Anadromous Fish Commission (NPAFC)
 - North Pacific Research Board (NPRB)
 - Pacific Fishery Management Council (PFMC)
7. Proposals for FIS Topic Sessions and workshops at PICES-2011, theme sessions at ICES ASC 2011, and inter-sessional workshops
8. Proposals for new FIS working groups and study groups
9. Proposals for new meetings with PICES as co-sponsor
10. High priority projects
11. Other priority items with funding implications
12. Proposed publications
13. Inter-sessional activities, meetings and requests for travel support
14. Review of FIS Action Plan
15. Other business

FIS Endnote 3

**Proposal for a ½-day FIS Topic Session at PICES-2011 on
 “Population dynamics, trophic interactions and management of cephalopods in the
 North Pacific ecosystems”**

In most coastal and oceanic ecosystems, cephalopods are or can be an influential driver of food web dynamics due to their rapid growth, high population turnover rates. They also represent a major, and apparently growing, fraction of total catches, both in the Northern Pacific and throughout the world’s oceans. In contrast to the generally slower population response rates of most finfish, cephalopod populations tend to exhibit boom-bust cycles, challenging traditional management strategies. As events along the West Coast of the United States and Canada have shown, they may also represent highly visible indicators of ecosystem change, and both the causes and the consequences of the jumbo squid range expansion on the California Current ecosystem are questions of growing interest as a result. This theme session will focus on the ecology and management of cephalopods in North Pacific ecosystems, specifically on the known or suspected drivers of population dynamics, and applied or potential management strategies that are (or may be) robust to such dynamics. Papers that focus on the role of cephalopods within marine ecosystems, particularly with respect to trophic interactions and the strategic management of marine ecosystems (*e.g.*, the role of cephalopods as forage versus fisheries targets, or as competitors for species targeted by commercial fisheries), are highly encouraged.

Proposed Convenors: John Field (U.S.A.), Yasunori Sakurai (Japan) and Mikhail Zuev (Russia)

Potential invited speakers: Chingis Nigmatullin (Russia, research area – ecology of ommastrephid cephalopods in pelagic food webs), Mary Hunsicker or Tim Essington (U.S.A. research area – economic and trophic role of cephalopods in global marine fisheries)

FIS Endnote 4**Proposal for a 1-day FIS/POC Topic Session on “Recent changes of North Pacific climate and marine ecosystems: implications for dynamics of the dominant species”**

The coincidence of multidecadal-scale alternations of dominant marine fish species coupled with multidecadal-scale “Climatic Jumps” created a concept of the Regime Shift. The recently published PICES ecosystem status report noted that the frequency of these events appears to have increased and various indicators suggest that their amplitude has increased as well. The Arctic Oscillation Index, for example, reached an extreme negative anomaly during January–March of 2010, which brought a severe winter to much of the Northern Hemisphere, while other areas were warmed equivalently by the effects of the 2009/10 El Niño. The summer of 2010 saw record-setting high temperatures in some PICES member countries, accompanied by an abrupt shift in the tropics from El Niño to La Niña in July 2010. In the northwestern Pacific, after decades at low levels, sardine abundance has begun to increase while the anchovy abundance is declining; perhaps signalling a new Regime. This topic session will review recent ocean/climate variability, with particular emphasis on what has occurred from 2009 to 2010. It will focus on the major ecological components of North Pacific marine ecosystems, particularly commercially important fish species. Papers on mechanistic linkages between population dynamics of marine species and environmental conditions are especially encouraged.

Proposed Co-Convenors: Sukyung Kang (Korea), James Overland (U.S.A.), Akihiko Yatsu (Japan) and Skip McKinnell (PICES)

Invited speakers: two keynote speakers (climate-1 and fish-1)

FIS Endnote 5**Proposal for a ½-day POC/FIS Topic Session at PICES-2011 on “Linking migratory fish behavior to End-to-End models”**

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 behavior 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. Recently, new technology has been introduced to tagging equipment and as a consequence data availability is vastly improved. Additionally, new technologies are used to investigate fish movements in laboratory settings. This new information is expected to improve our understanding of fish migration mechanism and contribute to the development of fish-migration models. Furthermore, the development of high-resolution ecosystem models coupled to circulation models makes it possible to simulate fish-migration in the context of realistic environmental fields. The purpose of this session is to understand the current state of development in modeling fish behavior and discuss future potential collaborations to improve fish migration models. This session anticipates presentations that discuss successes (and failures) in modeling migratory fish behavior. Presentations related to data availability for model evaluation of fish behavior are also welcome. Based on the results and opinions expressed at the session, the conveners would like to discuss the desirability of establishing a group that will focus its attention on developing and advancing the state of fish behavioral modeling.

Co-Convenors: Enrique Curchitser (U.S.A.), Michio Kishi (Japan), Shin-ichi Ito (Japan), Geir Huse (ICES) and Skip McKinnell (PICES)

Invited speakers: travel support requested for 1 invited speaker: either Wei Hao (China) or Jerome Fiechter (U.S.A.)

REPORT OF THE MARINE ENVIRONMENTAL QUALITY COMMITTEE

The business meeting of the Marine Environmental Quality Committee (MEQ) was held on October 27, 2010 in Portland, Oregon, U.S.A. (14:00 to 18:00 hrs). Chairman, Dr. Steven Rumrill, called the meeting to order and offered a welcome to all participants. MEQ members and observers were asked to introduce themselves and to provide a brief statement about their interests and expertise. The meeting was attended by 10 members and 13 observers (*MEQ Endnote 1*). No MEQ members or observers from China were present. Mr. Graham Gillespie served as the meeting recorder.

AGENDA ITEM 2

Meeting agenda, and review and scope of MEQ activities

The meeting agenda (*MEQ Endnote 2*) was reviewed and the sequence of issues was modified to accommodate departing flights by MEQ members. Dr. Rumrill reviewed the scope of MEQ activities described by the current MEQ Action Plan (2006) to include contaminants in the marine environment, harmful algal blooms, environmental aspects of mariculture, and non-indigenous species. Additional activities such as ecosystem-based management and human dimensions of ecosystem-based fishery management were also included in the scope of MEQ but are not encompassed by the current MEQ Action Plan. The MEQ Action Plan (2006) is out-dated and should be revised.

AGENDA ITEM 3

Implementation of PICES-2009 decisions

MEQ sponsored or co-sponsored the following topic sessions at PICES-2010 in Portland:

- ¾-day Science Board Symposium (S1) on *North Pacific ecosystems today, and challenges in understanding and forecasting change* (October 25)
- 1-day FIS/MEQ Topic Session (S7) on *Economic relation between marine aquaculture and wild capture fisheries* (October 26)
- ½-day MEQ Topic Session (S9) on *Conceptual and numerical models of harmful algal bloom dynamics* (October 27)
- ½-day MEQ/FIS Topic Session (S11) on *Identifying vulnerable marine ecosystems in the North Pacific* (October 29)
- 1-day MEQ/FUTURE Topic Session (S12) on *Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function* (October 26)
- ½-day POC/MEQ/FUTURE Topic Session (S14) on *Marine renewable energy development in coastal and estuarine environments around the North Pacific* (October 27)
- 1 day MEQ Workshop (W3) on *New technologies and methods in harmful algal bloom detection. I. HAB species detection* (October 23)

AGENDA ITEM 4

Status reports from MEQ expert groups

Section on Harmful Algal Blooms in the North Pacific (HAB-S)

Dr. Vera Trainer, HAB-S Co-Chair, provided a summary of the activities of the Section, including a summary of past HAB-S activities. HAB-S was formed in 2003 and has conducted a series of annual reviews and workshops that focus on different HAB species. The current focus now places an emphasis on harmonization of datasets, anthropogenic forcing of HAB events, the linked physical-biotic transport of HAB species by onshore and offshore processes, and mitigation for HAB events. HAB-S sponsored a Topic Session (S9) and

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workshop (W3) at PICES-2010. Summaries of both can be found in the Session Summaries of the Annual Report. Progress has been made to provide web-based access to the Harmful Algal Event Database (HAEDAT). The HAB program within the Intergovernmental Oceanographic Commission (IOC) was discussed, and the potential for further HAB-S cooperation with IOC groups and activities was identified. With financial support from the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) to set up a program to enhance seafood safety in developing countries, HAB-S held two HAB detection training courses in the Philippines in 2009 and Guatemala in 2010. HAB-S requests assistance from PICES to identify a proper focal point within China for full participation in HAB-S activities.

Working Group on *Aquatic Non-Indigenous Species (WG 21)*

Ms. Darlene Smith, Co-Chair of WG 21, presented a summary of Working Group activities over the past year. The highlights of these accomplishments include a demonstration workshop on the Rapid Assessment Survey methodology held at the Kobe University (Japan; July 13–15, 2010) where the goal was to provide training to Southeast Asian countries on NIS survey techniques that are quick and inexpensive. The demonstration workshop was co-hosted by Professor Hiroshi Kawai (Kobe University), Dr. Hisashi Yokoyama (Fisheries Research Agency, Japan), and Dr. Thomas Therriault (Fisheries and Oceans Canada) and was attended by participants from Malaysia, the Philippines, Indonesia, Singapore, Thailand and Vietnam.

WG 21 also held a Rapid Assessment Survey in Newport (Oregon, U.S.A.; October 18–20, 2010) immediately before the PICES-2010 in Portland. The RAS was hosted by Dr. John Chapman (Oregon State University, Hatfield Marine Science Center), and attended by participants from Japan, Russia, Canada and the U.S.A. Progress was also made on the WG 21 NIS Database Project, and new database features include the mapping of indigenous and non-indigenous species at a global scale using the MEOW ecoregions, and the ability to generate custom NIS atlases.

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

Ms. Ingrid Burgetz, Co-Chair of WG 24, summarized WG 24 activities over the past year. Progress was made toward TOR-1 (Modeling and Assessing Interactions of Marine Aquaculture) by conducting a review of long and short term, near and far-field effects of aquaculture on benthic communities, including chemical and physical changes, and rate of ecosystem recovery. Each member country was asked to review research related to their primary culture approaches (finfish, shellfish and algae culture), and the first drafts of the review are due April 1, 2011. Discussions were held regarding TOR-2 (Risk Assessment Methodologies) and to develop an overview of risk assessment approaches and relative legislative frameworks required for sustainable marine aquaculture. The members of WG 24 decided that once this report is finalized WG-24 will not pursue additional activities under this TOR due to the need to concentrate efforts on TOR-1 and TOR-3 activities (only 1 year remains for WG 24, and WG-24 expertise lies in the TOR-1 and TOR-3 areas). The deadline for submitting country updates for the TOR-2 report is November 30, 2010. Progress has also been made to address TOR-3 (Aquatic Animal Disease of Aquaculture Concern), and the report will identify diseases of concern, regulations/rules, national/regional diagnostic and control programs, detection methods, past and ongoing research activities, and issues around perceived or realized risks associated with transfer of diseases between wild and farmed fish. The deadline for first drafts of the TOR-3 reports is April 1, 2011.

Study Group on *Human Dimensions (SG-HD)*

Dr. Mitsutaku Makino, Chairman of SG-HD, presented an overview of the activities completed by the Study Group. It is widely recognized that human dimensions are an important component of PICES activities, and they are relevant to the PICES FUTURE (particularly SOFE, other groups). The first draft of the HD-SG report and recommendations will be completed by January 2011. The draft report will be circulated to the PICES members for comments in February or March 2011, and the revised version will be submitted at the PICES inter-sessional Science Board meeting in April 2011. Additional edits will be completed during the summer of 2011 and the final report will be presented during PICES-2011 in Khabarovsk, Russia. A proposal has been submitted to the Japanese Trust Fund/MAFF to support a new PICES Working Group on Human Dimensions over the period of 2012–2016.

AGENDA ITEM 5

Relations with other programs and organizations

Dr. Peter Kershaw presented a report on the objectives and activities of the Group of Experts on Scientific Aspects of Marine Pollution (GESAMP) and potential areas of collaboration with PICES (see *MEQ Endnote 5*).

AGENDA ITEM 6

Renewed MEQ focus on contaminants in the North Pacific marine environment

Several members of MEQ expressed interest in establishing an expert group to investigate the collaborative assessment and reporting of contaminants in the marine environment of the North Pacific. They pointed to the popularity of the MEQ/FUTURE Topic Session (S12) on “*Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function*” and the large number of presentations that highlighted contaminants as an example of the need for a new group. It is important to note that investigation of the role of contaminants in the marine environment is specifically identified by the MEQ Action Plan as a focus area. As a first step, MEQ agreed to promote the idea of a workshop on the topic at PICES-2011 (see *MEQ Endnote 5*).

AGENDA ITEM 7

Report from FUTURE: Proposed Working Group

AICE-AP Chairman, Dr. Thomas Therriault, briefly discussed the outcome of an inter-sessional FUTURE workshop held August 16–18 in Seoul, Korea. MEQ recommended the establishment of a new BIO/MEQ Working Group on *Marine Ecosystem Responses to Multiple Stressors* (*MEQ Endnote 3*)

AGENDA ITEM 9

Review and revision of MEQ Action Plan

MEQ agreed to review and revise the Action Plan once the PICES Strategic Plan has been revised.

AGENDA ITEM 10

MEQ Best Oral Presentation award for PICES-2010

The MEQ Best Presentation Award Committee (Changkyu Lee, Olga Lukyanova, Darlene Smith, Steve Rumrill) was identified and provided with scoring sheets and standardized criteria for judging the eligible presentations and posters. The MEQ Best Oral Presentation for 2010 was awarded to Jenny Lane (USA): S9-6484 – *The development of toxigenic Pseudo-nitzschia bloom models in Monterey Bay, California, and their application at a single monitoring site within the model domain.*

AGENDA ITEM 11

Suggested theme for PICES-2012

MEQ members voiced their continued support for the PICES tradition of referring to the host country for identification and establishment of the theme for the PICES Annual Meeting. The Committee suggested that a possible theme for PICES-2012 might be “*Critical gaps in understanding the resiliency of North Pacific Marine ecosystems to anthropogenic stressors and climate change.*”

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AGENDA ITEM 12

Items with financial implications for 2011

The MEQ Committee received and endorsed proposals for 2 workshops and 3 topic sessions for PICES-2011 in Khabarovsk, Russia.

Topic Sessions

- ½-day MEQ Topic Session on “*Harmful algal blooms in a changing world*” (*HAB-S Endnote 4*)
- 1-day MEQ/FIS Topic Session on “*Identification and characterization of environmental interactions of marine aquaculture in the North Pacific*” (*WG 24 Endnote 5*)
- 1-day MEQ/FUTURE Topic Session on “*Land-sea interactions and anthropogenic impacts on biological productivity of North Pacific Ocean coastal ecosystems*” (*MEQ Endnote 4*)

Workshops

- 1-day MEQ HAB-S Workshop on “*Incorporation of satellite remote-sensing into monitoring of HABs*” [later renamed as “*Remote sensing techniques for HAB detection and monitoring*”] (*HAB-S Endnote 5*)
- 1-day MEQ Workshop on “*Trends in marine contaminants and their effects in a changing ocean: Refining indicator approaches in support of coastal management*” [later renamed as “*Pollutants in a changing ocean: Refining indicator approaches in support of coastal management*”] (*MEQ Endnote 5*)

MEQ members provided the following ranks on proposed joint theme sessions with ICES at the ICES Annual Science Conference in 2011:

1. Assessment and management of Large Marine Ecosystems,
2. Harmful algal blooms in the Baltic Sea,
3. Ecological response of phytoplankton and microbes to global change processes in ocean basins, shelf seas, and coastal zones,
4. Extracting energy from waves and tides,
5. Integration of multi-disciplinary knowledge in the Baltic Sea to support science-based management,
6. The interface between management and science.

Other items

Section on Harmful Algal Blooms in the North Pacific

- PICES to support a HAB-S member to attend the ICES Annual Science Conference in Gdansk, Poland,
- PICES to co-sponsor the 15th International HAB Conference to be held in Changwon Korea, 2012,
- Training course on satellite remote sensing for early career scientists (*HAB-S Endnote 5*) to be held the week prior to PICES-2011, ideally in Khabarovsk,
- IOC representative (Henrik Enevoldsen, Monica Lion) to attend PICES-2011 to discuss HAE-DAT, country maps and decadal reports,
- request for participation by a manager/scientist(s) from China who has access to HAB monitoring data,
- ½-day HAB-S business meeting at PICES-2011.

Working Group on Non- indigenous Species (WG 21)

PICES or MAFF funding will be used to support:

- 4-day Rapid Assessment Survey of marine non-indigenous species in Vladivostok (MAFF Project Funds; note: requires logistic support from Russian host institutions),
- 4–5 day demonstration RAS workshop in Thailand (Spring, 2011),
- Extend WG 21 mandate to 2014 to permit the conclusion of final RAS in Japan and Canada,
- 2-day WG 21 business meeting at PICES-2011,
- Travel for PICES members to participate in joint meeting between PICES WG 21 and ICES WGs PICES at the 7th International Conference on Marine Bioinvasions (Spain).

Working Group on *Environmental Interactions of Marine Aquaculture*

- 1-day WG 24 business meeting at PICES-2011.

Study Group on *Human Dimensions*

- Extend SG-HD to 2012 in order to overlap with MAFF fund request.

AGENDA ITEM 13

Other business

None

MEQ Endnote 1

MEQ participation list

Members

Ik Kyo Chung (Korea)
 Glen Jamieson (Canada)
 Shigeru Itakura (Japan)
 Kunio Kohata (Japan)
 Changyu Lee (Korea)
 Olga Lukyanova (Russia)
 Mitsutaku Makino (Japan, Co-Chairman)
 Steven Rumrill (U.S.A., Chairman)
 Darlene Smith (Canada)
 John Stein (U.S.A.)
 Thomas Therriault (Canada)

Observers

Katsuyuki Abo (Japan)
 Nick Adams (USA)
 Ingrid Burgetz (Canada)
 Bich-Thuy Eberhardt (USA)
 Graham Gillespie (Canada)
 Yichiro Ichibashi (Japan)
 Peter Kershaw (GESAMP)
 Sangjin Lee (NOWPAP)
 Emily Olesin (USA)
 Peter Ross (Canada)
 William Sydeman (USA)
 Vera Trainer (USA)
 Takafumi Yoshida (NOWPAP, CEARAC)

MEQ Endnote 2

MEQ meeting agenda

1. Welcome /introduction of MEQ Committee members and observers
2. Approval of MEQ meeting agenda
3. Implementation of PICES-2009 decisions
4. Status reports from MEQ expert groups
 - Section on *Harmful Algal Blooms in the North Pacific* (Dr. Vera Trainer, USA/Dr. Changkyu Lee, Korea)
 - Working Group on *Aquatic Non-Indigenous Species* (Ms. Darlene Smith, Canada/Dr. Vasily Radashevsky, Russia)
 - Working Group on *Environmental Interactions of Marine Aquaculture* (Dr. Ingrid Burgetz, Canada/Dr. Brett Dumbauld, U.S.A./Dr. Katsuyuki Abo, Japan)
 - Study Group on *Human Dimensions* (Dr. Mitsutaku Makino, Japan)
5. Relations with other programs and organizations
 - Group of Experts on Scientific Aspects of Marine Pollution / GESAMP (Dr. Peter Kershaw, UK)

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6. Discussion of contaminants Topic Session and potential new MEQ Study Group on *Contaminants in the Marine Environment* (CME-SG; Dr. Olga Lukyanova, Russia)
7. Report from FUTURE Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems* (AICE-AP) and FUTURE Workshop; proposed Work Group on *Marine Ecosystem Responses to Multiple Stressors* (Dr. Tom Therriault, Canada)
8. Discussion of MEQ contributions and potential realignment of HABs, NIS, and Marine Aquaculture to address FUTURE (Dr. John Stein, U.S.A.)
9. Review and revision of MEQ Action Plan (Dr. Steven Rumrill, U.S.A.)
10. MEQ 2010 Best Presentation and Poster awards
11. Suggestion for the theme for PICES-2012, Hiroshima, Japan
12. Summary of MEQ items with financial implications for 2011
 - a) Proposed inter-sessional meetings
 - b) Proposed topics sessions, workshops, publications, etc.
 - c) Travel support requests
 - d) MEQ support for proposed ICES sessions
 - e) Other items
13. Other business

MEQ Endnote 3

Proposal for a FUTURE (AICE)/MEQ/BIO Working Group on *Marine Ecosystem Responses to Multiple Stressors*

Duration: 2011 to 2013

Proposed Chairs: Dr. Motomitsu Takahashi (Japan); Dr. Steve Rumrill (U.S.A.*); Dr. Ian Perry (Canada*)

Proposed Terms of Reference:

1. review and identify critical stressors responsible for ecosystem-level changes, with emphasis on North Pacific ecosystems
2. identify spatial extent/regional differences in anthropogenic and natural stressors among North Pacific ecosystems
3. identify potential sources of data/information available from national/international programs and PICES expert groups on ecosystem responses/anthropogenic stressors
4. identify how PICES countries are currently working to address the cumulative effects from multiple stressors in the marine environment
5. provide metrics of ecosystem change, resiliency and vulnerability for implementation within the PICES FUTURE program as per recommendations from the Intersessional FUTURE Workshop on Ecosystem Indicators
6. convene workshops and sessions to compare ecosystem responses by regions and evaluate results
7. publish a final technical report to summarize results

* denotes tentative service as co-chair with recognition of need for potential replacement or additional co-chair to contribute required expertise and distribute workload.

MEQ Endnote 4

**Proposal for a 1-day MEQ/FUTURE Topic Session on
 “Land-sea Interactions and Anthropogenic Impacts on Biological Productivity of North Pacific Ocean
 Coastal Ecosystems” at PICES-2011**

Co-convenors: Dr. Masahide Kaeriyama (AICE – Japan); Dr. Thomas Therriault (AICE – Canada); Dr. Olga Lukyanova (MEQ – Russia); Dr. Steven Rumrill (MEQ – U.S.A.)

Description: Land-sea interactions are widely recognized as an important component of coastal ecosystem processes throughout the North Pacific Region. Anthropogenic activities in upland and coastal areas can significantly alter the productivity of coastal ecosystems and disturb the communities that depend on them. Human activities such as pollution or overfishing can result in immediate and direct impacts on biological productivity. However, there are an increasing number of indirect impacts such as altering the flow of ecosystem-transboundary materials (ETMs) that are responsible for the enriched productivity of many northern coastal systems. In Asia, the dissolved iron that is transported from the Amur River basin into the Sea of Okhotsk and Oyashio Region is now recognized as a major regulator of the primary productivity in these coastal waters. Similarly, disruptions in the timing and amplitude of riverine discharges from the Columbia River Basin (Pacific Northwest) result in significant alterations of salinity regimes, sediment transport, biological productivity, and fisheries returns throughout the region influenced by the Columbia River plume. Anthropogenic impacts such as changes in land use, artificial river channelization, hydropower structures, and urbanization disrupt and alter the flow of ETMs thereby reducing the productivity in these coastal ecosystems. Furthermore, these alterations can lead to the manifestation of other stressors in coastal ecosystems such as jellyfish blooms, hypoxia events, and harmful algal bloom (HAB) outbreaks.

This session will focus on: 1) how ETMs (e.g., dissolved iron, carbon and other elements) are transported from upland ecosystems into coastal ones, 2) what mechanisms regulate the supply of ETMs and how the downstream transport of these impact the productivity (primary production) of coastal systems, 3) how anthropogenic impacts disrupt the ETM system and resulting changes downstream including increased ecosystem vulnerability, 4) how anthropogenic impacts directly reduce coastal productivity, and 5) exploration of potential adaptive management strategies based on the ecosystem-approach to protect the ETM system to ensure sustainability of coastal ecosystems and stability for the coastal societies depending on them.

PICES request: travel support for 3 invited speakers: Dr. Takayuki Shiraiwa (Hokkaido University, Japan); Dr. Nadezhda Khristophorova (Far Eastern Federal University, Russia); Dr. Barbara Hickey (University of Washington, U.S.A.)

MEQ Endnote 5

**Proposal for a 1-day MEQ Workshop on
 “Trends in marine contaminants and their effects in a changing ocean:
 Refining indicator approaches in support of coastal management” at PICES-2011**

Co-convenors: Dr. Peter Ross (Canada); Dr. Olga Lukyanova (Russia)

Description: Many anthropogenic pollutants impact coastal and marine environment all over the world. Persistent biomagnifying chemicals can accumulate in the marine food web to level that are toxic to organisms, and where they also present health risks to humans especially those who depend strongly on the sea as a source of food. Many other chemicals are less persistent but, nevertheless, cause concern as they can affect, for example, hormone and immune status. Both exposure and susceptibility may be strongly affected by climate variability and change. So-called “microplastics” may concentrate pollutants, be ingestible by the ocean's tiny denizens — from zooplankton to filter feeders like clams and mussels — and move up the food chain up to seabirds and marine mammals. Microplastics persist in the ocean for very long times, and they are likely

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accumulating world-wide. Chemical pollutants undergo long range atmospheric transport, travelling according to their physical-chemical properties and to the characteristics of the environment that they encounter (climate, wind direction and others), reaching remote regions where they have never been produced or used. In the case of long-live top predators that were born before the rise organochlorine chemicals, present body burdens and exposure to biomagnifying chemicals is a product of lifetime contaminant accumulation. Marine mammals can mobilize large quantities of stored fat reserves to get them through the period of stress. Bioaccumulating contaminants are collected by anadromous fish in the ocean and then focused into nursery lakes with, as yet, unknown effects on the lake ecosystems in which they hatch and rear. Capacity of a marine environmental compartment to retain and release chemicals, which depends on several processes, is widely variable both spatially and temporally. The effect of climate changes can significantly influence global pollutant cycling. New approaches to pollution monitoring must take into account factors that may confound the interpretation of temporal and spatial trends, as well as the interpretation of health of species being monitored.

Objectives:

- identify the scope of PICES / FUTURE activities that focus on contaminants in the North Pacific marine environment
- update and revision of MEQ Action Plan elements on marine contaminants
- Identify potential interactions with IOC / ICES / GESAMP / NOAA programs that focus on contaminants in the marine environment, including PICES approach to address plastics and microplastics
- develop recommendations for a PICES Study Group on Marine Contaminants, including terms of reference, membership, deliverables

Travel support for 1 PICES Co-convenor and 1 invited scientist (Dr. Peter Kershaw, GESAMP - Plastics and microplastics)

Request additional travel support from GESAMP, NOWPAP, NOAA

REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

The meeting of the Physical Oceanography and Climate Committee (POC) was held from 14:00–18:00 h on October 27, 2010. The Chairman, Dr. Michael Foreman, called the meeting to order and welcomed members and observers (*POC Endnote 1*). Dr. Kyung-Il Chang agreed to act as rapporteur. Dr. Chan Joo Jang was introduced as a new POC member from Korea, replacing Dr. Young-Gyu Park. Several changes were made to the draft agenda to accommodate an ICES report in Agenda Item 5, new Topic Session and workshop proposals for PICES-2011 in Agenda Item 9, and several requests for inter-sessional support in Agenda Item 11. The new draft agenda was adopted (*POC Endnote 2*).

AGENDA ITEM 3

Completion of PICES-2009 decisions

1. Travel support request for CREAMS-AP to send 2 invited speakers in the Special Session on “*Plan for the international cooperation for CREAMS/PICES EAST-IP*” at the PEACE Workshop in September 2010 in Gangneung, Korea, was approved.
2. Travel support request for CC-S to send 2 scientists (non-CC-S members) to attend their 2nd Carbon Synthesis Workshop in Japan, June 2010, was approved. (Note: these funds were not actually used as support was found from other sources.)
3. Travel support request to send 1 PICES scientist to Co-Chair and speak at a WG-FCCIFS co-sponsored session at the September 2010 ICES ASC in Nantes, France.
4. Travel support request to send 1 WG 20 member to the PICES/ICES/FAO Symposium on “*Climate change effects on fish and fisheries*” in Sendai, April 2010.
5. Travel support request to send 1 WG 20 member to the ESSAS Annual Meeting in Iceland, August 30–September 1, 2010.
6. ESSAS request for PICES to provide logistical support to help organize their 2011 Open Science Meeting was approved but the \$20K requested to support the travel of young scientists from Asian countries to this meeting was deferred to 2011.
7. Proposed POC/BIO 2-day workshop on “*Carbon data synthesis*” was approved for PICES-2010.
8. Proposed POC/BIO/MONITOR/FUTURE 1-day Topic Session on “*Comparing the two major gyres of the subarctic North Pacific – seasonal and interannual variability and its predictability*” was approved for PICES-2010.
9. Proposed POC/MEQ/FUTURE ½-day Topic Session on “*Marine renewable energy development in coastal and estuarine environments around the North Pacific*” was approved for PICES-2010.
10. Proposed POC/FIS/BIO/FUTURE 1-day Topic Session on “*Impact of climate variability on marine ecosystems: understanding functional responses to facilitate forecasting*” was approved for PICES-2010.
11. Proposed POC Contributed Paper Session was approved for PICES-2010.

AGENDA ITEM 4

Reports of existing subsidiary bodies and plans for ones

Section on *Carbon and Climate* (CC-S)

Dr. James Christian, Co-Chairman of the Section on *Carbon and Climate* (CC-S), reported on the Section’s October 22–23 Data Synthesis workshop and its meeting on October 24. He also summarized the 5-year report (see *CC-S Endnote 3*) that was emailed to all POC members on October 17. The Committee commended CC-S on its excellent progress and unanimously approved a recommendation to Science Board that the Section be renewed for another 5 years. Requests were made for a 1-day business meeting at PICES-2011 and for PICES to become a co-sponsor and provide funds for international participants at a SOLAS/IMBER workshop on

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“*Designing a global ocean acidification–carbon observing system*” in late 2011 or early 2012. There was insufficient information on this workshop so POC decided that Dr. Christian should submit a more comprehensive proposal to Science Board at its inter-sessional meeting in April 2011. The full CC-S annual report appears elsewhere in the PICES 2010 Annual Report.

Advisory Panel on *CREAMS/PICES Program in East Asian Marginal Seas* (CREAMS-AP)

Dr. Joji Ishizaka, Co-Chairman of CREAMS-AP, gave a brief report on the activities of the Panel over the past year. These included two cruises in July 2010 and meetings in Qingdao, China on May 11, in Gangneung, Korea at the PEACE Workshop on September 11–12, and in Portland, U.S.A. on October 23. Requests were made to provide travel support for 3 invited speakers to a proposed workshop on “*Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES EAST-I Program*” (CREAMS-AP Endnote 4) at PICES-2011, and for 4 students or early career scientists to attend the NOWPAP/IOC-WESTPAC/PICES training course on “*Remote sensing data analysis*” in Vladivostok in October 2011. The full CREAMS-AP report can be found elsewhere in the PICES 2010 Annual Report.

Working Group on *Evaluation of Climate Change Projections* (WG 20)

Dr. Foreman, Co-Chairman of WG 20, gave a brief summary of the Working Group business meeting on October 24. (Details can be found in the Working Group report elsewhere in the PICES 2010 Annual Report.) Highlights included: (1) a review of activities over the past 4 years cross-referenced to the Working Group’s TORs, (2) an outline of WG 20’s final report, (3) draft recommendations to FUTURE and PICES, and (4) a draft of TORs for a new working group on “North Pacific Climate Variability and Change” that was proposed by Dr. Emanuele Di Lorenzo (POC Endnote 3). There was considerable discussion about these TORs with a few of the more important issues being: (i) the need to clarify phrases like “conceptual mechanistic models”, (ii) the need to include “uncertainty” somewhere in the TORs, (iii) possible involvement with ICES, and (iv) possible membership (Drs. Howard Freeland and Ichiro Yasuda expressed interest). Dr. Shin-ichi Ito remarked that though it ended 1½ years ago, CFAME (Climate Forcing and Marine Ecosystems Task Team) has still not submitted a final report and this may hamper the establishment of this new working group. WG 20 will be disbanded after PICES-2010 so apart from an update on the status of its final report, there will be no need to provide further progress updates to POC.

PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS)

Dr. Anne Hollowed, Co-Chair of WG-FCCIFS, gave a brief report summarizing activities of the Group over the past year, the highlight of which was the very successful symposium on “*Climate change effects on fish and fisheries*” that they organized in Sendai, Japan, April 26–29, 2010. There was some discussion on the future of this Working Group after its term ends in 2011 and how it might be linked to the new working group proposed by WG 20. ICES plans to create a Strategic Initiative on Climate Change (SSICC) as the next step to succeed WG-FCCIFS and was seeking to align its activities with PICES. POC Committee members agreed that the present ICES “Initiative” has a mandate that is too broad for a Working Group. Joint activities with PICES should be considered by POC after more concrete TORs are available. Travel support requests were made for a workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*” at the ESSAS Open Science Meeting in Seattle, U.S.A. on May 22, 2011; a session on “*Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*” at the ICES Annual Science Meeting in Gdansk; Poland and a workshop on “*Reaction of Northern Hemisphere ecosystems to climate events: A comparison*” in Hamburg, Germany in May 2011. More details can be found in the WG-FCCIFS report contained in the 2010 PICES Annual Report.

AGENDA ITEM 5

Relation with other international organizations

The following five brief presentations were given.

1. Dr. Howard Freeland, representing Argo, reviewed the current status of the Argo program, noting the relatively low density of Argo floats in some parts of the North Pacific and asking PICES members for help in the deployment of floats during their future surveys. Interested parties should contact Mathieu Belbeoch (belbeoch@jcommops.org).
2. Dr. Hee-Dong Jeong, also acting as an observer representing NEAR-GOOS, gave an overview of NEAR-GOOS activities over the last year, focusing on a meeting in Vladivostok in April and updates on their Regional Delayed Mode Data Base (RDMDDB) and regional observing system. There will be a workshop on NEAR/GOOS products at the 8th IOC/WESTPAC international scientific symposium in March 2011 in Busan, Korea.
3. Dr. Toshio Suga, a member of the CLIVAR Pacific Implementation Panel, summarized projects relevant to the North Pacific (NOPCE and Hot Spot) and discussed possible future collaborations with PICES. He was particularly interested in the proposed new working group on “North Pacific Climate Variability and Change” and suggested that CLIVAR might want to co-sponsor a workshop or Topic Session with that group at either the PICES-2012 in Japan, or at Ocean Expo-2012 in Yeosu, Korea. He also suggested inviting a PICES representative to the next Pacific Panel meeting in April 2012 in Noumea, New Caledonia.
4. Dr. Ken Drinkwater, Co-Chairman of the ESSAS Steering Committee, gave a brief summary of their annual meeting in Reykjavik, Iceland, and the status of their upcoming 2nd Open Science Meeting “*Comparative Studies of Climate Effects on Polar and Sub-Polar Ecosystems: Progress in Observations and Predictions*” in Seattle, May 2011. He requested travel support for 2 scientists from PICES Asian countries and 2 students or early career scientists from Asia to attend this meeting (expected total cost is \$14K).
5. Dr. Jürgen Alheit gave a brief summary of ICES activities relevant to PICES, re-iterating the travel support requests of the PICES/ICES WG-FCCIFS.

AGENDA ITEM 6

Election of new POC Chairman

Dr. Michael Foreman nominated Kyung-II Chang to stand for election as the new POC Chairman. No other candidates were nominated. The decision to elect Dr. Chang was unanimous (Executive Secretary presiding). Dr. Foreman agreed to remain as Vice-Chairman to provide assistance and continuity.

AGENDA ITEM 7

Discussion of POC Action Plan

Considering numerous changes that are anticipated when the Terms of Reference for the three FUTURE Advisory Panels are ratified, the Chairman recommended that changes to the POC Action Plan be postponed for a year. The Committee agreed to review this issue at PICES-2011.

AGENDA ITEM 8

Update on FUTURE and the new Advisory Panels

Dr. Hiroaki Saito, Chairman of the COVE Advisory Panel on *Climate, Oceanographic Variability and Ecosystems* (COVE-AP), gave a brief summary of the COVE-AP meeting held on October 22. COVE-AP fully supports the proposed new “climate” working group and is proposing another new working group on “Ecosystem Responses to Multiple Stressors” and a FUTURE workshop on “*Indicators of Status and Change within North Pacific Marine Ecosystems*” to occur just before or after the inter-sessional Science Board meeting in April 2011.

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AGENDA ITEM 9

Planning for PICES-2011

1. The Committee endorsed a request for a 1-day CREAMS-AP workshop on “*Recent Advances in Monitoring and Understanding of Asian Marginal Seas: 5 years of CREAMS/PICES EAST-I Program*” (CREAMS-AP Endnote 4), with 3 invited speakers, to be followed by a business meeting.
2. In addition to a POC Paper Session, business meetings for CC-S, WG-FCCIFS, and the proposed new working group on “North Pacific Climate Variability and Change”, three Topic Sessions were proposed for PICES 2011 (POC Endnote 4).
3. No suggested invited speakers for the Science Board Symposium were put forward.

AGENDA ITEM 10

PICES-2012 theme

The Annual Meeting will be held in Hiroshima, Japan and at the time of the 2010 POC meeting, the theme had yet to be finalized.

AGENDA ITEM 11

Items with financial implications

Inter-sessional travel requests in 2011

The Committee agreed to put forward to Science Board the following ranked list of travel support requests:

1. Two non-PICES invited scientists to attend the International Workshop on “*Development and application of Regional Climate Models*”, Incheon, Korea, October 11–12, 2011 (POC Endnote 5).
2. An Asian PICES scientist to give a plenary talk at the annual meeting of the Canadian Meteorological and Oceanographic Society, “*Ocean, atmosphere and the changing Pacific*”, Victoria, Canada, June 5–9, 2011.
3. CREAMS-AP requests 4 students or early career scientists to attend the NOWPAP/IOC-WESTPAC/PICES training course on “*Remote sensing data analysis*” in Vladivostok, Russia, October 8–12, 2011.
4. WG-FCCIFS requests that Drs. Ichiro Yasuda and Emanuele Di Lorenzo co-convene the ICES/PICES session “*Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems*” at the ICES ASC in Gdansk, Poland, September 2011.
5. WG-FCCIFS requests 2 Asian scientists to attend their workshop on “*Biological consequences of a decrease in sea ice in Arctic and sub-Arctic Seas*”, just prior to the ESSAS Open Science meeting in Seattle, U.S.A., May 2011.
6. WG-FCCIFS requests 2 Asian co-conveners to attend a workshop on the “*Reaction of Northern Hemisphere ecosystems to climate events: A comparison*” in Hamburg, Germany, May 2011.
7. ESSAS requests 4 PICES Asian scientists (2 students/early career scientists) to attend the ESSAS Open Science meeting in Seattle, U.S.A., May 2011.
8. SOLAS requests students to be selected from PICES member countries to attend the 5th SOLAS Summer School in Corsica, France, August 29–September 10, 2011.
9. WMO requests 1 PICES scientist to attend their International Workshop on “*Climate and oceanic fisheries*” in the Cook Islands (South Pacific), October 3–5, 2011.

Proposed publications for 2010 and beyond

1. WG-FCCIFS suggested publishing their report on the Symposium on “*Climate change effects on fish and fisheries*” held in Sendai, Japan (April 2010) provided to ICES, as PICES Scientific Report;
2. The WG-FCCIFS Sendai Symposium Co-Chairs and interested Working Group members plan to develop a synthesis paper for publication in a journal like *Nature*.
3. Drs. Shoshiro Minobe and Emanuele Di Lorenzo, the Co-Conveners of the PICES-2009 workshop (W8) on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*”, are planning to write a review paper based on the workshop presentations.

Funding requests associated with PICES-2011

- Travel support requested for 3 invited speakers to attend a 1-day CREAMS AP workshop on “Recent Advances in Monitoring and Understanding of Asian Marginal Seas: 5 years of CREAMS/PICES EAST-I Program” (see CREAMS-AP report, Agenda Item 6, elsewhere in the PICES 2010 Annual Report).
- See requests in *POC Endnote 4*.

AGENDA ITEM 12

POC Best Presentation and Poster awards

Drs. Ichiro Yasuda, Stephen Bograd, and Elena Ustinova were judges for the best young presenter and best poster at the POC Paper Session and Topic Session S8. The POC Best Presentation award was given to Hiroshi Kuroda (Japan) for “*A numerical study on the winter mixed layer on the shelf-slope region south of Japan*”. The best poster award (a tie) was given to Sarah Ann Thompson (U.S.A.) for her poster “*Comparing pathways of functional response of top predators to seasonality of upwelling in the California Current*”, and Chan Joo Jang (Korea) for his poster on “*Variability of mixed layer depth and its relation with chlorophyll concentration in the North Pacific Ocean*”.

AGENDA ITEM 13

Other business

Of the 4 topic sessions that will be convened at the ICES Annual Science Conference in Gdansk, Poland, September 19–23, 2011 and that were considered relevant to POC’s interests, none inspired sufficient enthusiasm among the POC members present to co-convene or suggest PICES support.

AGENDA ITEM 14

Adoption of report and recommendations to Science Board (Agenda Item 14)

This POC report was circulated among, and approved by all Committee members. All recommendations were brought by Dr. Foreman to Science Board meeting on October 30, 2010.

POC Endnote 1**POC participation list**Members

Steven Bograd (U.S.A.)
 Kyung-Il Chang (Korea, rapporteur)
 James Christian (Canada)
 Michael Foreman (Canada, Chairman)
 Shin-ichi Ito (Japan)
 Chan Joo Jang (Korea)
 Hee-Dong Jeong (Korea)
 Nate Mantua (U.S.A.)
 Elena Ustinova (Russia)
 Ichiro Yasuda (Japan, Vice-Chairman)
 Yury Zuenko (Russia)

Observers

Jürgen Alheit (ICES)
 Emilie Brevière (SOLAS)
 Alexander Bychkov (PICES)
 Ken Drinkwater (ESSAS)
 Howard Freeland (Argo)
 Anne Hollowed (U.S.A.)
 Joji Ishizaka (Japan)
 Sophia Johannessen (Canada)
 Kuh Kim (Korea)
 Toshio Suga (CLIVAR)

POC Endnote 2

POC meeting agenda (revised)

1. Welcome, introductions, opening remarks
 - Membership changes
2. Changes to, adoption of, agenda and appointment of rapporteur
3. Completion of PICES-2009 decisions:
4. Reports of existing subsidiary bodies and plans for new ones
 - i) Five-year summary report of the Section on *Carbon and Climate* (Christian/Saino) and request for section renewal.
 - ii) Progress report of the Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* (Ishizaka/Lobanov/Kim)
 - iii) Progress/final report of WG 20 on *Evaluation of Climate Change Projections* (Foreman/Yamanaka) and recommendations for FUTURE.
 - iv) Progress report and future plans of PICES/ICES WG on *Forecasting Climate Change Impacts on Fish and Shellfish* (Ito/Hollowed).
5. Relations with other international organizations/programs:
 - i) Argo (Howard Freeland)
 - ii) NEAR-GOOS (Hee-dong Jeong) and other OOS's (?)
 - iii) WCRP/CLIVAR (Toshio Suga?)
 - iv) ESSAS (George Hunt)
 - v) Other organizations/programs ?
6. Election of new POC Chairman
7. POC Action Plan discussion
8. Discussion of FUTURE Implementation Plan and the new Advisory Panels. (Hiroaki Saito)
9. Planning for PICES-2011 "*Mechanisms of marine ecosystem reorganization in the North Pacific*" in Khabarovsk, Russia, October 14–22, 2011.
 - i. Topic/Paper Sessions*:
 - a. POC paper session
 - b. Others (?)
 - ii. Invited speakers for the Science Board Symposium
10. Theme for PICES-2012 in Hiroshima, Japan
11. Items with financial implications
 - i) Proposed inter-sessional meetings for 2011 and beyond
 - ICES/PICES Early Career Scientist Symposium, site (Palma, Majorca?) & dates (2012) TBA
 - *Effects of climate change on the World's oceans – II*, Yeosu, Korea, May 14–18, 2012 (official event of Ocean Expo 2012).
 - others
 - ii) Publications for 2010 and beyond
 - CC-S (?)
 - CSR Special volume on Tides in Marginal Seas – A Volume in Memory of Prof A. Nekrasov. Published April 1, 2010: 16 papers
 - Review paper from PICES-2009 workshop "*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*" (Minobe and Di Lorenzo)
 - iii) Travel support requests
 - iv) Other items
12. 2009 POC Best Presentation and Poster awards (Judges will be appointed early in week and give their recommendation at the Closing Session)
13. Other business
14. Adoption of POC report and recommendations to Science Board

POC Endnote 3**Proposal for a working group on “North Pacific Climate Variability and Change”****Motivation**

Need to develop essential mechanistic understandings of North Pacific climate variability and change that can better guide the formulation of process-based hypotheses underlying the links between ecosystem dynamics and physical climate.

Draft Terms of Reference

1. Develop conceptual models or frameworks of North Pacific climate variability and change that can be readily used by ecosystem scientists to explore hypotheses of the links between ecosystem dynamics and physical climate.
2. Summarize the current understanding of mechanisms of Pacific climate variability, and evaluate the strengths of the underlying hypotheses with supporting evidence.
3. Coordinate, in conjunction with ecosystem scientists, the development and implementation of process-based models to hindcast the variability of available long-term biological time series and explore forecasting.
4. Understand and fill the gaps between what the physical models can currently produce and what ecosystem scientists suggest are important physical forcing factors required for predicting species and ecosystem responses to climate change.
5. Maintain linkages with, and summarize the results from National and International programs/projects such as CLIVAR, IMBER, US CAMEO, Japanese Hot Spot in the Climate System, POMAL, CREAMS EAST-I, POBEX, and others.
6. Convene workshops and sessions to evaluate and compare results
7. Publish a final report summarizing results.

Proposed Co-Chairs: Emauele Di Lorenzo (U.S.A.), Shoshiro Minobe (Japan), Michael Foreman (Canada)

Membership Suggestions (a subset of the following):

Canada: Michael Foreman, Patrick Cummins, William Merryfield, John Fyfe, Howard Freeland

China: Lixin Wu, Guimei Liu

Japan: Shoshiro Minobe, Shin-ichi Ito, Ichiro Yasuda

Korea: Chan Joo Jang, Kwang-Yul Kim, Sang-Wook Yeh

Russia: Yury Zuenko, Elena Ustinova, Vladimir Kattsov

U.S.A.: Emanuele Di Lorenzo, Arthur Miller, Enrique Curchitser, Muyin Wang, Charles Stock, Nathan Mantua, Bo Qiu

POC Endnote 4**Proposals for Paper and Topic Sessions for PICES-2011**1. *Contributed Paper Session*

Co-convenors: Kyung-Il Chang (Korea) and Michael Foreman (Canada)

Sponsor: POC

Duration: 1 day

Invited speakers: none

Description: Papers are invited on all aspects of physical oceanography and climate in the North Pacific and its marginal seas.

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2. Topic Session

Title: Linking migratory fish behavior to End-to-End models

Sponsors: POC, FIS, ICES(?)

Duration: ½day

Co-Convenors: Enrique Curchitser (U.S.A.), Michio Kishi (Japan), Shin-ichi Ito (Japan), Geir Huse (ICES) and Skip McKinnell (PICES)

Invited speakers: travel support requested for 1 invited speaker: either Wei Hao (China) or Jerome Fiechter (U.S.A.)

Description: 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 behavior 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. Recently, new technology has been introduced to tagging equipment and as a consequence data availability is vastly improved. Additionally, new technologies are used to investigate fish movements in laboratory settings. This new information is expected to improve our understanding of fish migration mechanism and contribute to the development of fish-migration models. Furthermore, the development of high-resolution ecosystem models coupled to circulation models makes it possible to simulate fish-migration in the context of realistic environmental fields. The purpose of this session is to understand the current state of development in modeling fish behavior and discuss future potential collaborations to improve fish migration models. This session anticipates presentations that discuss successes (and failures) in modeling migratory fish behavior. Presentations related to data availability for model evaluation of fish behavior are also welcome. Based on the results and opinions expressed at the session, the conveners would like to discuss the desirability of establishing a group that will focus its attention on developing and advancing the state of fish behavioral modeling.

3. Topic Session

Title: Recent changes of North Pacific climate and marine ecosystems: implications for dynamics of the dominant species

Sponsors: FIS, POC

Duration: 1 day

Co-Convenors: Sukyung Kang (Korea), James Overland (U.S.A.), Akihiko Yatsu (Japan) and Skip McKinnell (PICES)

Invited speakers: two keynote speakers (climate-1 and fish-1)

Description: The coincidence of multidecadal-scale alternations of dominant marine fish species coupled with multidecadal-scale “Climatic Jumps” created a concept of the Regime Shift. The recently published PICES ecosystem status report noted that the frequency of these events appears to have increased and various indicators suggest that their amplitude has increased as well. The Arctic Oscillation Index, for example, reached an extreme negative anomaly during January–March of 2010, which brought a severe winter to much of the Northern Hemisphere, while other areas were warmed equivalently by the effects of the 2009/10 El Niño. The summer of 2010 saw record-setting high temperatures in some PICES member countries, accompanied by an abrupt shift in the tropics from El Niño to La Niña in July 2010. In the northwestern Pacific, after decades at low levels, sardine abundance has begun to increase while the anchovy abundance is declining; perhaps signalling a new Regime. This topic session will review recent ocean/climate variability, with particular emphasis on what has occurred from 2009 to 2010. It will focus on the major ecological components of North Pacific marine ecosystems, particularly commercially important fish species. Papers on mechanistic linkages between population dynamics of marine species and environmental conditions are especially encouraged.

4. Topic Session

Title: Mechanisms of physical-biological coupling forcing biological “hotspots” in the Western North Pacific and Western North Atlantic [later renamed to “Mechanisms of physical-biological coupling forcing biological “hotspots””]

Sponsors: BIO/POC with potential for FIS

Duration: 1 day

Co-convenors: Elliott Hazen (U.S.A.), Robert Suryan (U.S.A.)
 (Japan) Suggested: Yutaka Watanuki (MBM Co-Chair), Ichiro Yasuda
 (Russia) Suggested: Oleg N. Katugin, Vladimir Radchenko
 (ICES) Jürgen Alheit

Requests: 2 invited speakers (PICES), 2 invited speakers (ICES)

Potential invited speakers: Sei-Ichi Saitoh (Japan), Jun Nishioka (Japan), Yuri Artukin (Russia), Gail Davoren (Canada/ICES), Per Fauchald (Norway/ICES), Andrew Pershing (USA/ICES)

Description: This topic session will examine the physical and oceanographic factors that result in biodiversity, ecological, or economic hotspots in the North Pacific. Spatially, this session will focus on the Kuroshio/Oyashio extensions and ecotone, the intersection of the Sea of Okhotsk and the western North Pacific (Kuril Islands region), and the Western Bering Sea. For the Atlantic, this session will focus on the intersection of the Gulf Stream and Labrador Current in addition to tidally driven systems such as the Gulf of Maine and Gulf of St. Lawrence.

“Hotspots” can broadly be defined as areas encompassing a high number of species, a high abundance of an indicator species, or an area of high economic value. More specifically, we seek interdisciplinary contributions on physical-biological coupling and resulting seasonal or year-round “hotspots” in primary to tertiary productivity. This includes data on physics, phyto- and zooplankton, forage fish, and upper trophic level predators (*e.g.* fish, seabirds, mammals, humans). We are particularly interested in multi-species and multi-use hotspots (*e.g.* the overlap between human and ecological importance) and potential changes in hotspots under future climate change scenarios. Modeling and empirical studies are encouraged. We would solicit a special publication in the primary literature pending subscription to the session.

POC Endnote 5

Proposal for an inter-sessional workshop

Title: International Workshop on “*Development and application of Regional Climate Models*”

Dates: October 11–12, 2011 (just before the 2011 PICES Annual Meeting in Russia)

Venue: Incheon, Korea

Co-conveners: Kyung-II Chang (POC), Michael Foreman (POC), Chan Joo Jang (POC), Angelica Peña (BIO)

Description: Both global and regional numerical climate models are important tools in understanding physical mechanisms involved in and controlling climate change and variability at multiple spatio-temporal scales. They may also provide the unique possibility to construct physically based future climate projections, the starting point for many socio-economic impact and adaptation considerations to future climate change. Global and regional modeling complement each other. While the global coupled general circulation models (GCMs) may be capable of capturing the large-scale mean climate behavior, especially those related to anthropogenic forcing, they often cannot be directly used for assessing regional climate impacts mainly due to their coarse spatial scale. Furthermore, they are usually not successful in capturing regionally important physical processes and reproducing higher order statistics and extreme events. Regional climate modeling has been introduced to fill the gap between the GCMs and the growing demand of climate predictions and scenarios on highly-resolved spatio-temporal scales. Various approaches and parameterizations have been adopted in existing regional climate models (RCMs). This two-day workshop will provide a platform to discuss various aspects of regional climate modeling such as different approaches, downscaling, parameterizations, and coupling to the GCMs. It will also encompass the coupling of RCMs to ecosystem models.

Financial support: Two invited speakers from PICES member nations and two invitees from non-PICES member countries that are familiar with state of the art Regional Climate Models – supported by PICES (approach ICES as possible co-sponsor?); Korean government will support up to 10 invited speakers from PICES countries.

Link to PICES/FUTURE goals: Higher resolution projections of climate change that can be used by PICES ecosystem scientists.

REPORT OF TECHNICAL COMMITTEE ON DATA EXCHANGE

AGENDA ITEMS 1, 2 AND 3

Welcome and introduction of members, election of Chairman and Vice-Chairman, adoption of agenda

The meeting of the Technical Committee on Data Exchange (hereafter TCODE) was held from 14:10–18:00 on October 27, 2010. Since both the Chairman and Vice-Chairman were absent, Dr. Skip McKinnell, Deputy Executive Secretary, called the meeting to order and welcomed the participants (*TCODE Endnote 1*). The first business item was the election of a new Chairman and Vice-Chairman to serve for the next three years so Dr. McKinnell asked for nominations. Dr. Toru Suzuki (Japan) was nominated for Chairman and Dr. Hernan Garcia was nominated for Vice-Chairman and both were willing to stand for election. No other nominations were received. The nominees were endorsed unanimously by the participants. Formally, a term of office for the chairman does not begin until the conclusion of the Annual Meeting at which they are elected, Dr. Suzuki was willing to conduct the meeting in the absence of the chair and vice-chair. Several changes were made to the draft agenda and the revised agenda was adopted (*TCODE Endnote 2*).

AGENDA ITEM 4

Review progress on TCODE Work Plan for 2009/2010

a) Support of HAB-S work

TCODE will continue, through Mr. Robin Brown, to support HAB-S work. The submission of HAB data to the ICES/PICES database is uneven and generally poor. United States and Atlantic Canada data are good, whereas Canadian Pacific data are poor. Generally, there is one person in each country who controls these data and this can lead to submission delays. The results are disappointing in both ICES and PICES. Few countries are providing the necessary the metadata (hereafter MDB) information by geographical area. We will continue this item and circulate the information to members. Dr. Igor Shevchenko requested that Mr. Brown register the HAB-S database on the TCODE web site.

b) Cooperation with other data management groups outside PICES

- i) As a follow up on the unsuccessful ICES Topic Session proposal “*Data for the Masses: Recent advances in the application of Marine Data and Information Management*” at the 2010 ICES Working Group on Data and Information Management (WGDIM) meeting in Nantes, France, it was determined that TCODE would not resubmit a proposal for the 2012 ICES ASC. A discussion of how ICES and PICES should work at the broadest levels, including data management, followed. This issue will be tabled until the results of the PICES/ICES Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* are known. Mr. Brown will encourage the inclusion of data management in those discussions.
- ii) A report from ICES WGDIM in 2009 was given by Dr. Georgiy Moiseenko. His continued participation with this Working Group is encouraged.
- iii) An invitation was received to attend IODE’s (International Oceanographic Data Exchange of IOC) 21st session (March 23–26, 2011) in Liège, Belgium. TCODE members suggested that Dr. Suzuki attend the conference as a representative of PICES/TCODE. In addition, he should attend the IODE Scientific Conference (March 21–22, 2011) that precedes this committee meeting. TCODE proposed to Science Board that they support a request for \$3000 for this travel.
- iv) Drs. Garcia and Suzuki expressed their wish to attend the 5th meeting of IODE GE-BICH (Group of Experts on Biological and Chemical Data Management and Exchange Practices) from January 17–20, 2011 in Oostende, Belgium. They will report the summary of the meeting at PICES-2012.

c) PICES Metadata Federation project

- i) Dr. Shevchenko requested that TCODE recommend the renewal of the remote server contract with

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AdHost. Additional storage space will be needed in the upcoming fiscal year (July 2011–July 2012). Dr. Shevchenko estimates that the cost will be approximately \$3000 (up from about \$2000 for this year). TCODE will request that funds be made available by PICES.

- ii) Dr. Shevchenko will continue to administer the AdHost server and Dr. Suzuki will serve as backup.
- iii) Dr. Shevchenko will run the AdHost server performance experiment (stress test) on accessing metadata from different locations and multiple users. He will approach other TCODE members as participants.
- iv) Mr. Brown and Dr. John Holmes added 50–60 Canadian metadata records to the PICES Metadata server in addition to the 100 that were already there. Canadian records total about 150 and now all PICES countries are participating.
- v) TCODE thanks Ms. Tatiana Semenova, intern at the PICES Secretariat, for her work to transfer the PICES Digital Library to the rented server. The rented server will contain a virtual PICES web site and a backup for the PICES web site.
- vi) It is requested that China, Japan, and Korea move their metadata records to the AdHost server. This will be the responsibility of Drs. Suzuki, Kyu-Kui Jung, and Shevchenko.
- vii) There are links to MIRC NPEM and KODC servers from the NSDI clearinghouse site that are unusable and should be removed. TCODE needs to look into this and it was requested that Dr. Suzuki try to do this removal. Updating the AdHost server to monitor MDB use was tabled.
- viii) Dr. Shevchenko will present a poster on this issue at the PICES-2010 poster session (October 28). He and Mr. Brown will also prepare a PowerPoint presentation to explain and promote the GeoNetwork portal. Plans to advertise the GeoNetwork resource at the 3rd PICES summer school on “*Satellite oceanography*” in Seoul, Korea (August 25–28, 2009) and a training course on “*Remote sensing data analysis*” in Vladivostok, Russia (October 8–12, 2011) were/will not be done due to a lack of space. The request to have the GeoNetwork resource reported at next year’s Opening Session was to be tabled and reviewed prior to next year’s Annual Meeting. Plans to have short GeoNetwork resource presentations for MONITOR, FUTURE’s Advisory Panels, SOFE, COVE and AICE, were tabled pending the development of the PowerPoint presentation. The MDB server link on the sidebar has been added to the PICES web page and backup options for the GeoNetwork portal have been explored by Dr. Shevchenko. Mr. Brown and he will continue to update the technical report to reflect GeoNetwork.

d) TCODE web pages

Dr. Shevchenko continues to maintain and update TCODE web pages.

e) FUTURE activities

Mr. Brown is participating in FUTURE activities and serves as Chairman of the Advisory Panel on *Status, Outlook, Forecast and Engagement* (SOFE-AP).

f) Update of WG 22 iron database and proposed collaboration with IOC/IODE

The update of the Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22) iron database and proposed collaboration with IOC/IODE has not been done but will continue to be the responsibility of Mr. Brown.

g) Metadata reporting from NPESR

The recent publication of the North Pacific Ecosystem Status Report (PICES Special Publication 4, 2010) will be examined by Mr. Brown to see if the metadata in the report is in the TCODE MDB.

h) Coordination with Section on Carbon and Climate

Dr. Suzuki discussed coordination with the Section on *Carbon and Climate*, including a description of their database.

i) Activities with MONITOR

The coordination of activities with MONITOR will continue as the responsibility of Dr. Thomas Royer, with the gathering of MONITOR activities through their reports and correspondence.

j) PICES-2011 Topic Session proposals

The TCODE e-poster Topic Session on “*Monitoring and ocean observing systems*” at PICES-2010 and a proposal for a Topic Session at PICES-2011 were discussed. Since there were only three e-posters in 2010, it was decided not to give an award for the top poster. It was suggested that TCODE hold a joint e-poster session on monitoring and data management systems with MONITOR at PICES-2011. The theme of that meeting is “*Ecosystem reorganization – tracking changes in ecosystems and their status*”. Conveners are needed for that session. A joint session with CREAMS-AP/POC/BIO/MONITOR is a possibility to address permanent observations and data exchanges in East Asia Marginal Seas in the PICES region. (The topic was later changed to “*How well do our models really work and what data do we need to check and improve them?*” and was co-sponsored by MONITOR and FUTURE; TCODE later announced an e-poster Topic Session on “*Data and data systems for validation of numerical models*” (TCODE Endnote 3)).

k) Relationships with other international organizations

The request to have an *ex-officio* member from OBIS (Ocean Biogeographic Information System) was tabled pending further discussions with OBIS on the situation and the purpose of such an appointment. Dr. Suzuki will investigate this with IODE.

l) POMA nominations

A call will come in December for nominations for the PICES Ocean Monitoring Service Award (POMA) and candidates will be voted on by MONITOR and TCODE. Candidates from previous years will continue to be considered and will need to be resubmitted to the Secretariat for consideration for 2011. Members of TCODE were requested to think about likely candidates and to have their nominations ready before the inter-sessional Science Board Meeting in April 2011.

m) Renewal of rented server

A proposal to renew the rented server for next year was prepared by Dr. Shevchenko and a request for its funding was presented to the Science Board for consideration.

n) Metadata submissions

A discussion of how TCODE can encourage the submission of metadata was conducted. Dr. Shevchenko presented a PowerPoint and requested that TCODE members view his poster during the poster session. It was suggested that this PowerPoint of the GeoNetwork portal be circulated and/or presented to the other PICES Committees. A presentation at the Science Board Symposium at PICES-2011 might be an appropriate venue. Dr. Garcia indicated that it might be possible to pursue a more formal approach to encourage metadata submissions.

AGENDA ITEM 5

Report of FUTURE AP meetings

Mr. Brown, Dr. Shevchenko and Dr. Suzuki reported on the summaries of SOFE-AP, AICE-AP and COVE-AP meetings, respectively.

AGENDA ITEM 6

Annual country reports

Canada, Japan and Russia presented their annual activities of oceanographic data and information.

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AGENDA ITEM 7

Relation with other international programmes/organizations

TCODE continues to investigate a relationship with ICES, IOC/IODE, OBIS and other international programmes and organizations.

AGENDA ITEM 8

Summary of items with financial implications

Dr. Suzuki's request of \$3,000 for travel support to attend an IODE XXI session in Liège, Belgium; Dr. Shevchenko proposal of \$3,000 to continue renting a server with expanded capability for next year; TCODE's request for travel support for an invited speaker for PICES-2011 in Khabarovsk, Russia were presented to Science Board at the PICES Annual Meeting.

AGENDA ITEM 9

Discussion and adoption on the TCODE work plan 2010/2011

Members of TCODE discussed the work plan for 2010/2011 and adopted it (*TCODE Endnote 4*).

TCODE Endnote 1

TCODE participation list

Members

Robin Brown (Canada)
Hernan Garcia (U.S.A.)
Georgiy Moissenko (Russia)
Tom Royer (U.S.A.)
Yin Ruguang (China)
Igor Shevchenko (Russia)

Toru Suzuki (Japan)
Tomowo Watanabe (Japan)
Ninsheng Yang (China)

Observer

Skip McKinnell (PICES)

TCODE Endnote 2

TCODE meeting agenda

- 1) Welcome and introduction of members
- 2) Election of chairperson and vice-chairperson in triennial 2011–2013
- 3) Adoption of agenda
- 4) Review progress on TCODE Work Plan for 2009/2010
 - a) Continue to support HAB-S work (R. Brown)
 - b) Cooperation with other data management groups outside PICES
 - i) Follow up on the unsuccessful ICES Topic Session proposal at the 2010 WG on Data and Information Management meeting in Nantes, France (T. Suzuki [B. Megrey])
 - ii) ICES WG on Data and Information Management (G. Moiseenko)
 - iii) IODE-XXI (T. Suzuki)
 - iv) IODE GE-BICH (H. Garcia and T. Suzuki)
 - c) PICES Metadata Federation project
 - i) Renew Remote server contract (I. Shevchenko)
 - ii) Continue to administer AdHost server (I. Shevchenko)

- iii) Run the AdHost server performance experiment on accessing metadata from different locations and multiple users (I. Shevchenko [B. Megrey])
- iv) Brown and Holmes will gather some Canadian metadata records to establish a Canadian presence on the PICES Metadata server. Report on progress at next year TCODE meeting (R. Brown)
- v) Request SB suggest to GC that next PICES intern (Tatiana Semenova) assist with the transfer of the PICES Digital Library to the rented server. Report on status of PICES Digital Library migration and Ecosystem Status Report web pages (I. Shevchenko)
- vi) Japan, Korea and Canada move their metadata records to the AdHost server (T. Suzuki, K-K. Jung, R. Brown, I. Shevchenko)
- vii) Remove NPEM and KODC servers from the NSDI clearinghouse site [B. Megrey]
- viii) Update AdHost server to monitor MDB use (Olga Vasik)
- ix) Promote the GeoNetwork Portal
 - (1) Prepare short PowerPoint presentation on GeoNetwork portal (I. Shevchenko [B. Megrey])
 - (2) Request GeoNetwork resource be advertised at PICES Summer in Seoul (June 2010) and Winter school in Vladivostok (February 2010) (I. Shevchenko [B. Megrey])
 - (3) Request GeoNetwork resource be reported at next years opening session as part of PICES activities (I. Shevchenko [B. Megrey])
 - (4) Plan to have a short presentation on the GeoNetwork resource be given at the MONITOR (and other committee's?) meetings (request at front of the agenda and delay start of TCODE). Prepare a presentation for SOFE, COVE and AICE (I. Shevchenko, R. Brown)
 - (5) Add the MDB server link on the sidebar of the PICES web page
 - (a) Explore GeoNetwork Portal backup options (I. Shevchenko)
 - (b) Update the Technical report to reflect GeoNetwork (I. Shevchenko)
- d) Maintain TCODE web pages (I. Shevchenko)
- e) Participate in FUTURE activities (R. Brown)
- f) Update of WG 22 iron database and proposed collaboration with IOC/IODE (R. Brown)
- g) Use preparation of NPESR to examine participation of metadata reporting (R. Brown)
- h) Coordination with CC-S (Section on *Carbon and Climate*) (T. Suzuki)
- i) Coordination of Activities with MONITOR (Tom Royer)
- j) PICES-2011 Topic Session proposals (All)
- k) Relationships with other international organizations
TCODE will request the Science Board instruct the PICES Secretariat to invite Edward Vanden Berghe (OBIS, USA) to join TCODE as an *ex-officio* member (T. Suzuki [B. Megrey])
- l) POMA Nomination
Nominations will be prepared by Hernan Garcia, K.-K. Jung and R. Brown
- m) Prepare proposal to renew rented server for another year (I. Shevchenko [B. Megrey])
- n) Develop strategy to award and encourage metadata submission (All)
- o) Add TCODE web site to collect and distribute TCODE documents (H. Garcia)
- 5) Report of FUTURE AP meetings (R. Brown, I. Shevchenko, T. Suzuki)
- 6) Annual country reports
- 7) Relation with other international programmes/organizations
- 8) Summary of items with financial implications
 - a) Proposed inter-sessional meetings for 2011 and beyond
 - b) Proposed publications for 2011 and beyond
 - c) Travel support requests
 - d) Proposal to continue rented server for another year
 - e) Other items
- 9) Discussion and adoption on the TCODE work plan 2010/2011
- 10) Other business
- 11) Closing

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TCODE Endnote 3

Proposal for an electronic poster session on “Data and data systems for validation of numerical models” at PICES-2011

Significant physical, chemical, biological and fisheries information has been assembled from ocean monitoring and observing systems. Data and data products from these repositories are provided for users in many fields of ocean sciences. Contributors to this session will demonstrate standalone and web-based applications for exploring, viewing, analysing and distributing data and data products that can be used to force and/or evaluate The ocean circulation and ecosystem models that support the goals of FUTURE. Traditional poster presentations are also welcome. This session is linked with MONITOR/FUTURE Topic Session on “How well do our models really work and what data do we need to check and improve them?”.

Recommended convenors: Igor Shevchenko (Russia) and TBD

TCODE Endnote 4

TCODE work plan 2010/2011

- 1) Continue to support, coordinate, and indentify of PICES data and information products
 - a) MONITOR (T. Royer)
 - b) AICE-AP (HAB-S, WG21, WG24) (I. Shevchenko and R. Brown (HAB-S))
 - c) COVE-AP (CC-S, WG20, WG22, WG23) (T. Suzuki and R. Brown (WG22))
 - d) SOFE-AP (WG-FCCIFS, SG-HD) (R. Brown)
 - e) CREAMS-AP (T. Suzuki)
 - f) CRP-AP (TBD)
 - g) MBM-AP (TBD)
- 2) Cooperation with other data management groups and activities
 - a) ICES WG on Data and Information Management (WGDIM) (G. Moiseenko)
 - b) IODE-XXI Session in March 2011 (T. Suzuki)
 - c) IODE GE-BICH in January 2011 (H. Garcia and T. Suzuki)
 - d) IODE ODP (T. Suzuki)
 - e) OBIS (TBD)
 - f) 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. Schevchenko and All)
 - f) China, Japan and Korea move their metadata records to the AdHost server (R. Yin (China), T. Suzuki (Japan), K-K. Jung (Korea), I. Shevchenko)
 - g) Remove NPEM, KODC, MIRC servers from the NSDI clearinghouse site (TBD (NPEM), TBD (KODC), T. Suzuki (MIRC))
 - h) Update AdHost server to monitor MDB use (Olga Vasik)
 - i) Promote the GeoNetwork Portal
 - i) Prepare short PowerPoint presentation on GeoNetwork portal (I. Schevchenko and R. Brown)
 - ii) Request GeoNetwork resource be reported at PICES 2011 opening session as part of PICES activities (I. Schevchenko)
 - iii) Prepare a presentation for Expert Groups (I. Shevchenko and R. Brown)
 - iv) Add the MDB server link on the sidebar of the PICES web page
 - (1) Explore GeoNetwork Portal backup options (I. Shevchenko)
 - (2) Update the Technical report to reflect GeoNetwork (I. Shevchenko, H, Garcia, R. Brown)

- 4) Maintain TCODE web pages (I. Shevchenko)
- 5) PICES 2011 E-Poster Session
Responsibility – I. Schevchenko (convenor)
- 6) PICES 2011 POC/MONITOR/TCODE Workshop (T. Suzuki (co-convenor))
- 7) Topic Session and/or Workshop Proposals to PICES 2012 in Hiroshima, Japan (All)
- 8) POMA nomination
Three remaining nominations will be rolled over to the next year for consideration at the next inter-sessional SB meeting. Recommendation of new nominations will be prepared before the next inter-sessional Science Board meeting in April 2011 by H.Garcia.

REPORT OF THE TECHNICAL COMMITTEE ON MONITORING

The Technical Committee on Monitoring (hereafter MONITOR) met from 14:00–18:00 h on October 27, 2010, under the chairmanship of Dr. Hiroya Sugisaki. Twelve committee members were present, and a total of 15 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

Status of FUTURE

Three FUTURE Advisory Panel members from MONITOR, Drs. Vyacheslav Lobanov (COVE-AP), Young-Jae Ro (AICE-AP) and Phillip Mundy (SOFE-AP) and Hiroya Sugisaki (Science Board member) attended the joint Advisory Panel meeting held on October 22, 2010. The workshop on multiple stressors for the next Annual Meeting and new expert groups connected to the FUTURE program were proposed by the FUTURE Advisory Panels. MONITOR agreed with their proposals.

AGENDA ITEM 3

North Pacific Ecosystem Status Report

The Chairman was grateful to all Committee members for their cooperation and participation in the completion the second version of the North Pacific Ecosystem Status Report (PICES Special Publication 4, 2010). Dr. Lobanov, lead author of a chapter that was not included in the Report, explained that the collected manuscripts of 12 co-authors will be published elsewhere in the future.

AGENDA ITEM 4

Progress reports

Integrated Framework for Sustained Ocean Observation Task Team (IFSOO-TT)

On behalf of the representative Task Team member from PICES, Dr. David Checkley, Dr. Sugisaki, reported on the activities of IFSOO-TT, established as a post-OceanObs09 expert group to study the outcomes of the conference. MONITOR is cooperating with the Task Team by documenting the ocean monitoring activities of PICES member countries.

Sustaining Arctic Observing Network (SAON)

On behalf of *ex-officio* MONITOR member and Chairman of SAON, Dr. John Calder, Dr. Sugisaki reported on the activities of SAON. SAON activities were also introduced at the MONITOR-sponsored Topic Session on “*Development and use of ocean observing and forecasting systems in coastal and marine management*” (S15) at PICES-2010.

ICES-GOOS

Dr. Mundy attended an ICES-GOOS Steering Group meeting on April 20–21, 2010 at Woods Hole, U.S.A. to discuss the Topic Session on “*Development and use of ocean observing and forecasting systems in coastal and marine management*” co-sponsored by ICES to be held at the PICES 2010 Annual Meeting and to explore ways to build on the continuing relationship between ICES and PICES in ocean observing activities. Dr. Jonathan Hare attended on behalf ICES and recommended that MONITOR establish working relations with ICES observational committees, such as the Working Group on *Ocean Hydrography* (WGOH) and the

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Working Group on *Operational Oceanographic Products for Fisheries and Environment* (WGOOFE) (see *MONITOR Endnote 3*).

Advisory Panel on Continuous Plankton Recorder Survey in the North Pacific (CPR-AP)

Dr. Sonia D. Batten presented a report of the scientific accomplishments and present status of the North Pacific Continuous Plankton Recorder (CPR) project on behalf of CPR-AP Chairman, Dr. Mundy. In spite of the difficult funding situation, the importance of CPR is becoming larger as the body of published work increases. Although not optimum, the funding situation is stable for the next two years. Efforts to procure more funding will benefit from the continued endorsement of PICES. Dr. Sanae Chiba reported on the joint research project between the Sir Alister Hardy Foundation for Ocean Sciences (SAHFOS) and Japan, analyzing the cross-Pacific CPR samples. This project has started last year, and it is progressing as planned.

Advisory Panel for a CREAMS/PICES Program in East Asian Marginal Seas

A summary of the CREAMS-AP business meetings, held May 11, 2010 and October 23, 2010 was presented by Dr. Lobanov.

North East Asian Regional Global Ocean Observing System (NEAR-GOOS)

Dr. Lobanov reported that NEAR-GOOS is operational.

AGENDA ITEM 5

PICES Ocean Monitoring Service Award (POMA)

The Committee Chairman reviewed the role of MONITOR to nominate and recommend candidates for POMA to the Science Board.

AGENDA ITEM 6

National reports

The following Committee members from five member countries made short presentations on national monitoring activities relevant to PICES:

- Canada: Drs. David Mackas and Jennifer Boldt
- Japan: Drs. Sei-Ichi Saitoh, Chiba and Hiroya Sugisaki
- Korea: Drs. Young Jae Ro and Kwang Soon Park
- Russia: Drs. Vyacheslav Lobanov and Vladimir Kulik
- United States: Drs. Phillip Mundy, Jeffrey Napp and John A. Barth

AGENDA ITEM 7

Best Presentation awards

MONITOR was assigned responsibility to judge the Topic Session on “*Development and use of ocean observing and forecasting systems in coastal and marine management*” (S15). The Chairman thanked those who volunteered in advance for their service.

Dr. Hisashi Yamaguchi (Nagoya University, Japan) was awarded the MONITOR Best Poster Award for his poster (co-authored by Young Beak Son, Eko Siswanto, Joji Ishizaka, Shinjae Yoo, Yu-Hwqan Ahn, Sang Woo Kim, Junwu Tang, Hiroshi Kawamura and Yoko Kiyomoto) on “*Variation of satellite chlorophyll a in the East China Sea based on local satellite algorithm with reduced influence from suspended sediment*”.

Unfortunately, there were no presenters applicable to receive the MONITOR Best Presentation award (early career scientist) this year.

AGENDA ITEM 8

Planning for PICES-2011 and inter-sessional meeting

MONITOR strongly supported the following two proposals for PICES 2010 annual meeting:

1. Dr. Barth proposed a 1-day joint Topic Session with FUTURE-AP entitled “*How well do our models really work and what data do we need to check and improve them?*” (MONITOR Endnote 4).
2. Dr. Lobanov proposed a 1-day workshop on “*Recent Advances in Monitoring and Understanding of Asian Marginal Seas: 5-years of CREAMS/PICES EAST-I Program*” [The duration of this workshop was later revised to ¾-day] (MONITOR Endnote 5).
3. The Committee members agreed that one MONITOR representative should attend the next ICES GOOS-related meeting.

AGENDA ITEM 9

Report of MONITOR elections

Dr. Hiroya Sugisaki was re-elected as Chairman for a second term and Dr. Phillip Mundy was elected as Vice-Chairman.

MONITOR Endnote 1

Participation list

Members

John A. Barth (U.S.A)
 Jennifer Boldt (Canada)
 Sanae Chiba (Japan)
 Vladimir Kulik (Russia)
 Vyacheslav Lobanov (Russia)
 David L. Mackas (Canada)
 Phillip R. Mundy (U.S.A., Vice-Chairman)
 Jeffery Napp (U.S.A)
 Kwang Soon Park (Korea)
 Young Jae Ro (Korea)
 Sei-Ichi Saitoh (Japan)
 Hiroya Sugisaki (Japan, Chairman)

Observers

Sonia D. Batten (Canada, CPR-AP)
 Jonathan Hare (U.S.A, ICES-GOOS)
 Carrie Holt (Canada)

MONITOR Endnote 2

MONITOR meeting agenda

1. Welcome, Introductions and Sign-in (All)
2. Report on the meeting of FUTURE on 22nd, Friday (AICE: Ro, COVE: Lobanov, SOFE: Mundy)
3. North Pacific Ecosystem Status Report-II (will be distributed at the Portland meeting) (All)
 - i. report on the synthesis workshop in Honolulu
 - ii. overview of MONITOR activities for NPESR-II
4. Reports on corresponding MONITOR
 - i. Report on IFSOO-TT (Integrated Framework for Sustained Ocean Observation Task Team: post Ocean Obs. '09 activity) (Sugisaki)
 - ii. Report on SAON meeting (Calder, Sugisaki)
 - iii. Report on ICES-GOOS Steering Group meeting (Mundy)
 - iv. Status of Pacific CPR program and advisory panel (Mundy)
 - v. Status of CREAMS w. POC & report on the NPESR workshop on status and trends on the East Asian Marginal Seas (Lobanov)
 - vi. Status of NEAR-GOOS activities (Lobanov)
5. Report on POMA (Sugisaki)
6. National reports of relevant monitor/observation activities
 - Canada (Boldt, Mackas)
 - China (Zhang, Zhao)
 - Japan (Chiba, Saitoh, Sugisaki)
 - Korea (Park, Ro, Suh)
 - Russia (Kulik, Lobanov)
 - United States (Barth, Mundy, Napp)
7. Judges for PICES 2010 Best Paper awards (All)
8. Proposals for PICES 2011 MONITOR Topic Sessions, workshops, inter-sessional meetings (All)
9. Election of MONITOR Chairman and Vice-Chairman (All)
10. Other business

MONITOR Endnote 3

MONITOR participation in ICES GOOS Steering Group (IGSG) meeting

PICES was represented at an ICES GOOS Steering Group (IGSG; Dr. Jonathan Hare, Chairman) meeting in Woods Hole, Massachusetts April 20–21, 2010 by MONITOR Vice-Chairman, Phillip Mundy. Two additional observers from U.S. ocean observing activities participated. Three IGWG members participated from two countries; in addition two members participated by correspondence. Dr. Mundy also attended the second day of the IGWG meeting which was held jointly with the Working Group on the *Northwest Atlantic Regional Sea*. The purpose of this joint meeting was to increase the interaction between ocean observing activities in the western North Atlantic. During the first day of the IGSG meeting, the overall structure of GOOS and Regional Alliances was discussed and a variety of activities across the Atlantic was presented.

The following is a summary of PICES activities relative to GOOS was presented by Dr. Mundy:

- The North Pacific Marine Science Organization (PICES) will have its 2010 Annual Meeting from October 22–31, 2010, at the Oregon Convention Center, Portland, Oregon, U.S.A. A joint ICES-PICES Theme Session on ocean observing will be held (see Agenda Item 4, ICES-GOOS).
- FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems) is a program established by PICES that will address three key questions: (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?

- One activity of FUTURE and MONITOR are cross-Pacific CPR transects. These activities are coordinated with SAHFOS and progress was reviewed.

In accord with its term of reference 5(c), IGWG agreed to continue its participation with PICES in the form of a jointly sponsored Topic Session entitled “*Development and use of ocean observing and forecasting systems in coastal and marine management*” to be held at PICES-2010 Portland, Oregon, as presented by MONITOR Vice-Chairman, Dr. Mundy. The ICES Keynote speaker will be Dr. Glenn Nolan from the Working Group on Oceanic Hydrography.

On the second day of the IGWG meeting, the status of the observing systems in the northwest Atlantic was reviewed in a series of presentations by the Working Group on the *Northwest Atlantic Regional Sea* (WGNARS). The WGNARS report is available at <http://www.ices.dk/reports/SSGRSP/2010/WGNARS10.pdf>.

MONITOR Endnote 4

Proposal for a 1-day Topic Session at PICES-2011 on “How well do our models really work and what data do we need to check and improve them?”

Given the importance of models to FUTURE, it is important to examine their skill and utility through comparison with data. Models are being used to study and forecast physical (atmospheric and oceanic circulation and mixing), chemical (air-sea fluxes, dissolved oxygen), biological (primary production, trophic dynamics) and fisheries (individual based modeling, migration pathways) processes. Climate forcing and coupling between processes is of prime importance. We invite presentations over the range of modeling scales, from local to global, and from hours to decades. Contributions are also welcome identifying data sets that we currently have that are helpful for assessing model skill and what new data sets are needed and might be obtained through ocean observing efforts. Discussions of uncertainty in model predictions and ways to reduce that uncertainty are also invited.

Co-sponsors: MONITOR, POC, FUTURE and IMBER

Recommended Convenors: John (Jack) Barth (U.S.A), Young-Jae Ro (Korea), Phillip Mundy (U.S.A), Sei-Ichi Saitoh (Japan), Michael Foreman (Canada), and Dake Chen (China)

MONITOR Endnote 5

Proposal for a 1-day Workshop at PICES-2011 on “Recent Advances in Monitoring and Understanding of Asian Marginal Seas: 5-years of CREAMS/PICES EAST-I Program” [later revised to ¾-day]

Under the auspices of the EAST-I program initiated and supervised by the CREAMS/PICES Advisory Panel, scientists from Japan, Korea, and Russia have carried out many successful cruises in the east Asian marginal seas over the last 5 years. With the active discussion and promotion by CREAMS/PICES of a new EAST-II program focusing on the Yellow and East China Seas, it is timely to have a forum summarizing some important results obtained by the international cooperative efforts of EAST-I. This session welcomes studies on hydrography, circulation, and ecology and their variability in East Asian Marginal Seas in the PICES area and on effect of climate and long-term changes in the abiotic and biotic environments of this region.

Co-sponsors: POC, MONITOR and TCODE

Recommended Convenors: Kyung-Il Chang (Korea), Toshitaki Gamo (Japan), Young-Shil Kang (Korea) Kyung-Ryul Kim (Korea), and Vyacheslav Lobanov (Russia)

REPORT OF THE SECTION ON *ECOLOGY OF HARMFUL ALGAL BLOOMS IN THE NORTH PACIFIC*

The Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S) met from 9:00 to 18:00 h on October 24, 2010, in Portland, U.S.A. The meeting was attended by members from all PICES countries except China. Other scientists attending the meeting are named under their respective countries (*HAB-S Endnote 1*). The proposed agenda for the meeting (*HAB-S Endnote 2*) was reviewed and approved. Before reviewing the goals of the meeting, Co-Chairman, Dr. Vera Trainer, introduced Dr. Changkyu Lee (Korea) as the new HAB-S Co-Chairman, and acknowledged outgoing Co-Chairman, Dr. Hakgyoon Kim (Korea), for his involvement with the Section.

AGENDA ITEM 2

Country reports

Canada

Mr. Robin Brown reported that currently, the only interest by Canada in HAB events is related to the possible impact of *Heterosigma* blooms on returns of sockeye salmon stocks. There has been an overall long-term decline in returns and they were extremely low in 2009. In 2007 there was a *Heterosigma* bloom in the Strait of Georgia where these sockeye salmon entered the ocean as juveniles. The Pacific Salmon Commission held a workshop on declining sockeye salmon returns where Dr. Jack Rensel spoke of recent *Heterosigma* research and possible links to the decline. The report of this workshop has been published and is available at www.cohencommission.ca/ViewExhibit.php?id=76?. A federal judiciary inquiry into the reasons for the decline of sockeye salmon stocks in the Fraser River will be completed by the Cohen Commission in 2011. This may re-focus research on stock declines, but HAB research may not be considered as either very important or contributing to salmon stock declines.

Effective December 19, 2010, a re-organization of responsibilities for aquaculture will occur in Canada. The regulation of aquaculture fisheries will shift from provincial to federal jurisdiction under the Department of Fisheries and Oceans.

China

No report was available.

Japan

Dr. Shigeru Itakura related that there were two prominent species, *Heterocapsa circulaisquama* and *Chattonella antiqua*, in the waters of Japan from 2009–2010, *Heterocapsa circulaisquama* was first observed in October 2009 in Lake Kamo, a brackish lake where oyster farming takes place. Extensive damage to this fishery has resulted. The LAMP (loop-mediated isothermal amplification) method was developed for detection of *Heterocapsa circulaisquama* cells and they were detected via this method in 2010. It was found that temperatures $>25^{\circ}\text{C}$ and salinity >20 ppt provided the best growth of these cells. Body scales were also examined for identification purposes and to confirm the species. No fisheries damage occurred in 2010 even though cells were present at high concentrations.

Blooms of *Chattonella antiqua* were studied in Yatsishiro Bay in 2009 and 2010. Blooms of this species usually occur in the JP-04 region, but in 2009 and 2010 blooms occurred in the JP-05 region as well. Monitoring is done by fishermen who take water samples from their boats to count cells at sea and report concentrations via cell phone in real time.

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During this period, an estimated \$60 million of fisheries damage occurred from losses of amberjack, yellowtail, *etc.* despite rapid sampling and identification of cells by fishermen. Countermeasures are needed to mitigate the impacts of blooms, however, those tested to date (clay, chemicals) have proven to be ineffective for these blooms.

Korea

Dr. Changkyu Lee reported on the effect of unusual occurrences of *Cochlodinium polykrikoides* blooms in the East China Sea 2009 (August) possibly linked to low salinity (high rainfall in eastern China) off Jeju Island. *C. polykrikoides* concentrations of around 41,000 cells/L were found in August 2010 but no sustained bloom occurred that year as was seen in 2009. Overall, these blooms seemed to be less intense and smaller in scale than in previous years. *Gonyaulux*, *Alexandrium* and *Scropsiella* spp. were present in the more inshore regions. *C. polykrikoides* blooms are potentially linked to lower salinity. In 2004, *C. polykrikoides* was reduced in concentration in nearshore regions and possibly pushed offshore. An increase in *Gonyaulux* sp. was seen in the nearshore region in lower salinity waters. Lower salinity in inshore waters may reduce *C. polykrikoides* concentrations, as seen in high rainfall times such as in 2009 and 2010. Recent decreases in intensity, duration, and scale of *C. polykrikoides* blooms may be signaling a succession to other HAB species, including *Gonyaulux*, *Alexandrium*, *etc.* and this succession may require a shift in research efforts to new HAB species including *Pfiesteria*, *Prorocentrum* and others.

Summary:

1. Diatom abundance was higher in 2010, but no dense blooms were observed. Why?
2. Since 2007 smaller blooms of *C. polykrikoides* have not been able to be detected via satellite.
3. There is a possible policy change occurring in Korea whereby fish farms will be moved to more offshore regions, potentially reducing inshore eutrophication.

Russia

Dr. Tatiana Orlova noted that the Vladivostok area is monitored three times per month, and includes cyst surveys and monitoring for toxins in mussels. A total of 20 bloom-forming species were recorded in 2009 and 2010, with most of these species being diatoms. Increases in dinoflagellates have generally been recorded since 2004 and changes in their summer period have been noted. A strong bloom of *Heterosigma akashiwo* was observed in Vladivostok and other areas in Peter the Great Bay in 2010. This event corresponded with hot and dry environmental conditions in the region. High chlorophyll concentrations of about 300 million cells/L were observed via satellite. In general, water properties for winter showed convection and water exchange between the shelf and the inner sea, while summertime stratification was normal, coinciding with peaks in rainfall.

U.S.A.

Dr. Trainer reported that on the west coast of the United States (Alaska, Washington, Oregon, California), PSP (paralytic shellfish poisoning) and ASP (amnesic shellfish poisoning) toxin monitoring was performed for shellfish only and that HAE-DAT reports were compiled annually by the National HAB office in Woods Hole, Massachusetts.

In Alaska, five cases of PSP were reported in 2010, resulting in two deaths. In Juneau concentrations reaching 2044 µg/100g were reported in cockles. PSP is the most serious HAB problem; only commercial shellfish are tested for the toxin, and there is a large native population that harvests for subsistence and personal use. The University of Alaska, Ketchikan, is running an Alaskan HAB monitoring program conducted by Kate Sullivan.

In Washington State, PSP closures are rare on the outer coast but more common in Juan de Fuca Strait and Puget Sound. In 2009, PSTs were measured in mussels and in 2010 very high levels of PSPs (3000 µg/100 g) were detected. No ASP closures were implemented on the outer coast in 2009 and 2010. Average upwelling index values equate to a highly retentive characteristic of the Juan de Fuca Eddy. In 2009, *Akashiwo sanguinea* was implicated in what is thought to be the largest number of deaths of marine birds due to this

organism recorded to date. Cells were detected in 2010 and large densities were found in Puget Sound. There is evidence of a shift from diatom dominance to dinoflagellate dominance (Roz Jester data) starting around 2004. The Puget Sound Sound Toxins monitoring program for HAB cell detection is in effect to provide an early warning to fish and shellfish farmers in the region. The ECOHAB-Heterosigma project is investigating toxic components and ecology of *Heterosigma* blooms in Puget Sound.

Oregon has a MOCHA (Monitoring the Oregon Coast for Harmful Algae) program which monitors for HAB species and toxins in its area. Oregon includes all events on datasheets when reporting to HAE-DAT.

California reported no PSP closures in 2010. Weekly Biotoxin Reports give qualitative assessments of phytoplankton, including HABs.

IOOS (Integrated Ocean Observing System), a network of regional ocean observing systems, includes a component to study HABs. U.S. official reports of proposed HAB research in the U.S. include the HAB RDDTT, HARNESS and ECOHAB.

AGENDA ITEM 3

Relations with international organizations

ICES

Dr. Donald Anderson (WHOI) reported on the ICES-IOC Working Group on Harmful Algal Bloom Dynamics (WG HABD). Their Terms of Reference are regularly discussed and a set of activities or subjects is discussed at each ICES science meeting. Meetings are at least 3.5 days in duration and include many countries (mostly from Europe). ICES HAE-DAT reports, unfortunately, have largely not been entered to date and pressure will be applied to those countries not entering reports. Printed reports have been completed for many countries but have not yet been input – mostly these are for recent years. New findings are reported in an informal format (a short 10 to 15 minute presentation). Recent year findings include:

- azaspiracid poisoning (AZP) found in Huelva, Spain but not the organism known to produce it, *A. spinosum*;
- a Scotland bloom of *Karenia mikimotoi*;
- a bloom of *A. fundyense* in the western Atlantic;
- *Pyrodinium bahamense* in Florida.

Dr. Anderson presented HAB-S with a number of opportunities to collaborate with ICES including: HAIS/HAEDAT data integration, workshops, special sessions at existing meetings, exchange of new findings reports and exchange of country reports.

NOWPAP

Dr. Yoshida Takafumi (CEARAC) reported that the 2005 version of NOWPAP's HAB integrated report will be updated in the 2010–2011 biennium. NOWPAP will expand the target areas for investigation including in China, a larger area in the Republic of Korea, and the area north of Japan. A website for *Cochlodinium* information has been created and is available in the languages of NOWPAP member countries. Eutrophication status has been updated for areas of the Yangtze River estuary (China), northwest Kyusyu (Japan), Jinhae Bay (Korea), and Peter the Great Bay (Russia). A proposal by NOWPAP to hold a remote sensing training course with IOC-WESTPAC and PICES on “*Remote sensing data analysis*” was accepted and the course will take place prior to 2011 PICES Annual Meeting.

IOC

Dr. Trainer, reporting on behalf of Drs. Henrik Enevoldsen and Monica Lion (IOC), noted the ongoing collaboration between the IOC/UNESCO HAB Programme and HAB-S regarding the compilation of harmful

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algal event data in HAEDAT, capacity development, and new areas of cooperation. Possible new foci for HAB-S, where there is potential for interaction with IOC groups and activities in 2011 include:

- Taxonomic issues (IPHAB Task Team and IOC HAB Centre)
- HAB Observation Systems (IPHAB Task Team and GEOHAB)
- HAB and Remote Sensing (GEOHAB-IOCCG Working Group)
- HAB ecology topics (any of the GEOHAB Core Research Projects)
- HAB modelling (GEOHAB Modelling WG)
- Review of quantitative methodologies (IOC M&G 55 and associated Editors)
- Harmful phytoplankton that could potentially be transported or introduced by ballast water (ICES-IOC-IMO WGBOSV and ICES-(IOC) WKHABL)

AGENDA ITEM 4

PICES Seafood Safety Project

Dr. Charles Trick provided a summary of HAB-S activities under the PICES Seafood Safety Project (funded by the Ministry of Agriculture, Forestry and Fisheries of Japan). The goals of the project are to build HAB capabilities in non-PICES member countries, to collect data, and to provide training courses in developing countries for monitoring, analysis, and management of HAB species and toxins in fisheries. Training consists of a tiered monitoring approach starting with analysis of phytoplankton, then, if warranted, toxin content in phytoplankton and finally, if warranted, toxin content of shellfish. Selected sites are chosen based on: (1) existing HAB problems that have resulted in fisheries losses, (2) support from the government of the selected country, and (3) potential for sustainable monitoring in the future. The first country to hold a HAB training class was the Philippines in 2009, followed by Guatemala in 2010, and the third (to be geographically distinct from the first two) will be the Cook Islands-Kiribati Islands-Samoa (which has *Ciguatera*-related problems) in 2011.

AGENDA ITEM 5

GEOHAB Ocean Science Meeting on “HABs in benthic systems”

Dr. Trick reported on the GEOHAB-sponsored Open Science Meeting that took place in Honolulu, U.S.A. in June 21–23, 2010. The meeting dealt with the taxonomy of benthic HABs, toxin comparison, regulation, nutrient controls, habitat comparisons, grazing effects, phylogenetic comparisons and ecological models. The linking of toxins to specific species, the expansion of ciguatoxins, and the frequency of outbreaks (1400 cases/100k pop. in the Cook Islands, 800 cases/100k pop. in Samoa, and 400 cases/100k pop. in the Marshall Islands) were also discussed. Other issues included nutrients and land use practices, loss of habitat/land, and loss of coral and its replacement by coralline algae, seagrass, and algal turf. It was noted that variable substrates create a problem describing the density of benthic HABs (per unit area, volume, *etc.*). Nutrient loading resulting in loss of coral plus replacement and leading to water quality issues was also addressed. Other areas of concern were toxin regulation, that many species can produce ciguatoxins, variable influence of toxin content and toxicity by habitat, and seasonal cycles of toxin content that have no relation to biomass of organisms.

AGENDA ITEM 6

Future of HAB work within PICES

After Dr. Trainer reviewed the Terms of Reference for HAB-S (*HAB-S Endnote 3*), discussion revolved around suggestions for future work by HAB-S. Example topics for discussion and syntheses might include:

- Mitigation to reduce the impact of HABs,
- Numerical model development of bloom initiation and transport for predictions and forecasts,
- Relationship between oceanographic processes and HAB formation (*e.g.*, How physics and nutrients, including trace metals, are related to bloom formation),

- Organism identification using molecular biological techniques,
- Changes to certain monitoring techniques (*e.g.*, cell numbers and/or toxin levels),
- Species introductions including issues of anthropogenic sources (*e.g.*, ballast water) or natural systems (*e.g.*, species range extension).

Other future work:

- Together with TCODE, develop a metadatabase that describes HAB monitoring and research efforts in each PICES member country.
- Support the harmonization of methods for identifying HAB species. This could include intercalibration workshops co-sponsored by PICES and ICES.
- Develop early warning systems for the detection of HABs. This could include discussion of ocean observing systems and techniques.
- Educate the community (managers, students) about HAB organisms. For example, an in-depth study of selected HAB species (top ten) could include information about physiology, taxonomy, *etc.*

AGENDA ITEM 7

Events at PICES-2010

Summaries of the MEQ Topic Session (S9) on “*Conceptual and numerical models of HAB dynamics*” and the MEQ Workshop and laboratory demonstration (W3) on “*New technologies and methods in HAB research and monitoring: I. HAB species detection*” can be found in the Session Summaries section of the PICES 2010 Annual Report.

AGENDA ITEM 8

Proposals for PICES-2011

- A ½-day Topic Session on “*HABs in a changing world*”, convened by Drs. Mark Wells (U.S.A.) and Tatiana Morozova (Russia) (see *HAB-S Endnote 4*). Travel funds are requested for 2 invited speakers.
- A 1-day Workshop on the “*Incorporation of satellite remote sensing into monitoring of HABs*” convened by Drs. Tatiana Orlova (Russia), Yoshida Takafumi (CEARAC), and Vera Trainer (U.S.A.) to be preceded by a training course on satellite remote sensing for early career scientists (*HAB-S Endnote 5*). Funding is requested for at least 1 workshop speaker from the eastern Pacific. HAB-S also requests that the training course be held the week prior to the PICES Annual Meeting, ideally in Khabarovsk.
- A 1-day HAB-S meeting, including national reports for HAB events in 2006–2007 and a discussion of HAE-DAT use. Countries are requested to input HAB event data to HAE-DAT for 2000–2006 directly to the online database. HAB-S requests funding for an IOC representative (Henrik Enevoldsen, Monica Lion) to attend the next PICES Annual Meeting to discuss HAE-DAT, country maps and decadal reports.
- HAB-S requests participation by a manager/scientist(s) from China with access to HAB monitoring data to input data to HAE-DAT.
- Funds for 1 HAB-S member to attend the ICES Annual Science Meeting in Gdansk, Poland.

HAB-S-2010

HAB-S Endnote 1

HAB-S participant list

Members

William Cochlan (U.S.A.)
Ichiro Imai (Japan)
Shigeru Itakura (Japan)
Changkyu Lee (Korea, Co-Chairman)
Tatiana Morozova (Russia)
Tatiana Orlova (Russia)
Vera Trainer (U.S.A., Co-Chairman)
Charles Trick (Canada)
Yasunori Watanabe (Japan)
Mark Wells (U.S.A.)

Observers

Nicolaus Adams (U.S.A.)
Donald Anderson (U.S.A.)
Brian Bill (U.S.A.)
James Birch (U.S.A.)
Robin Brown (Canada)
Stewart Johnson (Canada)
Sangjin Lee (Korea)
Emily Olesin (U.S.A.)
Jay Parsons (Canada)
Jack Rensel (U.S.A.)
Steven Rumrill (U.S.A.)
Yoshida Takafumi (NOWPAP)

HAB-S Endnote 2

HAB-S meeting agenda

1. Welcome and introduction of Dr. Lee as new HAB Section co-chair (Trainer and Lee)
2. Country reports
 - Canada (Trick)
 - China (Wang)/HABs in the Coastal Waters of China in 2009 (Zhu)
 - Japan (Itakura)
 - Korea (Lee)
 - Russia (Orlova)
 - U.S.A. (Trainer)
3. Relations with international organizations
 - Report on ICES HAB working group and potential areas of collaboration (Anderson)
 - NOWPAP/CEARAC report (Takafumi)
 - Joint Harmful Algal Bloom Programme and International Oceanographic Data and Information Exchange Harmful Algae Information System: An update and proposal for the future (Trainer)
4. PICES Seafood Safety Project (Trick)
5. Report on GEOHAB Open Science Meeting on Benthic HABs (Trick and Cochlan)
6. Future of HAB work within PICES
7. Events at PICES-2010
8. Proposals for PICES-2011

HAB-S Endnote 3**HAB-S Terms of Reference**

1. To develop and implement annual bloom reporting procedures that can be consistent with ICES procedures and therefore incorporated into HAEDAT. This will be important in assessing impacts of HAB events and as a research tool to look at patterns that will lead to prediction capability.
2. To exchange national reports of HAB incidents and development in order to inform HAB Section members of new toxins, new developments, and new approaches. Both toxin producing and nontoxic (but harmful) algal species should be included.
3. To focus on specific needs for scientific advice among PICES member countries by identifying topics of interest, and providing syntheses of the available scientific information on those selected topics. Example topics for discussion and syntheses might include:
 - a. Mitigation practices to reduce the impact of HABs.
 - b. Numerical model development of harmful algal bloom initiation and transport for predictions and forecasts.
 - c. Relationship between oceanographic processes and HAB formation (*e.g.*, How the physics of nutrients, trace metals tie into bloom formation)
 - d. Organism identification using molecular biological techniques.
 - e. Discussion of possible changes to certain monitoring techniques (for example, cell numbers vs. toxin levels).
 - f. Species introductions including issues of anthropogenic sources (*e.g.*, ballast water) or natural systems (*e.g.*, species range extension).
4. Together with TCODE, to develop a metadata base that describes HAB monitoring and research efforts in each PICES member country.
5. Support the harmonization of methods for identifying HAB species. This could include intercalibration workshops co-sponsored by PICES and ICES.
6. Development of early warning systems for the detection of HABs. This could include discussion of ocean observing systems and techniques.
7. To educate the community (managers, students) about HAB organisms. For example, an in-depth study of selected HAB species (top ten) could include information about physiology, taxonomy, *etc.*

HAB-S Endnote 4**Proposal for a ½-day MEQ Topic Session on “HABs in a changing world” at PICES-2011**

The impacts of regional and global climate change and other anthropogenic forcing on the initiation, frequency and severity of Harmful Algal Blooms (HABs) are widely anticipated but difficult to identify. Often these “blooms” reflect subtle adjustments in the relative proportion of HAB species within a larger, more abundant phytoplankton community. In others, new blooms may reflect the possible climate-driven range extension of HAB species, but direct evidence that previous environmental conditions were unfavorable for bloom development normally is lacking. Ascribing HAB events to specific, but slowly evolving driving forces will demand comparative observations among similar but geographically separated ecosystems. This session invites papers that focus on emerging toxic and ecosystem disruptive HAB events as well as changing plankton assemblages that are evolving towards more frequent or intense HAB incidents. We particularly invite papers addressing long-term time series data, land use changes, effects of macro- or micro-nutrient stress on cell physiology, trophic interactions, and the impacts of changing riverine runoff, ocean development (*e.g.*,

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aquaculture, wind turbines), and ocean acidification. The goal of the session is to help formulate a better understanding of conditions enhancing the success of HAB species.

Recommended Conveners: Mark Wells (U.S.A.) and Tatiana Morozova (Russia)

Suggested invited speakers: Gustaaf Hallegraeff (Australia), Mingjiang Zhou (China; land use changes)

HAB-S Endnote 5

**Proposal for a 1-day MEQ Topic Workshop on
“*Incorporation of satellite remote sensing into monitoring of HABs*” at PICES-2011
[later renamed to “*Remote sensing techniques for HAB detection and monitoring*”]**

Monitoring of harmful algal blooms and the environmental factors associated with their occurrence often benefits from the addition of a satellite remote sensing perspective, but the use of satellite data is hindered by the lack the training needed to make effective use of the available data sets. The goal of the workshop is to teach participants the basic skills needed to work independently to acquire, analyze and visualize data sets derived from a variety of satellite sensors that may include SeaWiFS, MODIS, MERIS, AVHRR, and CZCS. The workshop will focus some attention on using the Ocean Color Web Data Server and developing some programming skills that will enable researchers to make use of satellite image data to answer important oceanographic questions. This workshop may include such themes as the fundamentals of bio-optics, pigment algorithms, primary production algorithms and, to a lesser extent, the underlying physical principals leading to the measurement of sea surface temperature, ocean wind speed and ocean topography. A series of lectures will detail research and monitoring efforts that use remote sensing for the study of harmful algal blooms in PICES member countries. This workshop will follow the NOWPAP/PICES/WESTPAC training class on satellite remote sensing for the study of harmful algal blooms.

Recommended conveners: Tatiana Orlova (Russia), Yoshida Takafumi (NOWPAP/CEARAC), Vera Trainer (U.S.A.)

Suggested invited speakers: Raphael Kudela (U.S.A.), Bruce Monger (U.S.A.), Rick Stumpf (U.S.A.), Ken Furuya (Japan), Alexanin (Russia)

REPORT OF THE SECTION ON *CARBON AND CLIMATE*

The meeting of the Section on *Carbon and Climate* (CC-S) was held from 09:00–13:00 on October 24, 2010 in Portland, U.S.A. under the chairmanship of Drs. James Christian (Canada) and Toshiro Saino (Japan). They welcomed members and observers to the meeting (*CC-S Endnote 1*). The agenda was adopted unanimously (*CC-S Endnote 2*).

AGENDA ITEM 2

Membership

Since the PICES 2009 Annual Meeting, two additional members were appointed to CC-S. Dr. Minhan Dai of Xiamen University, representing China, and Dr. C.T. Arthur Chen as an *ex-officio* member representing IGBP. A new member (Dr. Dong-Jin Kang) representing Korea was proposed and later formally appointed as Prof. Kyung-Ryul Kim has left CC-S. An additional *ex-officio* member, representing SOLAS (Dr. Yukihiko Nojiri), will be proposed. Subsequent to the meeting, the United States made an additional membership change, adding Dr. Burke Hales and removing Dr. Steve Emerson.

AGENDA ITEM 3

CC-S achievements in the past 12 months

PACIFICA Carbon Data Synthesis

Substantial progress was made on the PACIFICA data synthesis in 2010. Dr. Toru Suzuki (Japan) implemented the CARINA algorithms and created a web site for the output. A subset of CC-S members met in Tokyo in early June, and began to evaluate the output. At the 2010 PICES Annual Meeting another data synthesis workshop was held in the 2 days prior to the CC-S meeting, which was chaired by Dr. Masao Ishii (Japan) and Dr. Robert Key (U.S.A.). This workshop continued the work of the June meeting, evaluating data adjustments recommended by the CARINA algorithms. A detailed summary of this workshop is found in the section for the POC/BIO Workshop (W5) on “*Carbon data synthesis (III)*” in the Session Summaries section of the PICES-2010 Annual Report. The final PACIFICA data products will be completed in the coming year and a topic session presenting scientific analyses of these will be proposed for the 2012 Symposium on “*Effects of climate change on the world’s oceans*”.

AGENDA ITEM 4

Reports of collaborating organizations and agencies

Reports were given on several international programs relevant to the mandate of CC-S, including IOCCP (Kozyr, Nojiri), GO-SHIP (Ishii, Miller), and SOCAT (Nojiri).

Dr. Key reported that CARINA is completed and all results and products are available from CDIAC.

The SOLAS-IMBER Working Group on *Ocean Acidification* is proposing a Workshop to “*Design global ocean acidification/carbon observing system*” in late 2011 or early 2012. CC-S recommends that PICES co-sponsor this workshop, and further recommends that it be held in Yeosu in 2012 in concert with the Symposium on “*Effects of climate change on the world’s oceans*”.

AGENDA ITEM 5

Future meetings and activities

CC-S has existed for 5 years and has recently presented an interim report to POC and BIO detailing its accomplishments and providing background material and a rationale for reauthorization (*CC-S Endnote 3*).

CC-S-2010

For the PICES 2011 Annual Meeting, CC-S decided not to request any workshops or topic sessions but will propose a topic session for the Symposium on “*Effects of climate change on the world’s oceans*” in Yeosu, Korea scheduled for 2012. A full day for the CC-S meeting is requested at the 2011 PICES Annual Meeting to ensure time for extended discussion of progress on planned activities, including completion of PACIFICA, marginal seas, and analysis of SOCAT data.

CC-S Endnote 1

CC-S participation list

Members

James Christian (Canada, Co-Chairman)
Minhan Dai (China)
Andrew Dickson (U.S.A.)
Hernan Garcia (U.S.A.)
Masao Ishii (Japan)
Sophia Johannessen (Canada)
Alex Kozyr (U.S.A.)
Kitack Lee (Korea)
Kyung-Ryul Kim (Korea)
Lisa Miller (Canada)
Akihiko Murata (Japan)
Tsuneo Ono (Japan)
Toshiro Saino (Japan, Co-Chairman)
Toru Suzuki (Japan)

Observers

Alex Bychkov (PICES)
Joaquim Goes (U.S.A.)
Dong-Jin Kang (Korea)
Robert Key (U.S.A.)
Naohiro Kosugi (Japan)
Yuichiro Kumamoto (Japan)
Toshiya Nakano (Japan)
Yukihiro Nojiri (Japan)
Daisuke Sasano (Japan)
Elena Ustinova (Russia)
Luis Valdés (IOC)

CC-S Endnote 2

CC-S meeting agenda

1. Opening, (Christian, Saino)
Review and adopt agenda
2. Membership
3. CC-S achievements in the past 12 months
PACIFICA Data Synthesis
Report on progress of PACIFICA and remaining business (Ishii, Key)
4. Reports of collaborating organizations and agencies
SOCAT (Nojiri)
IOCCP/GCP (Kozyr)
CLIVAR/GO-SHIP (Ishii, Miller)
CARINA (Key, Kozyr)
5. Future meetings and activities
CC-S extension: next 5 years
Goals and objectives
Revise terms of reference?
Plan for presenting to POC/BIO/SB

CC-S Endnote 3**5-year review of CC-S activities**

The Section on *Carbon and Climate* (CC-S) was created in the fall of 2005 to establish a more permanent body to carry on the collaborative work that was initiated by the (now disbanded) Working Groups on *Carbon Dioxide in the North Pacific* (WG 13; 1997–2002) and on *Biogeochemical Data Integration and Synthesis* (WG 17; 2001–2005). The activities and plans of the Section were reviewed by the parent committees at PICES-2010, where the Section was requesting reauthorization for a further 5 years. CC-S has two parent committees, the Physical Oceanography and Climate Committee (POC) and the Biological Oceanography Committee (BIO). Drs. James Christian (Canada) and Toshiro Saino (Japan) have chaired the Section since its inception.

Membership

CC-S has members from all PICES nations and an *ex-officio* member (Dr. C.T.A. Chen) representing the International Geosphere–Biosphere Project (IGBP). Current total membership is 23 with national representation in the range from 2 to 6 members (see *CC-S Endnote 1*).

CC-S achievements*Topic Sessions at PICES Annual Meetings*

Through its parent committees, CC-S sponsored topic sessions at the 2007 and 2009 PICES Annual Meetings. The first was “*Decadal changes in carbon biogeochemistry in the North Pacific*” in Victoria, Canada in 2007 where Drs. Christian and Saino were the session convenors. Dr. Taro Takahashi (Columbia University, U.S.A.) was the invited keynote speaker. The organizers received about two dozen abstracts representing all of the member countries. The best poster presentation for all sessions sponsored by POC and its subsidiary bodies was given to Chun-Ok Jo (Korea) who participated in the session. Results from this session were published as a special section of the *Journal of Oceanography* (see under Publications).

A second topic session was held in Jeju, Korea in 2009 entitled “*Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific*”, also chaired by Drs. Christian and Saino. The invited speaker was Dr. Richard Zeebe (University of Hawaii, U.S.A.). The session was well attended (80 recorded attendees).

Both sessions drew large audiences and large numbers of presenters. This attests to widespread interest in carbon biogeochemistry at PICES Annual Meetings and the need for the continued presence of a formal body dedicated to these topic areas.

Publications

CC-S oversaw the publication of the *Guide to Best Practices for Ocean CO₂ Measurements* (PICES Special Publication Number 3 in 2007 (also listed as IOCCP Report #8). The Guide is now used worldwide and is considered to be the definitive reference for the ocean CO₂ system. It could easily be argued that it is the single most influential document published by PICES during these 5 years. The Guide is freely available in electronic form from the Carbon Dioxide Information and Analysis Center (CDIAC) at http://cdiac.ornl.gov/oceans/Handbook_2007.html.

CC-S members coordinate the distribution of printed copies of the guide in PICES countries; Drs. Alex Kozyr (U.S.A.) and Toru Suzuki (Japan) are responsible for their distribution in non-PICES countries. The guide has been translated and published in Korean is currently being translated into Chinese and Spanish, with other translations expected on a volunteer basis. CC-S members also coordinate verification of the accuracy of the translation and aid the volunteer translators in maintaining consistency of formatting and presentation.

CC-S-2010

CC-S sponsored a Special Section of the *Journal of Oceanography*, published in 2009 (volume 65, number 5) with Drs. Saino, Christian, Kitack Lee, and Christopher Sabine serving as Guest Editors.

PACIFICA data synthesis

The most significant undertaking of CC-S is the data synthesis project known as PACIFICA. PACIFICA has collected biogeochemical data (DIC, TA, nutrients, oxygen, salinity) from more than 200 cruises in the Pacific and implemented a set of algorithms for crossover analysis that permit the construction of a basin-wide, consistently calibrated data set. The PACIFICA algorithms were adapted from CARINA and implemented by Dr. Suzuki. The output was made available to all participants via WWW who reviewed and discussed it throughout 2010. A workshop was held in Tokyo, Japan in June and another in Portland, U.S.A. at PICES-2010 to review the results and make collective decisions about adjustments to raw data.

This database will be an important legacy of CC-S and PICES for the Pacific Ocean scientific community. It contains several important innovations relative to previous efforts. Most of the cruises are recent (post-WOCE), and data quality is generally higher than in the WOCE era, especially for total alkalinity. In addition, the inclusion of time-series programs from Lines P and 137°E means that an unprecedented amount of temporal information has been included. Completion and publication of the data and publication of scientific analyses using the data are unfinished business and will occupy much of the Section's time for the next 1–2 years. Scientific analyses of the data are expected to be presented at the Symposium on “*Effects of climate change on the world's oceans*” in 2012 (see below on upcoming symposia).

Future plans

Contribution to FUTURE

The Science Plan of PICES' integrative science program, FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems) notes that “natural and anthropogenic pressures are causing the oceans to acidify, while pollution, extirpations, invasive species, anoxia, habitat loss, and exploitation affect the coastal zones”, and suggests that “Region-specific assessments of topical issues (e.g., harmful algal blooms, eutrophication, native and alien species range changes, anoxia, and ocean acidification)” will be one of the key “anticipated benefits and products” of FUTURE. It is clear that ocean acidification, deoxygenation and productivity will be key issues for FUTURE and for Pacific Ocean science over the next 5–10 years. In PICES, much of the scientific expertise on these issues – particularly acidification – resides within CC-S. The Section anticipates a shift in focus from carbon biogeochemistry toward biological impacts of ocean acidification; the terms of reference were revised in 2008 to reflect this (see *CC-S Endnote 4*). CC-S also anticipates particularly strong involvement with COVE-AP but will likely play an important role in AICE-AP and SOFE-AP as well.

Participation in upcoming international symposia

The second Symposium on “*Effects of climate change on the world's oceans*” (co-sponsored by PICES, ICES, and IOC) will be held in Yeosu, Korea in May 2012 in conjunction with Ocean Expo 2012. CC-S Co-Chair, Dr. Christian, is on the Scientific Steering Committee. The third Symposium on the “*Ocean in a high-CO₂ world*” will be held in the fall of 2012 in Monterey, California. CC-S member, Dr. Richard Feely, (U.S.A.) is on the International Steering Committee. CC-S will sponsor topic sessions at one or both of these conferences.

pCO₂ and pH data analysis and archiving

PACIFICA focused primarily on discrete (bottle) data (DIC, alkalinity, nutrients, oxygen). A parallel international effort known as Surface Ocean Carbon Atlas (SOCAT) has been conducting synthesis of continuous underway pCO₂ data. While there is no need to duplicate this effort for our region, there is a need for CC-S members to take the lead on analysis and publication of SOCAT results for the North Pacific. These scientific analyses will be a focus of the Section's activities. Furthermore, many historic pH data sets are not properly archived. Properly documenting and archiving these data is necessary and will be a future CC-S objective.

Data synthesis for marginal seas

While PACIFICA focused primarily on the open ocean, a similar data synthesis effort will be undertaken for the marginal seas of the North Pacific and possibly the Pacific sector of the Arctic Ocean.

Contribution to RECCAP

The **REgional Carbon Cycle Assessment and Processes** (RECCAP) project is an international effort to develop a global carbon budget by synthesizing oceanic, terrestrial, and atmospheric carbon studies. CC-S members, Drs. Masao Ishii and Feely, are leading the oceanic synthesis effort for the Pacific Ocean. Contributions to RECCAP will be an important CC-S activity from 2010–2015.

Summary of objectives for 2010–2015

1. Complete and publish scientific analyses arising from PACIFICA data synthesis.
2. Proceed with data synthesis and intercalibration efforts for marginal seas and scientific analyses of these data.
3. Assess the measurement uncertainty required for CO₂ measurements in coastal regions, and identify suitable measurement techniques (and their associated quality control procedures) that are able to achieve these. Where practical, these proposed techniques should be tested through collaborative studies, and appropriate Standard Operating Procedures prepared.
4. Conduct analyses of the SOCAT surface ocean pCO₂ data base for the North Pacific region and coordinate synthesis and archiving of pCO₂ data from ongoing programs in PICES member countries. Contribute to the global data synthesis effort through RECCAP and related programs.
5. Document, archive, and quality control historical pH data and conduct retrospective analyses of ocean acidification.
6. Coordinate and encourage research into ocean acidification and hypoxia and their biological and ecosystem impacts.

CC-S Endnote 4

CC-S Terms of Reference
(bold indicates 2008 revisions)

1. Coordinate and encourage ongoing and planned national and international syntheses of carbon cycle research studies in the North Pacific and, where necessary and appropriate, for the larger Pacific basin;
2. Ensure effective two-way communication with other international scientific groups that have a responsibility for the coordination of ocean carbon studies, such as the International Ocean Carbon Coordination Project (IOCCP), CLIVAR/CO₂ Repeat Hydrography and the SOLAS/IMBER implementation group for carbon research;
3. Review the existing information on carbon cycling in the North Pacific, including anthropogenic carbon, the biological pump, impacts **of ocean acidification** on marine biota, and possible feedbacks to atmospheric greenhouse gases; identify gaps in our knowledge, and make prioritized recommendations for future research;
4. Periodically review the status of the methodology of CO₂ measurements, including the preparation of standards and reference materials, and advise on inter-calibration and quality control procedures;
5. Identify suitable data sets on the oceanic CO₂ system in the Pacific region as they become available, and recommend the mechanisms of data and information exchange;
6. Carry out and publish (in the refereed literature) basin-scale syntheses of carbon cycling in the North Pacific, including new data whenever appropriate, and encourage scientific interpretation of these evolving data sets;
7. Organize symposia, workshops, or Annual Meeting sessions on **the carbon cycle, ocean acidification**, and climate studies in the North Pacific.

REPORT OF WORKING GROUP 20 ON EVALUATIONS OF CLIMATE CHANGE PROJECTIONS

The fifth and final meeting of Working Group on *Evaluations of Climate Change Projections* (WG 20) was held from 14:00–17:00 hours, October 24, 2010 in Portland, U.S.A. The Co-Chairman, Dr. Michael Foreman, called the meeting to order and, after introductory formalities, WG 20 member, Dr. Muyin Wang, kindly agreed to act as the rapporteur.

AGENDA ITEM 3

Review of Working Group Terms of Reference and summary of accomplishments

Dr. Foreman began the meeting with a recap of the WG 20 Terms of Reference (TORs) and a summary of activities addressing each one (*WG 20 Endnote 3*). It was generally felt that significant progress had been made with the IPCC GCM evaluations (#1), the development of regional climate models (RCMs) (#3), collaboration with other PICES expert groups like CFAME and WG 25 (#2), and convening PICES and international workshops/sessions (#5).

AGENDA ITEM 4

WG 20 final report

As WG 20 completed its tenure at this PICES meeting, a primary discussion point was the structure and content of the final report. It was agreed that each of the Working Group member chapters should summarize work accomplished *versus* the Terms of Reference and be 10–20 pages long. With an expectation of contributions from all Working Group members, the following chapter outline was put forward:

1. Acknowledgments, Abbreviations and Acronyms, Executive Summary,
2. Introduction: Background, Terms of Reference, Membership, Outline,
3. Wang, Overland, Bond: GCM downscaling procedures and examples,
4. Di Lorenzo, Miller: regional climate modeling and covariability in North Pacific,
5. Foreman and colleagues: RCM development for BC shelf waters,
6. Christian: GCM carbon cycle development,
7. Curchitser, Hermann: RCM development for the NE Pacific and Bering Sea and two-way coupling of this RCM into the NCAR GCM,
8. Ustinova, Zuenko: evaluation of climatic variability in Far Eastern Seas,
9. Navrotsky: interactions between climate and ecosystems,
10. Yamanaka, Hasumi, and colleagues: ecosystem projections for the Kuorshio/Oyashio system,
11. Jang, Pang, Yeh, Oh and colleagues: GCM projections of changes to mixed layer depth,
12. Qiao, Wang, Wu and colleagues: Chinese contributions,
13. Summary and recommendations.

It was emphasized that the final report is considered “grey literature” and will not be formally reviewed. As such, individual chapters should only give highlights of work that is either planned for publication, or has already been published. For specific PICES formatting requirements authors were referred to http://www.pices.int/publications/scientific_reports. The PICES Secretariat will technically edit the report and although MS Word files are preferred, other formats are acceptable (*e.g.*, LaTeX equations will be converted to MathType). Tables can either be in Word or Excel (no images of tables) and though the figures can be in any one of the common various formats (*e.g.*, eps, tiff, jpg), they should be good quality and use greyscale if colour is not necessary. Chapters should be sent to Dr. Foreman by December 31, 2010, with earlier submissions preferred.

As PICES Science Board and Governing Council are particularly interested in the recommendations from this Working Group, Dr. Foreman presented four possibilities (WG 20 Endnote 4) that will hopefully be expanded

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and extended in the final report. Draft Terms of Reference for a new working group on “North Pacific Climate Variability and Change” that was proposed by Drs. Emanuele Di Lorenzo and Shoshiro Minobe were also presented and discussed along with the four recommendations. Several comments were made asking for clarification of terminology (*e.g.*, conceptual mechanistic model), time scales, and scope, and these were recorded so they could be passed on to Drs. Di Lorenzo and Minobe. Possible membership (*e.g.*, the need to bring in new people) was also discussed.

AGENDA ITEM 5

Update on FUTURE and its Advisory Panels

Dr. Hiroaki Saito, Chairman of the FUTURE Advisory Panel on *Climate, Ocean Variability, and Ecosystems* (COVE-AP), gave a brief summary of its meeting on October 22. COVE-AP fully supports the proposed new “climate” working group and is proposing both another new working group on “Ecosystem Responses to Multiple Stressors” and a workshop on “*Indicators of status and change within North Pacific marine ecosystems: A FUTURE workshop*” to occur just before or after the inter-sessional Science Board meeting in April 2011.

AGENDA ITEM 6

Other business

Dr. Anne Hollowed gave a brief summary of recent activities of the joint PICES/ICES WG on *Forecasting Climate Change Impacts on Fish and Shellfish*. Though this Working Group ends in 2011, its high productivity has spawned discussion on how it will continue within each the ICES and PICES frameworks. Regardless of how the Group is re-structured, there will be an ongoing need for IPCC GCM and RCM projections so Dr. Hollowed was supportive of WG 20 recommendations on how that might be done.

No other business was discussed and the meeting was adjourned at 17:00. Dr. Foreman thanked all members for their contributions over the four-year tenure of the Working Group.

WG 20 Endnote 1

WG 20 participation list

Members

James Christian (Canada)
Enrique Curshitsler (U.S.A.)
Michael Foreman (Co-Chairman, Canada)
Arthur Miller (U.S.A.)
Elena Ustinova (Russia)
Muyin Wang (U.S.A.)

Observers

Teresa A’mar (U.S.A.)
Kyung-Il Chang (Korea)
Anne Hollowed (U.S.A.)
Chan Joo Jang (Korea)
Dong-Jin Kang (Korea)
Jung Jin Kim (Korea)
Yuichiro Kumamoto (Japan)
Jae Hak Lee (Korea)
Tim Lee (U.S.A.)
Hanna Na (Korea)
Jae-Hyoung Park (Korea)
Thomas Royer (U.S.A.)
Toshi Saino (Japan)
Hiroaki Saito (Japan)
Sinjae Yoo (Korea)
Yury Zuenko (Russia)

WG 20 Endnote 2**WG 20 meeting agenda**

1. Welcome, introductions, opening remarks
2. Changes to, adoption of, agenda and appointment of rapporteur
3. Review of WG Terms of Reference and summary of accomplishments
4. WG 20 final report:
 - a. Organization, contents, formatting
 - b. Chapter assignments and deadlines
 - c. Recommendations for FUTURE
 - i. TOR for a new WG
5. Update on FUTURE and its Advisory Panels (Hiroaki Saito)
6. Other business
7. Adoption of meeting report for presentation at POC committee meeting

WG 20 Endnote 3**Summary of WG 20 activities versus Terms of Reference**

1. To analyze and evaluate climate change projections for the North Pacific and its marginal seas based on predictions from the latest global and regional models submitted to the Inter-governmental Panel on Climate Change (IPCC) for their 4th assessment report.
 - Several Wang/Overland/Bond papers published evaluating global climate models (GCMs) and their projections in North Pacific and Arctic,
 - Di Lorenzo, Miller and colleagues: conducted NPGO analyses of IPCC model results,
 - Hasumi and colleagues continued analyses and improvements to Japanese GCM (MIROC),
 - Yamanaka and colleagues continued analyses of ecosystem models coupled to Japanese GCM,
 - Qiao and colleagues studied GCM improvements by addition of surface waves,
 - Ustinova and colleagues evaluated climate variability in Far Eastern seas,
 - Jang and colleagues studied GCM projected mixed layer depth changes in North Pacific,
 - Foreman and colleagues evaluated GCM winds off BC.
2. To facilitate analyses of climate effects on marine ecosystems and ecosystem feedbacks to climate by, for example computing an ensemble of the IPCC model projections for the North Pacific and making these projections available to other PICES groups such as CFAME.
 - Worked with CFAME,
 - Conducted joint workshops at PICES Annual Meetings, and April 2008 workshop in Hawaii,
 - Contributed to the final report and co-authored publication,
 - Working with WG25 – joint PICES/ICES WG-FCCIFS,
 - Foreman, Yamanaka are WG 25 members,
 - Co-convened Theme Session on “*Downscaling variables from global models*” in which WG 20 members participated in, at the International Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*”, April 2010 in Sendai, Japan,
 - Manuscripts were submitted to ICES Journal of Marine Science
 - Yamanaka and colleagues continued development and analyses of an ecosystem model coupled to Japanese GCM
3. To facilitate the development of higher-resolution regional ocean and coupled atmosphere–ocean models that are forced by, and take their boundary conditions from, IPCC global or regional models.
 - RCMs developed, or under development, for:
 - California shelf (Auad, Miller, Di Lorenzo),
 - NE Pacific and Bering Sea – fully coupled to NCAR GCM (Curchitser *et al.*),

WG 20-2010

- BC shelf (Foreman *et al.*),
 - Washington-Oregon shelf (Bond, Hermann, Curchitser),
 - Kuroshio region (Kurogi, Hasumi, Tanaka),
 - Curchitser participated in RCM workshop in September,
 - Japanese have 0.25° resolution GCM.
4. To facilitate the development of local and regional data sets (*e.g.*, SST, river flow, sea ice cover) incorporating information from climate model projections as well as observations and historical re-analyses.
 - Augmenting a data set of buoy wind measurements off the BC coast by filling gaps over the last decade with values from a NASA archive and analysing 50-year time series for trends in magnitude or timing,
 - Argo float data freely available (Freeland has given several summaries at POC meetings),
 - See recommendation #3.
 5. To ensure effective two-way communication with CLIVAR.
 - CLIVAR representatives gave presentations at WG 20 business meetings or co-sponsored workshops at several PICES Annual Meetings,
 - A close relationship has been maintained with ESSAS (Wang, Curchitser).
 6. To convene workshops/sessions to evaluate and compare results.
 - Conducted annual workshops at all PICES meetings,
 - 3 jointly with CFAME,
 - Participated in the CFAME inter-sessional workshop on “*Linking and visualizing climate-forcing mechanisms and marine ecosystem changes: A comparative approach*” in Honolulu, April 2008,
 - Co-convened a Theme Session on “*Climate model projections*” at the International Symposium on “*Effects of climate change in the World’s oceans*”, May 2008 in Gijón, Spain,
 - Co-convened a Theme Session on “*Downscaling variables from global models*” at the International Symposium on “*Climate change Effects on Fish and Fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*”, April 2010 in Sendai, Japan.
 7. To publish a final report summarizing results.
 - Proceeding.

WG 20 Endnote 4

Draft recommendations for the final report

1. Continue evaluating IPCC GCM (and RCM) results.
 - a. James Overland, Muyin Wang, Chan Joo Jang (and others?) plan evaluations of new AR5 outputs when they are available (winter 2010–11?);
 - b. WG 25 (joint PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*) will be interested in these forecasts;
 - c. The RCM community is hoping to have a chapter in AR5;
 - d. Besides continuing Japanese GCM/ecosystem model studies (Yamanaka and colleagues), several North Pacific RCMs are under development that are being, or could be, coupled to ecosystem models (*e.g.*, Curchitser, Hermann, Rose *et al.*);
 - e. This activity may not warrant a new Working Group but the work should be part of COVE-AP and/or SOFE-AP.

2. Continue analyses of North Pacific inter-annual to inter-decadal variability. This would be an extension of the PICES-2009 workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*” (W8) convened by Emanuele Di Lorenzo and Shoshiro Minobe.
 - A new working group, under POC and with COVE-AP’s support, has been proposed (*WG 20 Endnote 5* has the draft Terms of Reference);
 - IPCC-AR5 will include decadal predictions. Unlike GCM predictions that should only be evaluated statistically, these decadal predictions should be directly comparable with subsequent observations. An analysis of these predictions could be part of SOFE.
3. Establish live-access servers or ftp sites to archive and provide easy access to results from RCMs, analogous to the PCMDI archive for IPCC GCM results.
 - This would address WG 20 TOR #4, something that was not adequately accomplished during the tenure of the Working Group;
 - It would also provide fisheries scientists (*e.g.*, WG-FCCIFS) with climate change variables on much finer spatial scales than can be resolved with the GCMs.
 - This could be a possible activity for the COVE or SOFE Advisory Panels and TCODE.
4. Provide and regularly update lists of links to GCM/RCM sites like NARCCAP (North American regional climate model results, <http://www.narccap.ucar.edu/>) and to relevant publications like the “Guide to Best Practices on the Use of Climate Models” (Overland *et al.*).

WG 20 Endnote 5

Proposal for a new Working Group on “North Pacific Climate Variability and Change”

Motivation

The need to develop essential mechanistic understandings of North Pacific climate variability and change that can better guide the formulation of process-based hypotheses underlying the links between ecosystem dynamics and physical climate.

Draft Terms of Reference

1. Develop conceptual mechanistic models or frameworks of North Pacific climate variability and change that can be readily used by ecosystem scientists to explore hypotheses of the links between ecosystem dynamics and physical climate.
2. Summarize the current understanding of mechanisms of Pacific climate variability, and evaluate the strengths of the underlying hypotheses with supporting evidence.
3. Coordinate, in conjunction with ecosystem scientists, the development and implementation of process-based models to hindcast the variability of available long-term biological time series.
4. Provide improved metrics to test the dynamics of the IPCC models.
5. Understand and fill the gaps between what the physical models can currently produce and what ecosystem scientists suggest are important physical forcing factors required for predicting species and ecosystem responses to climate change.
6. 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.
7. Convene workshops and sessions to evaluate and compare results.
8. Publish a final report summarizing results.

Suggested Co-Chairmen: E. Di Lorenzo (U.S.A.), S. Minobe (Japan), M. Foreman (Canada)

REPORT OF WORKING GROUP ON *NON-INDIGENOUS AQUATIC SPECIES*

The Working Group on *Non-indigenous Aquatic Species* (hereafter WG 21) held its fifth meeting October 23–24, 2010 under the co-chairmanship of Darlene Smith and Vasily Radashevsky who presented opening remarks and welcomed participants. All PICES member countries were present except China (*WG 21 Endnote 1*). On the first day, the agenda dealt with items 1 to 5, with the remainder being discussed on the second day. The agenda for the meeting can be found in *WG 21 Endnote 2*.

October 23, 2010

AGENDA ITEM 2

Reports on WG 21 activities in 2010

Demonstration Rapid Assessment Survey (RAS) workshop in Japan

A demonstration RAS workshop on “*An introduction to rapid assessment survey methodologies for application in developing countries*” was held July 13–15, 2010 at the Marine Station of the Center for Inland Seas on Awaji Island, Japan. The workshop was hosted by Professor Hiroshi Kawai of Kobe University (see PICES Press Vol. 19, No. 1, pp. 30–31). The goal of the workshop was to provide outreach to participants from developing Southeast Asian countries through training in survey techniques that are quick and inexpensive and can be used where monitoring for non-indigenous species (NIS) is limited and not conducted in a systematic manner. The RAS is a tool for small-scale surveys and is not a replacement for large-scale monitoring programs. Participants came from Malaysia, the Philippines, Indonesia, Singapore, and Thailand. They visited a number of sites around Osaka Bay where they were shown techniques to sample a variety of habitats. Specimens from the highly developed inner part of Osaka Bay and from the relatively pristine area outside of the Bay were collected and identified for comparisons. Based on the positive feedback received from the workshop in Japan, Dr. Thomas Therriault and Prof. Kawai are considering conducting a larger demonstration workshop next year.

RAS 2010 in Newport, Oregon, U.S.A.

The third WG 21 RAS was held at the Hatfield Marine Science Centre in Newport, Oregon, October 18–20, 2010. Twenty participants from Canada, Japan, Russia and the United States sampled intertidal and shallow subtidal habitats in Coos Bay and Yaquina Bay. Results of the Oregon RAS included identification of 191 taxa, most identified to the species level. Twenty-five species of polychaete represent the first records of these species in one or more of the sampled Oregon estuaries, and 8 species of polychaete represent new records in Oregon.

A significant advantage of these surveys is the opportunity for taxonomists to examine material from different areas and exchange ideas directly with other taxonomists of the same taxa and with other invasion ecologists. The participation of ascidian taxonomists in this survey allowed the identification of the second Pacific record of the introduced North Atlantic sea grape *Molgula citrina*, which was also the first Pacific record south of Alaska.

Two of the RAS participants, Graham Gillespie and Sylvia Behrens Yamada contrasted Canadian and U.S. methods to trap European green crab *Carcinus maenas*, allowing a unique opportunity to inter-calibrate methods used among PICES member countries. Sylvia Behrens Yamada and colleagues have conducted trap surveys in Washington and Oregon estuaries for over a decade while Graham Gillespie and colleagues have conducted trap surveys in British Columbia for the last 5 years.

WG 21-2010

Gear types are standardized but the survey methodologies have subtle differences. In Washington and Oregon surveys are completely intertidal with traps set from shore during low tides, while in British Columbia surveys include inter- and sub-tidal habitat with traps set by boat. Catch rates (proxy for abundance) vary widely: generally less than 1 crab/trap-day in Washington and Oregon, while some sites in British Columbia have yielded over 30 crabs per trap-day. Therefore, it was desirable to trap a common area using both methods for inter-calibration.

Direct comparisons provisionally indicate that the two methods are comparable. Shore-based trapping is the most efficient means in large coastal estuaries as green crab populations are limited to the upper intertidal. The sample sizes were low and comparisons over a range of abundance would further increase confidence in these results.

Collector plates were deployed during 2010 in Canada in the ports of Vancouver and Victoria, Canada, in an effort to compare with the Ruiz group in San Francisco, U.S.A. Collector plates were also deployed in Osaka Bay, Japan, and the ports of Pusan, Pohang and Daesan in Korea. In the United States collectors were deployed in Oregon for the WG 21 RAS and in Seattle.

Non-indigenous species database project

Deborah Reusser installed the new version of the PICES NIS database on the laptop computers of participants at the meeting, and was able to resolve incompatibility issues resulting from different versions of Windows operating systems. The database contains a new feature which permits mapping of indigenous and non-indigenous species at a global scale using MEOW ecoregions. Another feature of the database is the ability to generate custom atlas reports.

Non-indigenous species in the North Pacific atlas

The draft atlas was presented to participants. The atlas now contains 631 non-native species and will be placed on a password protected site for review by WG 21 members and taxonomists that have participated in the RAS.

The long-term future of the database and atlas was also discussed. Funding from the Japanese Ministry of Agriculture, Fisheries and Forestry (MAFF) used to develop the database ends March 12, 2012. The United States Atlas Program has offered to host the database. Given PICES' limited resources for data management, this offer will be investigated as a long-term solution for the NIS database and atlas.

AGENDA ITEM 3

Country reports

Canada

Dr. Therriault reported that the Canadian Government has renewed funding for NIS. Fisheries and Oceans Canada is reviewing its marine and freshwater monitoring programs. The current Canadian Aquatic Invasive Species Research Network (CAISN) 5-year program will end March 31, 2011. A new 5-year network focusing on early detection, rapid response, climate change and management advice will succeed it. The new name is the NSERC Network on Aquatic Invasive Species and it will include an Arctic component, given the expectation that the Northwest Passage will be open to shipping in the relatively near future. Information on CAISN can be found at www.caisn.ca. The first record of the periwinkle *Litorina litorea* was reported in British Columbia.

China

No Chinese member was in attendance to provide a report.

Japan

Dr. Takeo Kurihara informed the meeting that Japan has begun a National Survey on the Natural Environment program. Under this program, organisms will be monitored for 100 years. The monitoring is focused on natural and well-preserved sites and will identify all organisms including NIS. Additional information on this survey can be found at:

- <http://japan.wetlands.org/WetlandsInternationalJapanWIJ/tabid/1902/language/en-US/Default.aspx>
- http://www2.restec.or.jp/geoss_web/pdf/0415/wg3/biodiversity/03.pdf

Korea

Dr. Jung-Hoon Kang gave a presentation on Port Environmental Risk Assessment Technology. Korea is conducting biological and environmental monitoring in 11 shipping ports. The biological monitoring includes NIS. The NIS monitoring includes deployment of the WG 21 collector plates. NIS will be classified based on risk. DNA probes are being developed to detect high-risk species. Korea is considering adding the NIS data from their port surveys to the PICES NIS database.

Russia

Dr. Radashevsky reported that Dr. Alexander Zvyagintsev of the Institute of Marine Biology, Vladivostok, has created a group working on NIS which has studied organisms in ballast water from two ships, one from Japan and one from China. A list of species found in the ballast water has been published. Many of the species were NIS. The publication is in Russian but has a list of the Latin names of species. Surveys are being conducted around Vladivostok Harbour to detect NIS.

United States of America

Dr. Mark Sytsma reported on a West Coast governors' agreement on ocean health. It is an ocean policy for the region with 7 elements, including one on NIS. There are two tasks related to NIS, standardizing ballast water regulations (Pacific ballast water group) and eradication of four species of invasive *Spartina*. The objective of the *Spartina* management plan is to eliminate it by 2018. The three West Coast states and British Columbia are involved in implementing the management plan.

Dr. Blake Feist reported that NOAA deployed collector plates at two stations around Seattle. The plates were modified to be attached to fixed structures. The plates have been collected and preserved, but not analysed. Additionally Dr. Andrew Cohen of NOAA has produced a paper on pathogens in ballast which can be accessed at the following URL:

http://bioinvasions.academia.edu/AndrewCohen/Papers/432605/Cohen_A.N._2010._Non-native_Bacterial_and_Viral_Pathogens_in_Ballast_Water_Potential_for_Impacts_to_ESA-listed_Species_under_NOAAs_Jurisdiction._A_report_prepared_for_the_National_Oceanic_and_Atmospheric_Administration_National_Marine_Fisheries_Service_Endangered_Species_Division_Silver_Spring_MD._Center_for_Research_on_Aquatic_Bioinvasions_CRAB_Richmond_CA

Dr. Henry Lee II reported that the Environmental Protection Agency is developing national ballast water standards and that Gregory Ruiz (Smithsonian Environmental Research Center) and Dr. Ian Davidson (Portland State University) are continuing extensive monitoring of hull fouling on ships at ports on the west coast of North America.

AGENDA ITEM 4

Other updates*RAS workshop in Thailand for the WESTPAC region*

Dr. Apple Chavanich of Chulalongkorn University organized a Rapid Assessment Survey with WESTPAC funding. Dr. Therriault will share information and a proposal for a WG 21 event next year in Thailand.

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Activities with ICES

Ms. Smith reported on the discussions by two ICES working groups (Working Group on Introduction and Transfer of Marine Organisms and the Working Group on Ballast and Other Ship Vectors) on possible collaboration between ICES and PICES. The two ICES working groups discussed the PICES NIS database but consider it too complex for immediate use. However, they still wish to continue to explore opportunities for collaboration with WG 21. A joint meeting between WG 21 and the ICES working groups is proposed concurrent with the Marine Bioinvasions Conference in Barcelona, Spain, in August 2011.

Establishment of more formal linkages with NOWPAP

Dr. Sangjin Lee (NOWPAP) provided an update on NOWPAP NIS activities and indicated an interest in establishing linkages with PICES WG21. NOWPAP is one of the UNEP Regional Seas Programs. NOWPAP has 4 member states, China, Japan, Korea, and Russia. One of Regional Activity Centres, DINRAC (Data and Information Network Regional Activity Centre), has established a database related to marine environment conservation on their website. DINRAC has compiled national reports prepared by national experts from member states on NIS and combined into a regional report. It includes current status, legislation, prevention, detection and management of MIS, which is being implemented by each member state. More information on NOWPAP can be found at the following website: <http://www.nowpap.org> and <http://dinrac.nowpap.org>.

Scientific papers

Presentations on the following topics were given by the lead authors:

- Is it or isn't it? Taxonomic proficiency of North Pacific NIS polychaete assessments in the Northeast Pacific. Leslie H. Harris.
Polychaete Section, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California, USA, 90007.
- Per capita invasion probabilities: A linear model to predict rates of invasion via ballast water. Deborah A. Reusser¹, Henry Lee II² and Melanie R. Frazier²
¹ US Geological Survey, Western Fisheries Research Center and Oregon State University, 2111 NE Marine Science Dr., Newport, OR, 97365, USA. E-mail: dreusser@usgs.gov
² US EPA, ORD, NHEERL, Western Ecology Division, 2111 NE Marine Science Dr., Newport, OR, 97365, USA
- Density matters: Comparison of approaches to developing ballast water discharge targets. Henry Lee II¹, Deborah A. Reusser² and Melanie R. Frazier³
¹ U.S. EPA, Western Ecology Division, Pacific Coastal Ecology Branch, Newport, OR, 97365, USA. E-mail: lee.henry@epa.gov
² USGS, Western Fisheries Research Center, Newport, OR, 97365, USA
³ U.S. EPA, Western Ecology Division, Pacific Coastal Ecology Branch, Newport, OR, 97365, USA
- Implications of the species area rule to human welfare
John W. Chapman, Dept. Fisheries and Wildlife, Hatfield Marine Science Center, Newport Oregon, OR 97365, John.Chapman@OregonState.Edu

AGENDA ITEM 5

Long-term NIS activities in PICES

WG 21 is scheduled to complete its term at the PICES-2012 in Japan. A discussion was held among the 5 countries present to assess interest in continuing work on NIS within PICES. Representatives from Canada and the U.S. agreed that NIS will continue to be a priority for them. Korean participants believe that NIS will continue to be a priority but that the focus of work should change and include climate change elements. Japanese participants indicated that NIS will continue to be an important issue, but that the focus should change to include indigenous and non-indigenous species in the context of climate change. The Russian participant concurred that it was important to continue the NIS work.

Discussions amongst WG 21 members during the meeting and at the PICES Opening Reception about this topic resulted in the following topics to be considered for continued PICES work on NIS:

- Climate change is expected to alter both indigenous and NIS species. Indigenous species may well change their ranges, especially in ecosystem boundary areas. Climate change may result in new vectors or change in the relative importance of existing vectors that introduce NIS. Climate change may also alter the severity of the impacts of NIS species and may result in indigenous species becoming problem species, as is the case with some species of jellyfish.
- Future PICES work could include study of the impacts of climate change on indigenous and NIS. The foundation work of WG 21, including the database and RAS/taxonomy initiatives, could be used to support this new focus. There could also be an opportunity to incorporate the work of the Section on *Harmful Algal Blooms* (HAB-S), as harmful algae will be affected by climate change just the same as the macro-organisms that WG 21 has focused on.

WG 21 members also discussed how current and future work must be relevant to the FUTURE program and its Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems* (AP-AICE). Members believe that a new focus on climate change would be consistent with FUTURE.

October 24, 2010

AGENDA ITEM 6

WG 21 MAFF projects – Plans for 2011–12

Database and atlas

Discussion focused on the final entry of data. Dr. Lee II offered to enter data if it is sent him in an ordered format. WG 21 members and taxonomists that have worked on the RAS can submit data. Korea will consider entering the data from their port survey project. Deadline for comments on the database to Dr. Lee due December 31, 2010. Dr. Deborah Reusser noted increasing difficulties being encountered with different versions of Windows and operating languages, and is working to resolve this issue.

Taxonomy project

Plans for a WG 21 RAS prior to PICES-2011 in Khabarovsk, Russia, were discussed. Khabarovsk is situated on the Amur River, some 700 km north of the Port of Vladivostok. Vladivostok, with its Institute of Marine Biology, was selected as the best location for the WG 21 RAS.

Continuation of collector plate surveys

Dr. Therriault sent collectors out this year and offered to ship collector plates to WG 21 members for the 2011 sampling year.

Demonstration workshop for countries in economic transition

The first RAS demonstration workshop was a successful start but larger workshop is needed to reach more countries. Dr. Therriault and Prof. Kawai will work with Dr. Chavanich to develop a proposal to hold a second demonstration workshop in Puket, Thailand, during the summer of 2011, with support from WESTPAC. Target participants will be researchers and managers working on NIS.

Report to Japanese Fisheries Agency

A report of WG 21 and HAB activities conducted with the funding from MAFF will be presented to the Japanese Fisheries Agency. The WG 21 portion will include a summary of the RAS and the database and atlas development. The deadline for the report is October 31, 2010. The report is for bureaucrats and should highlight the successes and important results of the projects. For example, the confirmation that *Ulva pertusa*,

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which has been washing up in abundance in Oregon, is native to Asia and the documentation of *Mogula citrina*, a solitary tunicate from the North Atlantic.

AGENDA ITEM 7

Terms of Reference

WG 21 reviewed its Terms of Reference and confirmed that it is on track for completion in October 2012.

AGENDA ITEM 8

Other business

Request for financial support for

The organizers of the 7th International Conference on *Marine Bioinvasions* have requested financial support of \$5000 from PICES. PICES has previously provided financial support at this level to fund travel for participants from PICES member countries. WG 21 members are supportive of this request.

Potential linkages between WG 21 and FUTURE

Dr. Therriault led the discussion on potential linkages between WG 21 and the FUTURE program, focusing on AP-AICE. WG 21 activities are consistent with FUTURE but are scheduled to terminate October 2012, leaving a short time period to develop links. A decision will be required to continue PICES work on NIS if longer-term links to FUTURE are to be established.

Suggestions for linking NIS with HAB-S or rolling WG-21 over into a section were made. A number of WG 21 members indicated that their countries (Korea, Japan, Canada, U.S.) were interested in continuing with NIS. Climate change was proposed as a future focus of NIS activities.

WG 21 Endnote 1

WG 21 participation list

Members

Blake Feist (U.S.A.)
Graham Gillespie (Canada)
Jung-Hoon Kang (Korea)
Takeo Kurihara (Japan)
Henry Lee II (U.S.A.)
Yoon Lee (Korea)
Vasily Radashevsky (Russia, Co-Chairman)
Deborah Reusser (U.S.A.)
Darlene Smith (Canada, Co-Chair)
Mark Sytsma (U.S.A.)
Thomas Therriault (Canada)

Observers

Sangjin Lee (NOWPAP of UNEP)
John Chapman (U.S.A.)
Leslie Harris (U.S.A.)
Wang Qixiang (China)

WG 21 Endnote 2

WG 21 meeting agenda

October 23, 2010

1. Opening Remarks and Introductions (Smith and Radashevsky)
2. Reports on WG 21 activities in 2010
 - Demonstration Rapid Assessment Survey (RAS) Workshop in Japan (Therriault)
 - Newport Rapid Assessment Survey 2010 (Therriault and Chapman)
 - PICES NIS Database Project (Lee and Reusser)
 - Non-indigenous species in the North Pacific Atlas (Lee/Reusser)
 - Collector plate deployment in 2010 (Therriault and others)
3. National reports (All)
4. Other updates
 - RAS workshop in Thailand for the WESTPAC region (Smith)
 - Activities with ICES (Smith)
 - Establishment of more formal linkages with NOWPAP (Sangjin Lee)
5. Long term NIS activities in PICES

October 24, 2007

6. WG 21 MAFF Projects – Plans for 2011-12
 - Database and atlas (Reusser and Lee)
 - Taxonomy (Therriault)
 - Report to Japanese Fisheries Agency (Kurihara)
7. WG 21 Terms of Reference (All)
8. Other business (All)

REPORT OF WORKING GROUP 22 ON IRON SUPPLY AND ITS IMPACT ON BIOGEOCHEMISTRY AND ECOSYSTEMS IN THE NORTH PACIFIC OCEAN

The final meeting of the Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (hereafter WG 22) was held from 14:00–18:00 hours on October 24, 2010. The Co-Chairmen, Drs. Fei Chai and Shigenobu Takeda called the meeting to order and welcomed the participants (*WG 22 Endnote 1*). The draft agenda was reviewed and adopted (*WG 22 Endnote 2*). As WG 22 will be disbanded in 2010, the Co-Chairmen expressed appreciation to the WG 22 members and to all scientists who contributed to the workshop and the annual meeting session proposed by the Working Group.

AGENDA ITEM 2

Review of WG 22 activities

Iron biogeochemistry data sets in the North Pacific

Data collected by WG 22 during its term (2007–2010) include dates, position (station, depth), cruise #, iron measurements (size, analytical method). A map of the stations and a list of the data sources will be prepared. Dissolved iron data sets collected from Japanese scientists are being worked on. WG 22 members (Drs. Takeda, Mark Wells and William Crawford) will contact other key scientists who have made iron measurements in the North Pacific in order to collect as much available iron data as possible. The database may include cruise/station information in which iron samples were collected and analyzed but have not been published.

Report on BIO Topic Session 2 (S2)

To review the past and ongoing laboratory, field and modeling studies on iron biogeochemistry and its impact on biological productivity and marine ecosystems in the North Pacific Ocean, WG 22 convened the BIO Topic Session co-sponsored by SOLAS (Surface Ocean-Lower Atmosphere Study) on “*Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean*” at the PICES-2010 in Portland, U.S.A. Participation included scientists from Canada, China, Germany, Japan, and the United States (*WG 22 Endnote 3*). There were 11 oral presentations focusing on iron biogeochemistry and the impact of iron (dust) on ecosystem dynamics, based on field observations, onboard experiments and numerical models. A summary of the session is included in the Session Summaries section of this Annual Report. Co-convenors (Drs. Angelica Peña, Toshiro Saino and Mark Wells) will ask invited speakers to submit extended abstracts with key figures and tables to be included in the WG 22 final report.

AGENDA ITEM 3

Basic questions and recommendations for the future of iron studies within PICES

The Working Group discussed basic questions regarding the future of iron studies within PICES. It was agreed that the next phase of iron research in the North Pacific will involve:

- ecosystem responses to changes in iron supply rate, amount, and pathway,
- dissolution or biological availability and residence time of suspended particulate Fe (from rivers, resuspended sediments, industrial combustion, and dust),
- mechanisms controlling chemical speciation of Fe in seawater and interaction of Fe binding organic ligands with particulate Fe,
- dynamics of Fe binding organic ligands, and
- interactions of iron with other stressors such as pH, Cu, *etc.*

For improving ecosystem models that include an iron cycle, more information is needed on:

- iron removal and recycling,

WG 22-2010

- iron sources,
- physiology of co-limitation by iron and other parameters, and
- grazing on phytoplankton communities.

The Working Group agreed that they needed to have a better understanding of the iron supply before they can get ecosystems right, but they also need to get ecosystems right before they can get the iron concentration right.

WG 22 recommended that PICES should support:

- integration of regional studies on iron biogeochemical cycles and its ecosystem impacts,
- development of a North Pacific database for iron and related parameters,
- symposium/annual meeting sessions on the role of iron in regulating ecosystem responses to natural and anthropogenic forcing in the North Pacific, and
- model inter-comparisons activities.

WG 22 term of reference 5 “*Elucidate the role of iron as a potential regulator of harmful algal bloom (HAB) in coastal ecosystems of the North Pacific*” has not been fully taken up for discussion in WG 22. Therefore, it is suggested that this topic could be incorporated into the activity plans of HAB-S and/or FUTURE.

AGENDA ITEM 4

Publication of the WG 22 final report

A draft of the final report will be prepared for the PICES Scientific Report series in April 2011. The contents and assignment of the WG 22 final report were discussed (*WG 22 Endnote 4*). WG 22 will also prepare a review to be submitted to *Oceanography* that summarizes the key issues on iron sources and cycling in the North Pacific and the Working Group recommendations for future iron studies in the North Pacific.

AGENDA ITEM 5

Future activities related to the work of WG 22

- A workshop on Asian Dust and Ocean EcoSystem (ADOES), November 28–December 2, 2010;
- A joint Quebec–Shandong provinces workshop on ocean acidification in Qingdao, December 6–8, 2010;
- American Geophysical Union 2010 Fall Meeting, December 15:
 - B06 Linkages in biogeochemical cycles between the surface ocean and lower atmosphere over the Pacific Ocean (Convenors: Mitsuo Uematsu, William Miller, and Maurice Levasseur);
 - OS27 Biological, chemical and physical controls on the Gulf of Alaska ecosystem (Convenors: John Crusius, Rob Campbell, Yi Chao, and Fei Chai);
- A SCOR Working Group 131 Synthesis and Modelling workshop (Convenors: Philip Boyd and Dorothee Bakker), Summer 2011;
- Dr. Chai introduced a new consortium of In-Situ Iron Studies (ISIS) to resolve the impact of iron fertilization on marine ecosystems, to quantify its potential for removal of atmospheric carbon dioxide, and to improve our collective understanding of the changing ocean.

Proposal for a new working group

Dr. Maurice Levasseur (Canada) prepared a proposal for a new working group on “*Sensitivity of the North Pacific to Atmospheric Iron Deposition in a Low pH Ocean*” (*WG-22 Endnote 5*). This proposal was discussed at the COVE-AP meeting on Friday, October 22, 2010 where they decided to include the topic as part of the mandate of their own Working Group proposal on “*Ecosystem response to multiple stressors.*” COVE-AP felt that the topic of Dr. Levasseur’s proposal was too specialized and should be broadened to comprise other important issues that all PICES countries are interested in. WG 22 recommended that COVE-AP consider nominating a few of WG 22’s current members (*e.g.*, Levasseur, Wells, Chai, or Takeda) as potential members of the new working group to reflect the activities that have been accomplished by WG 22.

WG 22 Endnote 1**WG 22 participation list**Members

Fei Chai (U.S.A., Co-Chairman)
 William Crawford (Canada)
 Jun Nishioka (Japan)
 Hiroaki Saito (Japan)
 Shigenobu Takeda (Japan, Co-Chairman)
 Mark Wells (U.S.A.)

Observers

Emilie Brévière (SOLAS)
 Mike Dagg (U.S.A., BIO)
 Hidefumi Fujioka (Japan)
 Joaquim Goes (U.S.A.)
 Josiane Mélançon (Canada)
 Atsushi Tsuda (Japan)

WG 22 Endnote 2**WG 22 meeting agenda**

1. Adoption of agenda
2. Review of 3 years of WG 22 activities
3. Basic questions and recommendations for the future of iron studies within PICES
4. Publication of the WG 22 final report
5. Future activities related to the work of WG 22
6. Other business

WG 22 Endnote 3

**Participation list for BIO Topic Session (S2) on
 “Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in
 the North Pacific Ocean” (co-sponsored by SOLAS) at PICES-2010**

Emilie Brévière (Germany, SOLAS)
 Fei Chai (U.S.A.)
 Hong Chen (China)
 William Crawford (Canada)
 Jay Cullen (Canada)
 Huiwang Gao (China)

Josiane Mélançon (Canada)
 Kazuhiro Misumi (Japan)
 Jun Nishioka (Japan)
 Hiroaki Saito (Japan)
 Mark Wells (U.S.A.)
Others

WG 22 Endnote 4**WG 22 final report**

- Table of Contents
- Introduction (Fei, Takeda)
- Natural supplies of iron to the North Pacific
 - Atmospheric depositions, rivers and resuspended sediments (Nishioka, Wells, Crawford, Uematsu)
- Linkages between iron supply and ecosystem responses (Yamanaka, Fei)
 - Model improvements during the past three years
 - New ecosystem models with iron cycle
- Data sets of iron and related parameters in the North Pacific (Takeda, Wells)
 - Dissolved Fe, particulate Fe, total Fe, Fe(II), and organic ligands data
 - Station maps
- Basic questions and Recommendations for future activities of iron studies within PICES and connection with other international programs (Saito, Wells, Maurice, Fei, Takeda)

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- References
- Appendices
 - List of iron measurements in the North Pacific,
 - Annual reports,
 - (Extended) abstracts from the workshop/session.

WG-22 Endnote 5

A proposal for a new expert group on *Sensitivity of the North Pacific to Atmospheric Iron Deposition in a Low pH Ocean*

Co-Chairs (proposed)

Maurice Levasseur (Laval University, Canada)
Gui-Peng Yang (Ocean University of China, China),
Philippe Tortell (University of British Columbia, Canada)
Shigenobu Takeda (Nagasaki University, Japan)

Proposed members

Martine Lizotte (Laval University, Canada)
Guangyu Shi (Institute of Atmospheric Physics, China)
Hui-Wang Gao (Ocean Institute of China, China)
Nadja Steiner (Fisheries and Oceans Canada, Institute of Ocean Sciences)
Lisa Miller (Fisheries and Oceans Canada, Institute of Ocean Sciences)
Michael Scarratt (Fisheries and Oceans Canada, Maurice Lamontagne Institute)
Takeshi Yoshimura (CRIEPI, Japan)
Mark Wells (University of Maine)
Jay Cullen (University of Victoria, Canada)
Andrew Ross (Fisheries and Oceans Canada, Institute of Ocean Sciences)

Central Objective

To determine how the predicted decrease in ocean pH will impact the response of the HNLC ecosystems to atmospheric iron deposition in the North Pacific.

Rationale

Twelve large-scale iron ocean fertilizations (IOFs) have been conducted so far in order to assess the impact of Fe deposition on primary production, carbon sequestration, climate-relevant trace gas emissions, and global climate (see reviews by de Barr *et al.*, 2005, Boyd *et al.*, 2007). These experiments have shown that Fe-dust can increase, albeit modestly, carbon sequestration, and significantly affect the production and flux of DMS and other trace gases to the atmosphere (see review MEPS 2008). In several of these experiments, the dynamics of DMS were tightly coupled to the growth and decline of prymnesiophytes such as *Emiliania huxleyi* and *Phaeocystis* spp. which tended to respond quickly to iron addition. These early blooms of prymnesiophytes also contributed to carbon production and sequestration by diverting a portion of the nutrients from the diatom blooms. Several prymnesiophytes are calcifying organisms, which are highly sensitive to variations in pH. Thus, the predicted decrease in oceanic pH could affect their response to iron availability. This could significantly alter the impact of atmospheric iron deposition on the North Pacific ecosystems.

The proposed working group would contribute to bring together the following ongoing activities, foster additional collaborations, and help secure funding; 1) In Canada, Nadja Steiner (IOS-DFO) and Maurice Levasseur (Laval University) are already leading a project on the co-effect of Fe and pH on the North-East Pacific Ecosystem, 2) Maurice Levasseur (Laval University) and Gui-Peng Yang (Ocean University of China) received funds from the Government of Quebec (Canada) to conduct a joint Quebec–Shandong workshop on the impact of ocean acidification on marine resources and biogeochemical cycles. The objective of the workshop is to establish a new Quebec–Shandong joint multidisciplinary 3-year research program on the impact of ocean acidification and the functioning of marine ecosystems, coastal resources, and biogeochemical cycles.

General Approaches

This important question should ideally be addressed through large-scale *in situ* experiments (addition of dust, Fe, Fe+CO₂, CO₂, control). But this represents a technical, financial, and logistical challenge probably out of reach. For this reason, we propose to start with the development of onboard and *in situ* mesocosms protocols. Such protocols should allow maintaining a constant pH level for the duration of the experiment (several days). These experiments should be conducted in the different HNLC regions. The target area for the PICES WG 22 could be the North Pacific HNLC waters.

Specific Approaches for WG 22

In Canada, part of this project could be associated with the ongoing Line P cruise program led by the Institute of Ocean Sciences (IOS) of the Department of Fisheries and Oceans (DFO). Additional days devoted to the project could be added to the two Line P summer cruises if we can find extra money (NSERC) to cover these extra days at sea. Chinese colleagues could explore the possibility of obtaining a special research permit to use Chinese dust during PICES experiments. Mesocosms have been developed for ocean pH studies by Dr. Ulf Riebesell. Dr. Levasseur contacted him for potential use of the mesocosms at OSP).

Contributions

The proposed working group would contribute to bring together the following ongoing activities, foster additional collaborations, and help secure funding; 1) In Canada, Nadja Steiner (IOS-DFO) and Maurice Levasseur (Laval University) are already leading a project on the co-effect of Fe and pH on the North-East Pacific Ecosystem, 2) Maurice Levasseur (Laval University) and Gui-Peng Yang (Ocean University of China) received funds from the Government of Quebec (Canada) to conduct a joint Quebec–Shandong workshop on the impact of ocean acidification on marine resources and biogeochemical cycles. The objective of the workshop is to establish a new Quebec–Shandong joint multidisciplinary 3-year research program on the impact of ocean acidification and the functioning of marine ecosystems, coastal resources, and biogeochemical cycles.

Related Article

Levasseur, M. 2011. If Gaia could talk. *Nature Geoscience* 4: 251–252.

**REPORT OF WORKING GROUP 23 ON *COMPARATIVE ECOLOGY OF
KRILL IN COASTAL AND OCEANIC WATERS AROUND
THE PACIFIC RIM***

The Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim* (WG 23) held its third meeting on October 24, 2010, from 0900–1230 h under the chairmanship of Dr. William Peterson who welcomed the members of the Working Group who were present as well as visitors (*WG 23 Endnote 1*), and shared apologies for those unable to attend.

AGENDA ITEM 2

Agenda additions and/or changes

The Chairman asked if there were any additional change to the agenda. The only item offered was the need to discuss where we could to dinner that evening. The meeting agenda can be found in *WG Endnote 2*.

AGENDA ITEM 3

Country reports

Reports from each PICES member country on progress during the past year were given. These reports were to include a variety of items including (1) status of metadata describing data which exists (which data can be easily shared for synthesis papers); (2) publications to be included in our publications data base; (3) status of the idea of having portions of papers written in other languages translated into English; (4) potential for collaborative research in the near future; (5) TOR # 5 – status of Working Group members’ work with modelers.

Canada

Dr. David Mackas summarized the extent of krill sampling in Canada, carried out by four programs. First, the ocean sampling that his group has been doing for a number of years was summarized. This, the “IOS Time Series” continues with 3–6 surveys per year, with sampling off southern Vancouver Island, northern Vancouver Island and Hecate Strait. Cruises are most often in May/June, August/September, depending on the availability of ship time. Sampling includes bongo tows during both day and night from which biomass per square meter is calculated. Another important time series is the one conducted by Dr. Ron Tanasichuk (Pacific Biological Station). He samples in Barkley Sound, with 10 surveys per year since 1991. Samples are processed chiefly for krill which are catalogued by length, weight, sex, maturity, gonad weights, and larval stage. Third, surveys also take place in the Strait of Georgia. These have been intermittent since 1968; the nighttime samples have been analyzed for euphausiids. Ms. Moira Galbraith (Institute of Ocean Sciences) maintains the database. Grad student Lingbo Li (University of British Columbia) has been analyzing the data from these samples and reports that there appears to be a big drop in the biomass of *Euphausia pacifica* in Strait of Georgia and an increase in *Thysanoessa spinifera* over the past 10 years. Finally, the cabled observatories, the NorthEast Pacific Time-Series Undersea Networked Experiments (NEPTUNE) and the Victoria Experimental Network Under the Sea (VENUS) projects include a 125 kHz echosounder (single frequency), and “krill” signals are being analyzed by Mei Sato (University of Victoria graduate student) with Dr. John Dower (University of Victoria).

China

No report was available.

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Japan

Dr. Yuki Okazaki reported on several activities. First, information on the vertical distribution of early life stages of *E. pacifica* was presented at the PICES/ICES/FAO Symposium on “*Effects of climate change on fish and fisheries*” held in Sendai, Japan, in April 2010. Second, they have begun to do some feeding experiments on adult krill during their cruises, with the first experiments carried out in June 2010 in the Oyashio. In a related effort, they will use the Odate/NORPAC net collections to look at eggs and larvae of *Euphausia pacifica*. Pilot studies are underway. They have also been looking at samples from the A-Line (2001–2008), PH Line (1980–2000) and the Saury surveys (2001–2007). They have found that euphausiid larvae were mostly found at stations with a depth of ~100 m and temperature < 12°C. Larvae were most abundant May/June coincident with phytoplankton blooms at that time of the year. Calyptopis and furcilia densities are similar in shelf and offshore waters. For much of this work, collaborations have been initiated with Dr. Tomohiko Kikuchi (Yokohama National University) and his PhD student. It is possible that collaboration will soon be established with Dr. Yoshinari Endo (Tohoku University) on krill and climate change. Finally, Dr. Okazaki expressed interest in working with the Peterson lab on population genetics of *Euphausia pacifica*.

Korea

Dr. Se-Jung Ju reported that there are many samples available from Korean waters that can be analyzed for krill eggs, larvae, juveniles and adults, including bi-monthly samples collected by the NFRDI, since 1968. However, he noted that many samples do not look good due to drying out. KORDI samples the East Sea and East China Sea in spring and summer and there are opportunities for others to join these cruises to sample euphausiids and to conduct experiments on living animals. He noted that Korean scientists tried some live animal experiments but without much success. They incubated 35 females but only 2 spawned 103 and 136 eggs per female, respectively. He is also doing lipid analysis on some krill collected from recent cruises.

Dr. Ju also presented an overview of studies of krill life cycles in the Yellow Sea Cold bottom water. By studying the acoustically-derived scatter layer, it was determined that the migration speeds of the krill scattering layers were 0.87 m day (downward at dawn) and 0.74 m day (upwards at night) in spring. Rates were different during summer: 0.44 m day (down) and 0.49 m day (up) in summer. In summer they only migrated to the base of the mixed layer where the water is still cold and where the Chl maximum is found.

Future work will include studies of the feeding ecology of krill using trophic lipid markers. Acoustics data from daytime suggests that adults are living on the bottom during the day. Thus it might be interesting to attempt to sample the adults with bottom sampling nets. Future work will also include two cruises per year, spring and summer, and these will involve net tows, acoustics for DVM, and additional lipid work.

To date, Korean scientists have published about 8 papers, 3 of which are in Korean.

Russia

No report was available.

U.S.A.

Sampling along the Newport Line is continuing every two weeks; the Peterson lab initiated feeding experiments on *Euphausia pacifica* and work was being carried out by a Chinese Ph.D. student, Xiuning Du. Dr. Peterson also summarized many of the items discussed in the following agenda items.

AGENDA ITEM 4

Progress report on *Euphausia pacifica* synthesis paper

Ms. Leah Feinberg (Oregon State University) presented a report on the synthesis of *Euphausia pacifica* brood sizes. This paper will be similar to one published in 2006 by Dr. Jaime Gómez-Gutiérrez (CICIMAR) and

others on *Euphausia pacifica* where brood size as a function of body length were compared using data from Puget Sound (Ross), the Sea of Japan (Iguchi) and Oregon (Peterson lab). She has updated that paper using data from the Oregon coast 2003–2007 (n = 368), the Gulf of Alaska (n = 60), the Southern California CalCOFI region (Decima, n = 84), and the Oyashio (Okazaki, n = 59). She has some data from the Yellow Sea (from Se-Jung Ju) but is still waiting for some data from Dr. Song Sun (China). She also needs to standardize the lengths (some people use total length, others body length). She is finding the same dome-shaped relationship as before, but with many more data points.

AGENDA ITEM 5

Using Zotero as a way of sharing published papers

WG 23 discussed the use of this tool as a way to store pdf files of published papers and other documents on the PICES website. Dr. Harold Batchelder arranged a meeting with an Oregon State University librarian and the Peterson lab to discuss with her the legal issues of posting pdf files of scientific papers to a WG 23 website. She suggested using Zotero which is a free, easy-to-use Firefox extension to help users to collect, manage, cite, and share research sources. According to the Zotero webpage (www.zotero.org), it lives right where you do your work—in the web browser itself. Zotero is able to link citation information which has been entered to online electronic archives provided by the publishers, and may serve as the best way for providing access to publications. WG 23 agreed that the tool seems like a good way to share data and publications.

AGENDA ITEM 6

Status of new project to characterize genetic structure of *Euphausia pacifica*

At the time of the meeting, it was reported that Dr. Peterson had hired a post-doc at the Hatfield Marine Science Center (Dr. Mattias Johansson) to begin some exploratory work on the population genetics of krill. Considerable progress has been made and will be reported on at PICES-2011 in Khabarovsk, Russia.

AGENDA ITEM 7

Report on the potential for using measurements of hepato-pancreas size as an index of condition in *Euphausia pacifica*

As with the genetics work, it was reported that we had only the potential to add measurements of the hepato-pancreas to our tool box. The Peterson lab hosted a young Chilean scientist, Ramiro Riquelme, during August 2010 in Newport, to collect living krill during our biweekly cruises and to measure the size of the hepato-pancreas. We learned that this appears to be a promising index of recent krill growth.

AGENDA ITEM 8

Discussion of TOR # 7

WG 23 discussed whether or not there was enough new information to justify organizing a krill symposium or a krill Topic Session for PICES-2011 in Khabarovsk, Russia. It was decided to not pursue this.

AGENDA ITEM 9

Summary of mid-term activities

A summary of activities of WG 23 following PICES-2009 in Jeju, Korea, and preceding PICES-2010 is reported in the following:

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1. A joint Korea–U.S. research cruise was scheduled for April 11–18, 2010 with the purpose of training Korean scientists on how to carry out ship-board laboratory studies of krill egg production, molting and grazing. Unfortunately the cruise was cancelled (on April 7) because the research ship was requested to help investigate the causes of the sinking of a Korean Navy ship at the end of March. Ms. Tracy Shaw and Dr. Peterson were to have joined this cruise, led by Dr. Se-Jong Ju, all of whom are Working Group members.
2. Dr. Peterson was allocated some start-up funds to begin study of pan-Pacific variations in genetic structure of our study organisms, *Euphausia pacifica*. A recent doctoral student, Mattias Johansson, was hired to begin this work.
3. Dr. Ju has collected *Euphausia pacifica* from Korean waters (both east and west sides of Korea) and has preserved them in alcohol for later analysis of genetic structure. Ms. Shaw has done the same with *E. pacifica* collected from the Bering Sea, so we now have specimens from three widely-separated locations.
4. The Peterson lab hosted a Chilean graduate student, Ramiro Riquelme, this summer. We learned from him how to do measurements of hepato-pancreas length as a measure of the euphausiid condition. [This technique was reported on at the WG 23 meeting during PICES-2010 (see Agenda Item 7) with the hope that other members of the Group will adopt this method in their future research.]
5. The Peterson lab continues to host Chinese graduate student, Xiuning Du (from Ocean University of China, in Qingdao), who is working on feeding rates of *Euphausia pacifica* through microscopic counts of phytoplankton and ciliates removed in control *vs.* feeding containers. [She was awarded Best Oral Presentation for her talk on “Feeding rates of adult *Euphausia pacifica* on natural particle assemblages in the coastal upwelling zone off Oregon, USA” for a BIO-sponsored Session at PICES-2010.]
6. A special issue of selected papers on krill from the 4th International Zooplankton Production Symposium on “*Human and climate forcing of zooplankton populations*” first appeared online in *Deep-Sea Research II*, and those who have seen it have commented that it is really nice and well worth the wait. The hard-copy of the journal was published in April 2010 (*Deep-Sea Research II*, Vol. 57, Is. 7–8). Due to the untimely death of Dr. Ed Brinton, we decided to dedicate the Krill Special Issue in his honor. Elsevier Press agreed that it was appropriate so Dr. Mark Ohman (Scripps, U.S.A.) and Jaime Farber Lorda (CICESE, Mexico) wrote up a brief obituary.
7. Tracy Shaw *et al.*'s paper on “Growth of *Euphausia pacifica* in the upwelling zone off the Oregon coast”, pp. 584–591, was published in the krill special issue of *Deep-Sea Research II* in which she summarized and synthesized all published growth rate data on *Euphausia pacifica*.
8. Drs. Peterson and Kazuaki Tadokoro organized a copepod and krill workshop titled, “*Examining the linkages between physics and fish: how to zooplankton and krill data sets improve our understanding of the impacts of climate change on fisheries?*” on April 25, 2010 at the PICES/ICES/FAO Symposium on “*Effects of climate change on fish and fisheries*” held in Sendai, Japan.
9. Dr. Yuju Okazaki arranged a tour of the Tohoku National Fisheries Research Institute laboratory following the Sendai symposium (April 2010) and, despite the rainy weather on Saturday following the symposium, the tour did take place.

WG 23 Endnote 1

WG 23 participation list

Members

Michael J. Dagg (U.S.A.)
Sejong Ju (Korea)
Michio J. Kishi (Japan)
David L. Mackas (Canada)
Yuji Okazaki (Japan)
William T. Peterson (U.S.A., Chairman)

Oberservers

Xiuning Du (China)
Leah Feinberg (U.S.A.)

WG 23 Endnote 2

WG 23 meeting agenda

1. Welcome and introduction
2. Agenda additions and/or changes
3. Country reports on progress during the past year on action items identified at PICES-2009
 - 3.1 metadata describing data which exists (which data can be easily shared for synthesis papers);
 - 3.2 publications to be included in our publications data base
 - 3.3 status of the idea of having portions of papers written in other languages translated into English
 - 3.4 potential for collaborative research in the near future
 - 3.5 TOR # 5 – status of your work with modelers
4. Report on progress on synthesis paper on *Euphausia pacifica* brood sizes
5. Discussion (and possible demonstration) of use of Zotero as a way of sharing published papers
6. Report on status of new project to characterize genetic structure of *Euphausia pacifica* from specimens collected off Oregon, Bering Sea and waters adjacent to the Korean peninsula
7. Report on the potential for using measurements of size of the hepato-pancreas as an index of condition in *Euphausia pacifica*.
8. Discussion of TOR # 7
9. Summary of mid-term activities

REPORT OF WORKING GROUP 24 ON *ENVIRONMENTAL INTERACTIONS OF MARINE AQUACULTURE*

The Working Group on *Environmental Interactions of Marine Aquaculture* (hereafter WG 24) held its second meeting on October 24, 2010 in Portland Oregon, under Co-Chairmen Dr. Katsuyuki Abo (Japan), Dr. Brett Dumbauld (U.S.A.), and Ms. Ingrid Burgetz (Canada). The list of participants and the meeting's agenda can be found in *WG-24 Endnotes 1 and 2*.

AGENDA ITEM 1

Welcome and introductions

Ms. Ingrid Burgetz provided welcome remarks which were followed by round table introductions. WG 24 members from Canada, Japan, Korea, Russia, the United States and were present. Observers from Canada, China, and Russia and also participated in the meeting. The agenda was reviewed; no comments or modifications were made.

The ability of WG 24 to re-define priorities within the overall Working Group (WG) Terms of Reference (TOR), and linking the activities to broader PICES activities was discussed. It was noted that the WG can select priorities based on interest and expertise of the members, and that these priorities would then be presented to the two parent Committees (MEQ and FIS) for approval. As this is the last year of WG 24's mandate, it was emphasized that the WG needs to demonstrate how marine aquaculture fits within PICES and the FUTURE program. Dr. Toyomitsu Horii (Japan) reported that he had attended the inter-sessional FUTURE workshop in Seoul, Korea (August 16–18, 2010) on behalf of the WG. There is a good fit for WG 24 within the FUTURE program, particularly in areas such as management of coastal resources and climate change.

AGENDA ITEM 2

Review of TOR activities from 2009-2010 and proposals for action items for 2010

Discussion of list of marine aquaculture–environment interactions

Through the circulation of documents via e-mail over the past few months, the WG 24 has agreed on categorizing the types of marine aquaculture and environment interactions. The WG discussed this categorization and as a result of this discussion the following modified list of interactions (separation of release of nutrients, non-cultured organisms and organic materials) are:

- Pest and pathogen interactions/management
- Benthic habitat interactions/alterations
- Chemical release
- Genetic interactions
- Alteration in nutrients/harmful algal blooms/eutrophication
- Release of non-cultured organisms
- Release of organic materials
- Effect of noise
- Alteration in light
- Marine mammal/bird interactions

Dr. Jack Rensel (U.S.A.) suggested that WG 24 broaden environmental interactions to include harmful algal blooms and eutrophication. He also noted that alteration in nutrients covers both water column and benthic impacts although it usually implies water column. He stressed that an important contribution of the WG is the opportunity to compare and contrast approaches used in different member countries.

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As part of the process in developing the categories of marine aquaculture-environment interactions, WG members were requested to identify the most important interactions for their country. Importance was defined as from an environmental, societal and/or economic perspective. Participants at the WG meeting were asked to confirm and/or comment on their responses. The following table identifies which interactions, by country, were identified as being most important.

Canada	Wild/cultured species interactions: <ul style="list-style-type: none">▪ Disease interactions▪ Pest management
China	<ul style="list-style-type: none">▪ Disease interactions: bidirectionality of disease transfer; diseases impacting shrimp production are of particular importance.▪ Genetic interactions
Japan	<ul style="list-style-type: none">▪ Pest and pathogen management▪ Benthic interactions/▪ Alteration in nutrients
Korea	<ul style="list-style-type: none">▪ Pest and pathogen interactions▪ Genetic interactions▪ Benthic habitat interactions▪ Alteration in nutrients
Russia	Wild/cultured species interactions: <ul style="list-style-type: none">▪ Alteration of nutrients/pollution▪ Disease interactions
USA	<ul style="list-style-type: none">▪ Pest and pathogen interactions▪ Benthic habitat interactions▪ Alteration in nutrients

Action Item: Ms. Burgetz will revise the list based on discussions (revised above) and will re-circulate the list to WG 24 members.

Discussion of Term of Reference 2: Risk assessment

TOR-2 Country reports

Ms. Ingrid Burgetz and Dr. Jay Parsons (Canada) provided a brief update on the upcoming change in responsibility for the regulation of aquaculture in British Columbia, Canada. The federal government, through the Department of Fisheries and Oceans will be assuming responsibility for regulating aquaculture with the exception of issuing licenses for siting of new aquaculture operations, which will still be the responsibility of the Province of British Columbia.

Dr. Galina Gavrilova (Russia) provided a brief country report indicating that the concept of risk and of risk assessment is not as popular in Russia as it is in Canada or the U.S.A. Russia is not a member of the World Trade Organization, and aquaculture activities are regulated by laws of the Russian Federation. The State standards and requests are issued by several ministries and agencies under the government of Russia (Federation Federal Fishery Agency, Ministry of Nature Protection and others). There are several law-making documents that regulate environmental quality and habitat alteration control for safety of seafood. The primary documents are: (1) List of maximal permissible concentrations for fisheries grounds; and (2) Federal sanitary norms and rules. In these documents the federal norms for toxic substances, heavy metals, organic pollutants and others have been established.

Dr. Brett Dumbauld (U.S.A.) provided information on recent changes in US shellfish aquaculture regulations. The US Army Corps of Engineers is responsible for permitting shellfish aquaculture and recently issued a new nation-wide permit with regional administration and review. The new regulations are being phased in, and the nationwide permit covers existing aquaculture activities but does not cover new ones. Approaches at the regional and state levels are still being worked out. Some activities and species are regulated only under the national permit, while others will require additional information and different approaches, and there may be additional regulations at the state-level. From the aquaculture industry perspective, these differences in regulations may pose problems.

Dr. Jack Rensel provided an update on the expansion of fish farming in the State of Washington, which is expanding on Indian tribal lands along the Columbia River. Specifically, the Colville Tribe, a self-governed tribe, has control and oversight of aquaculture activities rather than the State of Washington or the US Environmental Protection Agency. Dr. Rensel is working to make sure the expansion is done with an eye to carrying capacity. There is also expansion of aquaculture in the Juan de Fuca Strait, with large companies focusing on black cod and salmon.

No other country comments were received.

Ms. Ingrid Burgetz noted that each country takes a different approach to addressing the question of risks associated with aquaculture. In preparation for the WG 24 meeting at PICES-2009 in Jeju, Korea, members were asked to identify the mechanisms and methods currently being used to assess environmental interactions of aquaculture. The report, re-circulated prior to the WG meeting at PICES-2010, was proposed to form the basis of the WG's activities under TOR-2. The report is currently unfinished, and in need of revising by various member countries, due in part to some legislative changes. It was noted that the original response from Korea was mistakenly omitted from the report circulated, and that Russia's country report contains additional details to be included in this report.

It was proposed that the report from Japan could be used as a template for revising country responses. Specifically, members will be asked to identify the legislative framework for aquaculture in their country, and the current status of research on environmental assessment of aquaculture.

Action:

- WG Co-Chairmen will re-send the report with the suggestion to members to consider using the same approach as Japan for answering the original question.
- Each member will review their contribution to the TOR-2 report from 2009 and provide updates and revisions, as required, by **December 15, 2010**.

(Originally the agreed on date was November 30, 2010; however, the Co-Chairmen have agreed that a minimum of 30 days is appropriate for WG members to be able to gather and submit the additional details).

Note: This report, once finalized, will be WG-24's final activity under TOR-2.

Discussion of Term of Reference 3: Disease interactions

Dr. Dumbauld introduced the term of reference for Activity 3, and provided a brief overview of the status of the 2009 report on TOR-3, and options for activities under TOR-3. An example was whether the WG wants to look at new methods for disease diagnostics.

WG 24 briefly discussed whether the 2009 report should be further refined, and what purpose a revised report would serve. Dr. Lori Gustafson (U.S.A.) has agreed to take the lead role in coordinating a more comprehensive report on disease interactions and suggested that one way of dividing up the TOR-3 would be to focus on the following different components:

- (1) describe current strategies re: surveillance, diagnostics and reporting;

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- (2) describe methods to detect interactions (transmission between wild and farmed), including bringing together some information on what is going on in each member country;
- (3) describe emerging diseases of concern;
- (4) model the risks of emerging diseases – developing an approach to predicting the probability of disease occurring.

Realistically, WG 24 is unlikely to be able to address each of these components, and it was suggested that the WG not focus on detection and modeling of risks of interactions. The WG agreed in principle that the output should include an overview of diseases of aquaculture in the North Pacific, with different country inputs and provide an overall picture of where the disease research community as a whole might focus. This report should be targeted as a review for publication in a peer-reviewed journal. In addition to the existing WG members, a discussion on how to further engage experts in each of the member countries took place as additional expertise was agreed to be important to allow for a more comprehensive review.

TOR-3 Country Reports

Dr. Kong Jie (China, observer) provided an update on the on-farm use of diagnostic kits for viruses of aquaculture concern (*i.e.*, white spot in shrimp culture), stating that although there are now 8 to 10 viruses that can be diagnosed with these kits that have been under development in China for a number of years, farmers do not like to use the kits as they do not assist in addressing the disease, only identifying it.

Dr Gavrilova noted that diseases of aquaculture animals are a great problem in Russia, as in other countries. In Russia, there are Handbooks for the regulation of aquaculture operations in fresh water. However, until recently a special control agency for marine aquaculture products did not exist. Disease monitoring of marine aquaculture products is conducted only by research institutes. These results are then presented to the Federal Fishery Agency. The first results of research investigations in experimental hatcheries were presented in Russia's country 2009 report.

Dr. Myoung Ae Park (Korea) noted that the focus in Korea is diagnostics: surveys on fish farms and discussions with fish farmers about diagnostic methods and treatment options such as the use of vaccines, *etc.* Work is also focusing on prevention, through the development of vaccines (including viral and bacterial disease vaccines) and chemical approaches. OIE listed diseases are important.

Dr. Abo provided a brief introduction of the Japanese situation. Japanese members of the WG will provide information on diseases, diagnostics and vaccines.

Dr. Stewart Johnson (Canada) provided an overview of aquaculture-related disease and health research and scientific efforts in Canada, which are a combined effort between government, universities, First Nations and diagnostic laboratories. Diseases and pests of concern include sea lice, IHNV, *Renibacterium*, and *Aeromonas*. He noted the importance of understanding both the host biology and reaction and the information about pathogens of concern – where they occur, their natural prevalence in wild populations, survival outside of hosts, *etc.* He then provided a more detailed overview of the types of research that are being undertaken on sea lice and IHNV as examples, as well as research on developing new tools to assess the health of mussels and littleneck clams.

Action:

- WG members who work on disease will meet on October 25, 2010 to develop a draft Table of Contents for TOR-3 and to discuss how to move forward on this activity. The developed draft Table of Contents can be found in *WG-24 Endnote 3*.
- A report, designed for submission to a peer-reviewed journal, will be developed, using the Table of Contents with draft country reports due to Dr. Lori Gustafson on **April 1, 2010**.

Country leads for this activity are: Stewart Johnson (Canada); Valeriya Terekhova (Russia); Myoung Ae Park (Korea); Katsuyuki Abo (Japan); Lori Gustafson (U.S.A.).

Note: No country lead has been identified for China.

Discussion of Term of Reference 1: Modeling interactions

Dr. Abo provided an overview of TOR-1. He reviewed the 2009 report, including a summary of the types of culture methodologies used in each member country. At the PICES-2009 it was decided that WG 24 would use functional groups rather than individual species. The table was modified to summarize by functional groups (*i.e.*, netpen carnivorous fish, long line/raft filter feeders, sowing culture filter feeders, detritus feeders).

Similar to the activities that will be undertaken for TOR-3, a proposal had been sent to WG 24 members so that the WG could build on presentations given at the PICES-2008 and -2009 mariculture sessions that focused on benthic interactions. This proposal was discussed at length, and the consensus was that benthic interactions are too narrow for a focus. The WG agreed that the focus for a literature review and analysis under TOR-1 will be on:

Short- and long-term effects on the near and far-field benthic environment, including physical and chemical changes and rates of recovery. This will include beneficial as well as negative effects.

It was determined that by focusing efforts on near and far-field interactions, this would be sufficiently comprehensive for all member countries to contribute to the review. Additionally, it was noted that the review should include an analysis of algal culture, which has both positive and negative effects in the near and far-field. Dr. Jie described new work to look at integrated aquaculture to consider the economics as well as ecological factors. He thought that chemical and other factors are likely being considered in this research.

Action:

- WG members interested in TOR-1 will meet on October 25, 2010 to develop the Table of Contents (see *WG-24 Endnote 4*) for a report addressing the focal statement, and to finalize a plan to move this activity forwards.
- The report on near and far-field interactions will be developed by WG members identified as leads (see below), using the Table of Contents (see *WG-24 Endnote 4*) with draft country reports to be submitted to Dr. Abo on **April 1, 2010**.

Country leads for this activity are: Ingrid Burgetz (Canada); Galina Gavrilova (Russia); Hung Jeong Lim (Korea); Katsuyuki Abo (Japan); Brett Dumbauld (U.S.A.).

Note: No country lead has been identified for China.

AGENDA ITEM 3

Proposal for a Topic Session at PICES-2011

A proposal for a scientific Topic Session at the upcoming PICES meeting in Khabarovsk, Russia in 2011 was developed (*WG-24 Endnote 5*). Through discussions, WG 24 decided that the inclusion of socio-economic considerations related to marine aquaculture and environment interactions would be valuable and aligns with the FUTURE program. The WG requested a full day for the session, and support for 2 invited speakers.

WG 24 discussed the possibility of using the Topic Session as the basis for putting together a special publication in the new journal *Aquaculture Environment Interactions*. It was decided that should the proposal for a Topic Session be accepted, then the WG would again initiate this discussion, as it would help to inform who should be approached as invited speakers as well as other researchers whose presentations and input would be valuable to the session. Drs. Gavrilova, Dumbauld, and Abo agreed to be co-convenors and lead this activity.

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AGENDA ITEM 4

Review of action items and deliverables for 2010–2011

Ms. Burgetz reviewed the action items and deliverables for 2010–2011 and emphasized that this was the last year of WG 24 under the current mandate, and that it is very important that the WG produce the agreed-on reports under all three TOR. She emphasized the need to stick to the April 1, 2011 deadline for submitting country reports because the activity leads and WG Co-Chairmen will then require time to analyze the reports and write the report's introduction and the analysis and discussion sections. The report will then be circulated to the WG members at the end of August 2011 for their review and comments in September and October 2011, prior to the WG meeting at PICES-2011.

In addition to developing and finalizing the reports on each TOR, over the next year WG 24 will need to consider what recommendations they would like to put forward to the two parent Committees, MEQ and FIS, for future mariculture-related activities for PICES, including Topic Sessions, requesting that the TOR of WG 24 be re-evaluated and extended, or proposing TOR for a new working group.

The WG meeting at PICES-2011 will need to focus on finalizing the reports, consider any proposals for mariculture-related topic sessions or workshops for PICES-2012 and discuss and finalize any recommendations for future PICES work on mariculture that can be proposed to the MEQ and FIS committees.

WG-24 Endnote 1

WG-24 participation list

Members

Katsuyuki Abo (Japan, Co-Chairman)
Ingrid Burgetz (Canada, Co-Chairman)
Brett Dumbauld (U.S.A., Co-Chairman)
Galina Gavrilova (Russia)
Graham Gillespie (Canada)
Lori Gustafson (U.S.A.)
Toyomitsu Horii (Japan)
Stewart Johnson (Canada)
Hyun-Jeong Lim (Korea)
Myoung Ae Park (Korea)
Jack Rensel (U.S.A.)
Tamiji Yamamoto (Japan)

Observers

Kong Jie (China)
Jay Parsons (Canada)
Olga Lukyanova (Russia)
Steven Rumrill (U.S.A.)
Darlene Smith (Canada)

WG-24 Endnote 2

WG-24 meeting agenda

1. Welcome and introductions
2. Overview of TOR activities from 2009–2010 and proposals for action items for 2010
 - List of interactions
 - TOR-2: Finalizing 2009 report and country updates
 - TOR-3: 2009 report, country updates and 2010 activities
 - TOR-1: 2009 report, country updates and 2010 activities
3. Proposal for a Topic Session or Workshop at PICES-2011

4. Review of action items and deliverables for 2010–2011
 - Reports
 - Topic Session proposal
 - Proposal for future marine aquaculture work in PICES

WG-24 Endnote 3

Pathogens of aquatic animals: Detection, diagnosis and risks of interactions between wild and farmed populations in PICES member countries

1. **Executive Summary**
2. **Introduction**
3. **Status Review by Country**

Each country will submit a document reviewing some or all of the following topics. If possible countries will identify key concerns, critical information sources and primary organizations and/or regulations directing aquatic animal health. However, it is not expected that these reviews will be exhaustive. Rather, countries may choose to highlight select diseases, diagnostics or epidemiologic methods of regional importance and/or provide a foundation or direction for future research.

3.1 Topics

3.1.1 Pathogens of importance to wild and cultured aquatic animals by country

- May include information on invertebrates and/or finfish
- May include diseases of importance as defined by the OIE, as well as diseases of regional or country significance.
- May consider economic and/or ecological significance.

3.1.2 Overview of the regulations/rules regarding aquatic animal health

- Identification of departments or agencies involved in the regulation and/or control of aquatic animal diseases
- Brief review of the regulatory environment

3.1.3 Overview of national and/or regional programs related to the diagnosis and control of diseases of aquatic animals

- Identification of laboratories/departments etc. that are actively involved in disease diagnostics and/or research related to diagnostic test development

3.1.4 Overview of the methods used for the identification and detection of pathogens of concern

- To include diagnostic tests approved for regulatory use as well as those that are used within the research community.

3.1.5 Overview of perceived or realized risks associated with the transfer of pathogens between wild and farmed hosts

- This may include the introduction of pathogens resulting from the translocation or natural migration of animals from aquaculture or wild populations.
- This could include statistical methods, research activities or disease spread models used to study the potential transfer of pathogens.
- This could include examples or case studies of presumed disease transmission between aquaculture and wild populations.
- This could also include steps taken to reduce risk of transmission between aquaculture and wild populations.

4. Conclusion

The conclusion will summarize progress and gaps in the study of pathogen transfer between aquaculture and wild aquatic animal populations. Suggestions may include future conference sessions, new working group objectives, or peer-reviewed publications considering the need for harmonization or further development of research and surveillance methods.

WG-24 Endnote 4

Assessing environmental interactions of marine aquaculture: A review of long- and short-term, near- and far-field effects of marine aquaculture on benthic communities, including chemical and physical changes, and rates of ecosystem recovery in PICES member countries

1. Executive Summary

2. Introduction

3. Status Review by Country

Each country will submit a document reviewing some or all of the following topics. It is not expected that these reviews will be exhaustive. Rather, countries may choose to highlight select research results and projects of regional importance and/or provide a foundation or direction for future research. A generalized overview/analysis may be provided to introduce the detailed information, below.

3.1 Finfish Aquaculture Review

3.1.1 Near-field effects (including short and long term, resiliency of ecosystem to perturbation)

3.1.1.1 Physical changes *e.g.*, changes to seafloor structure from deposition of feces, feed,(smothering) placement of netpen

3.1.1.2 Chemical changes *e.g.*, addition of nutrients

3.1.1.3 Biological changes *e.g.*, changes in benthic community structure

3.1.2 Far field effects (including short and long term, resiliency of ecosystem to perturbation)

3.1.2.1 Chemical changes *e.g.*, eutrophication, resuspension of nutrients, etc

3.1.2.2 Biological changes *e.g.*, algal growth, *etc.*

3.1.3 Rates of Recovery *e.g.*, following fallowing or removal of netpens, change in redox following removal of site, length of time to see change in benthic community structure to recolonization

3.2 Shellfish Aquaculture Review

3.2.1 Near field effects including short and long term, resiliency of ecosystem to perturbation)

3.2.1.1 Suspension Culture

- Physical Changes *e.g.*, changes to seafloor structure from deposition of feces, placement of rafts, and shellfish drop-off
- Chemical Changes *e.g.*, addition of nutrients
- Biological Changes *e.g.*, changes in benthic community structure

3.2.1.2 On-bottom Culture (including beach culture, and sowing)

- Physical Changes *e.g.*, direct changes to seafloor structure from epibenthic shellfish addition, and harvest activities
- Chemical Changes *e.g.*, deposition of feces and nutrient addition
- Biological Changes *e.g.*, benthic community changes

3.2.2 Far field effects (including carrying capacity considerations)

3.2.2.1 Suspension Culture

- Chemical Changes
- Biological Changes

3.2.2.2 On-bottom Culture (including beach culture, and sowing)

- Chemical Changes
- Biological Changes

3.2.3 Rates of Recovery

3.2.3.1 Suspension

3.2.3.2 On-bottom Culture (including beach culture, and sowing)

3.3 Marine Algae

3.3.1 Near field effects

3.3.1.1 Physical changes (*e.g.*, change on circulation patterns (flow))

3.3.1.2 Chemical changes (*e.g.*, reduction of nutrients)

3.3.1.3 Biological changes (*e.g.*, creation of habitat for fish, biofouling)

3.3.2 Far field effects

- 3.3.2.1 Chemical changes
- 3.3.2.2 Biological changes (e.g. causes green tide, epiphyte bloom, increase in productivity)
- 3.4 Polyculture/Integrated Multi-Trophic Aquaculture
- 4. Discussion, Analysis, Recommendations, Future (and FUTURE) Analysis
- 5. References

WG-24 Endnote 5

**Proposal for a 1-day MEQ/FIS Topic Session at PICES-2011 on
“Identification and characterization of environmental interactions of marine aquaculture
in the North Pacific”**

Convenors: Galina Gavrilova; Brett Dumbauld; Katsuyuki Abo

Marine aquaculture is an important economic and social activity within PICES member countries. To ensure development of aquaculture is environmentally and economically sustainable we need to: 1) improve our understanding of interactions between marine aquaculture and the environment (including wild stocks of plants and animals), 2) develop methods to study and/or predict such interactions, and 3) devise ways to reduce negative impacts on the environment. To this end the PICES Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24) has begun to characterize the nature of these interactions with a focus on the benthic environment and aquatic animal health. To align with the activities of the WG 24 we propose to solicit papers in the following areas for this scientific session:

1. identification and characterization of marine aquaculture-environmental interactions;
2. development of tools to identify and study such interactions; and
3. social science research related to aquaculture interactions with the marine environment.

Duration: full day

A request was made for financial support for two invited speakers.

REPORT OF THE ADVISORY PANEL ON *CONTINUOUS PLANKTON RECORDER IN THE NORTH PACIFIC*

The Advisory Panel on *Continuous Plankton Recorder in the North Pacific* (CPR-AP) (under the auspices of the Technical Committee on Monitoring, MONITOR) met from 14:00–16:00 h on October 24, 2010, Portland, Oregon, U.S.A. The meeting was chaired by Dr. Phillip R. Mundy and attended by the Chairman of MONITOR, Dr. Hiroya Sugisaki. The list of participants and agenda can be found in *CPR-AP Endnotes 1* and *2*.

AGENDA ITEM 2

Overview of CPR activities in 2009–2010

Advice

CPR-AP continues to build a unique data set that is invaluable for understanding the extent and effects of global climate change in the North Pacific. The value of the information on inter-annual variability in geographic distribution and phenology of zooplankton is exemplified in the latest edition of the North Pacific Ecosystem Status Report, cited below. Information from CPR-AP is made available in a timely manner and is used to support a growing legacy of scientific publications. CPR-AP exemplifies how PICES fosters cooperation and communication among nations in North Pacific marine science. Nonetheless, the current financial support for the CPR project is not adequate to realize its full potential for the North Pacific. The level of financial and in-kind support from Canada, Japan, the United States and CPR-AP's originating agency, the Sir Alister Hardy Foundation for Ocean Sciences (SAHFOS) expected in 2011–2013 is not sufficient to provide for a full time North Pacific principal investigator, nor is it sufficient to process samples to the degree desirable for better understanding of large-scale changes. In addition, opportunities for additional transects cannot be pursued at current funding levels.

The Advisory Panel requests, through MONITOR, that the Science Board continue to support the Executive Secretary's annual letter of information to selected agencies that are potential partners in the CPR Consortium.

Sampling 2010 – sampling in 2010 was at the normal level, with 6 north–south transects (although one serious mechanical failure resulted in the loss of all samples on the June transect) and 3 east–west transects. Early sample analysis results suggest that 2010 biomass levels and *Neocalanus plumchrus* phenology are within the range determined in previous years. Abundances of the small copepod *Pseudocalanus* appeared to be anomalously high in spring 2010 in the NE Pacific. Once all samples are analyzed, we estimate that this will be at least 5 times, and potentially as much as 20 times, higher than previous spring abundances.

Sampling 2011 – the level of sampling is dependent on the renewal of Fisheries and Oceans Canada (DFO) funding, and the continued contribution from SAHFOS. The committed funding in place for 2011 means that at least 55% of the normal level of sampling will occur but we know from the past when there was lower funding, as in 2008 (as it turned out to be an unusually cold year), this meant that valuable information was lost. Should funding be reduced then, the Panel will be asked to prioritise the sampling that will occur.

Publications

CPR data contribute to a growing body of publications. Data from the North Pacific CPR made substantial and valuable contributions to the latest edition of the North Pacific Ecosystem Status Report (see Batten *et al.*, pp. 56–105, In S.M. McKinnell and M.J. Dagg. [Eds.] *Marine Ecosystems of the North Pacific Ocean, 2003–2008*. PICES Special Publication 4, 393 p.) Other recent and upcoming publications include Sydeman *et al.* (2010) *Macro-Ecology of Plankton-Seabird Associations in the North Pacific Ocean*. *Journal of Plankton Research*; Hamme *et al.* (2010). *Volcanic ash fuels anomalous plankton bloom in subarctic Northeast Pacific*. *Geophysical Research Letters*, 37, L19604, doi:10.1029/2010GL044629; and Batten, S.D., and Mackas, D.L.

CPR-AP-2010

(2009) Shortened duration of the annual *Neocalanus plumchrus* biomass peak in the Northeast Pacific. Marine Ecology Progress Series, 393, 189–198.

Funding

Dr. Batten reported that a combination of funding from Canada, Japan, the United States and SAHFOS are in place. The 3-year funding commitment of Canada is at an end in March 2011. However, application for an additional 3-year commitment is promising, but not assured. Otherwise, substantial progress in securing funding has been made. Dr. Sanae Chiba (Japan) obtained funding for the processing of western Pacific samples in Japan. In preparation, Japanese scientists traveled to SAHFOS in Plymouth, England to understand CPR sample processing conventions and a CPR workshop in Yokohama was hosted by Dr. Hiroya Sugisaki. Also in 2009, the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) approved financial multi-year support that will conclude in 2013. As of now, direct funding from DFO, North Pacific Research Board (NPRB) and EVOSTC are at approximately 70% of full costs for operating two transects (E–W and N–S), including processing samples. Current funding, when supplemented by sample processing support from Japan and continued input from SAHFOS, is expected to keep two transects in place. However, it permits fewer samples than desirable to be processed.

AGENDA ITEM 3

Reports from national representatives

Canada

Dr. David Mackas reported that Canadian funding will continue for a third year (April 2010–March 2011) at \$50,000/yr. The DFO International Governance Strategy program that contributes funding to both the NE Pacific and NW Atlantic CPR comes up for review/renewal in FY 2011–2012. However, the program has strong support from DFO Science in both the Atlantic and Pacific regions, and a 3-year renewal at the present level has been proposed.

The major scientific activity since PICES-2009 was the collaboration with Dr. Batten on chapters in the North Pacific Ecosystem Status Report, and on her annual report to NPRB. The DFO Institute of Ocean Sciences continued to be the east-side base for cruise staging and for the ‘quick-look’ component of North Pacific CPR sample processing. Despite some major changes in ship logistics and the retirement of DFO employee, Mr. Doug Moore (who handled sample processing and ID), there were no adverse impacts on operations. The main difference is that Mr. Moore now contracts his services directly to SAHFOS and Dr. Sonia Batten.

Japan

Dr. Sanae Chiba reported on an analysis by Japanese scientists of the CPR samples taken to the west of 170°E. Funding is provided by the Japan Society for the Promotion of Science (JSPS) Kakenhi (Kiban-A) at approximately \$400,000 for the 5 years, FY 2009–2013. Dr. Chiba also asked for funds from the Japan–UK research collaboration fund. She reported on efforts by other scientists in her group, including Dr. Tomoko Yoshiki, a new post-doctoral associate. Work by Dr. Tsuneo Ono (HFRI, physical–chemical data analysis) was also presented by Dr. Chiba. Japan continues to add value to CPR data by investigating oceanographic conditions along the transect routes for evaluation of east–west differences and synchrony in zooplankton populations.

Russia

Dr. Vladimir Kulik attended on behalf of Russia.

U.S.A.

The *Exxon Valdez* Oil Spill Trustee Council (Anchorage, U.S.A.) will issue a request for proposals for long-term research that includes the CPR sometime during the next 3 to 4 months. Long-term support of CPR is

expected. However, the level of support is currently unknown. Auke Bay Laboratories (ABL) is examining the possibilities for participation in processing of CPR samples and support of CPR transects on behalf of the Alaska Fisheries Science Center. If the outcome is positive, ABL would start participation in 2011.

Dr. George Hunt expressed interest in restoring the bird observation project on CPR transects that was discontinued in 2007. It was suggested that Dr. Kathy Kuletz (U.S. Department of the Interior, Anchorage) be approached about the possibility of supervising a retrospective study of existing CPR bird observer data. Dr. Hunt further recommended that the Board of the Point Reyes Bird Observatory be solicited for funding of the CPR bird observation project.

U.S. members support the recommendation for Science Board to send a letter of information and renewed request for funding to potential CPR Consortium members, and U.S. members further recommend that the letter be supported by the mailing of the North Pacific Ecosystem Status Report to the Consortium, highlighting the contributions of CPR data.

AGENDA ITEM 3

Suggestions for 2009–2010 CPR draft annual report

Panel members found the format currently in use to be acceptable for the 2009–2010 report.

AGENDA ITEM 5

New business

A number of international science meetings relevant to the CPR and zooplankton communities are upcoming.

- 5th International Zooplankton Production Symposium, March 14–18, 2011, Pucón, Chile.
<http://www.ices.dk/iceswork/symposia.asp?topic=2011>
- Workshop on “Comparative studies of zooplankton, *Calanus* spp.” at the ESSAS Open Science Meeting, May 22–26, Seattle WA, U.S.A.
http://www.pices.int/meetings/international_symposia/2011/ESSAS/default.aspx
- SAHFOS 80th Anniversary Symposium. SAHFOS will host a Plankton 2011 symposium on September 22–23, 2011, Plymouth, UK.
<http://www.sahfos.ac.uk/news/2010/10/14/sahfos'-80th-symposium.aspx>

Web links for CPR in the North Pacific can be viewed through:

- PICES, <http://www.pices.int/projects/tcprstnp/default.aspx/#data>
- SAHFOS, <http://www.sahfos.ac.uk/sister-survey/pacific-cpr-survey/background.aspx>

CPR-AP Endnote 1

CPR-AP participation list

Members

Sonia D. Batten (SAHFOS)
Sanae Chiba (Japan)
David L. Mackas (Canada)
Phillip R. Mundy (U.S.A., Chairman)
Jeffrey M. Napp (U.S.A.)

Observers

Alexander Bychkov (PICES)
George Hunt (U.S.A.)
Vladimir Kulik (Russia)
Tsuneo Ono (Japan)
Hiroya Sugisaki (Japan)
Tomoko Yoshiki (Japan)

CPR-AP-2010

CPR-AP Endnote 2

CPR-AP meeting agenda

1. Welcome (Mundy)
2. Overview of CPR activities in 2009–2010 (Batten)
3. Reports from national representatives on status of CPR
 - a. Canada (Mackas)
 - b. Japan (Chiba)
 - c. Russia (Kulik)
 - d. United States (Mundy)
4. Receive suggestions for 2009–2010 CPR draft annual report (Mundy)
5. New business
6. Adjourn

REPORT OF THE ADVISORY PANEL FOR A *CREAMS/PICES PROGRAM IN EAST ASIAN MARGINAL SEAS*

AGENDA ITEM 1

Opening Remarks

The meeting of the Advisory for a *CREAMS/PICES Program in East Asian Marginal Seas* (CREAMS-AP) was held during PICES-2010 in Portland, U.S.A.. Seven Panel members, and two observers, from Korea, Japan, Russia and China attended the meeting (*CREAMS-AP Endnote 1*). Dr. Kyung-Ryul Kim, Co-Chairman of CREAMS-AP, opened the meeting at 9:25 h, October 23, 2010 and reviewed the agenda (*CREAMS-AP Endnote 2*). Dr. Kim stated that this was the second formal meeting of the year held by the Advisory Panel, following the one held in May in Qingdao (see *CREAMS-AP Endnote 3*). He also mentioned that Dr. Dongfeng Xu (China) was not able to attend because of problems obtaining a U.S. visa.

AGENDA ITEM 2

National reports on activities and plans related to CREAMS/PICES Program

China

Dr. Yu Fei briefly discussed activities of the Institute of Oceanology (IOCAS), Chinese Academy of Sciences. A survey of the Yellow Sea Warm Current (YSWC) was conducted as an activity of EAST-II.

Korea

Dr. Kyung-Il Chang reviewed Korean EAST-I activities of 2010 and presented a brief plan for activities in 2011. Scientists and students joined an international GEOTRACES cruise conducted in July 2010 as part of the Korean EAST-I Program. Other activities in the Ulleung Basin in 2010 included four hydrographic surveys, deployment and recovery of surface bio-optical and subsurface sediment trap moorings (UBIM) and Super Station (E-RAP), the operation of other time series stations on a real-time basis, such as coastal monitoring based on HF radar stations and a coastal buoy (ESROB), and the volume transport monitoring by measuring submarine cable voltage in the Korea Strait. The first phase of the Korea EAST-I Program will finish at the end of 2010, and funding for a second 5-year phase will start in 2011. Pelagic-benthic coupling, reconstruction of paleo-environments, ecosystem modeling and future projections will be added to the previous research tasks in the second phase.

Dr. Jae-Hak Lee discussed the status of the time series measurement system, such as fixed platforms and moorings of surface buoys, and current meters and water level recorders, in the EAST-I and -II regions. He also explained the cruise plan in the northern East China Sea conducted by KORDI and Korean universities which can be considered a Korean EAST-II activity.

Japan

Co-Chairman, Dr. Joji Ishizaka, reported on the success of the *Nagasaki-maru* cruise as an activity of EAST-II (see Agenda item 4.2 for details), the development of new ocean color remote sensing products supported by the Yellow Sea Large Marine Ecosystem (YSLME) project, and results of ferry boat monitoring by Kyushu University (Japan) and the National Fisheries Research and Development Institute (Korea).

Russia

Co-Chairman, Dr. Vyacheslav Lobanov, spoke about recent Russian activities in the EAST-I program by the

CREAMS-AP-2010

V.I. Il'ichev Pacific Oceanological Institute (POI), with participation of other Russian institutes. Two cruises by the R/V *Professor Gagarinsky* (Ga46 and Ga47) implemented in the winter and spring seasons of 2010, along with additional observations taken in later cruises of the R/V *Akademik M.A. Lavrentyev*, focused on the study of winter–spring processes such as winter convection and sea ice formation in Peter the Great Bay, their role in dense water formation on the shelf, and ventilation of the deep basin as well as their impact on primary production. In spite of the relatively cold winter of 2009/2010, no evidence was found of deep basin bottom water ventilation by convection. A continuing trend of increasing bottom water temperature and decreasing oxygen was observed.

Dr. Yury Zuenko described three monitoring programs of the Pacific Research Institute of Fisheries and Oceanography (TINRO-Centre). One is focused on a detailed sampling of the upper part of Peter the Great Bay and has been carried out monthly from May to October since 2007. Another program generating annual observations covers a large area of EAST-I including Peter the Great Bay and adjacent northwestern parts of the sea. The third is a large-scale survey of most of the Russian Exclusive Economic Zone (EEZ) but this occurs infrequently.

AGENDA ITEM 3

Discussion on capacity building activities in 2011 and later

Dr. Ishizaka announced that CEARAC/NOWPAP was proposing their third training course on “*Remote sensing data analysis*” in Vladivostok, Russia in 2011 as a joint activity of NOWPAP, IOC-WESTPAC and PICES and suggested that CREAMS-AP should support the proposal. Dr. Lobanov mentioned that Science Board had already endorsed PICES involvement in the proposed training course at its 2010 inter-sessional meeting. Members agreed that the training course is part of the capacity building activities of CREAMS-AP and that they would assist in the activity. CREAMS-AP 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 4 students or early career scientists from PICES member countries to attend.

AGENDA ITEM 4

Status report and discussion on international cooperation

Hakuho-maru cruise in 2010

Dr. Dong-Jin Kang (Seoul National University) briefly mentioned that a GEOTRACES cruise was successfully conducted by the R/V *Hakuho-maru* from June 11 to July 23 in the western North Pacific and regions of interest to the EAST-I Program. It was unfortunate that the cruise could not include observations in Russian and Korean EEZs but it was productive, nevertheless, with onboard participation by Japanese, Korean, Russian and Chinese scientists.

Nagasaki-maru cruise in 2010

Dr. Ishizaka reported that the cruise of the T/S *Nagasaki-maru* was successfully conducted from July 17 to 27, 2010 in the Korean EEZ, getting the EAST-II Program off to a good start. The cruise had a complement of 27 participants, including 3 from Korea and 4 from China. Eighteen of these were students and post-doctoral level young scientists, so the cruise was also acted as a capacity building activity.

AGENDA ITEM 5

Progress on EAST-II Program*Report on Program of the East Asian Cooperative Experiment*

Dr. Ishizaka reported that the 5th PEACE (Program of the East Asian Cooperative Experiment) workshop, including a CREAMS-AP (EAST-II) meeting, was held on September 11 and 12, 2010 in Gangneung, Korea. Many results from both the EAST-I and EAST-II activities were presented and future directions were discussed. Last year, financial support from PICES for travel by 2 scientists was requested but, as it turned out, all participants were able to travel using their own funds. So the funds were not needed that year. The next PEACE meeting will take place in Nagoya, Japan in 2012.

Future plans

Dr. Ishizaka reported that a *Nagasaki-maru* cruise is scheduled for July 15–25, 2011 in the Korean EEZ and he proposed that it be included as one of the activities of EAST-II. The proposal was endorsed by CREAMS-AP members.

AGENDA ITEM 6

Proposal for a special session during PICES-2011

Dr. K.-R. Kim proposed that a special session on EAST-I activity be held at PICES-2011. Panel members agreed that the topic should be on “*Recent advances in monitoring and understanding of Asian marginal seas: 5-years of CREAMS/PICES EAST-I Program*” and should be for 1 day (CREAMS-AP Endnote 4). It was debated whether or not to hold it as either a workshop or topic session. A decision will be taken after discussion with the chairmen of the POC, MONITOR and BIO committees. Support for 3 invited speakers (MONITOR, POC, BIO) is requested.

AGENDA ITEM 7

Next CREAMS-AP meeting

It was tentatively decided to hold the next CREAMS-AP meeting in Hangzhou, China, as had been mentioned by Dr. Dongfeng Xu at the last CREAMS-AP meeting at Qingdao. Dr. Xu will circulate an announcement to CREAMS-AP members.

AGENDA ITEM 8

Miscellaneous Items

A PAMS (Pacific Asia Marginal Seas) meeting will be held April 21–23, 2011 in Taipei, Taiwan. Prof. Zhang at Toyama University, Japan plans to propose a special session related to the GEOTRACES cruise conducted in July 2010. Dr. J.H. Lee also plans to submit a proposal for a special session related to EAST-II activities. A summary of this CREAMS-AP meeting will be reported to the POC and MONITOR Committee meetings on October 27 by Drs. Ishizaka and Vyacheslav Lobanov, respectively.

The replacement of CREAMS-AP member, Dr. Sinjae Yoo, by Dr. Young Shil Kang was confirmed.

CREAMS-AP-2010

AGENDA ITEM 9

Closing

Co-Chairman, Dr. K.-R. Kim, closed the meeting at 12:00 h, October 23, 2010.

CREAMS-AP Endnote 1

CREAMS-AP participation list

Members

Kyung-Il Chang (Korea)
Yu Fei (China)
Joji Ishizaka (Japan, Co-Chairman)
Kyung-Ryul Kim (Korea, Co-Chairman)
Jae-Hak Lee (Korea)
Vyacheslav Lobanov (Russia, Co-Chairman)
Yury Zuenko (Russia)

Observers

Dong-Jin Kang (Korea)
Jin-Yeong Kim (Korea)



Participants at the CREAMS-AP meeting at PICES-2010 in Portland, U.S.A., (left to right) Yu Fei, Joji Ishizaka, Jae-Hak Lee, Vyacheslav Lobanov, Yury Zuenko, Jin-Yeong Kim, Kyung-Il Chang, Dong-Jin Kang, and Kyung-Ryul Kim

CREAMS-AP Endnote 2**CREAMS-AP 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 2011 and later
4. Status report and discussion on international cooperation
 - 4.1 *Hakuho-maru* cruise in 2010
 - 4.2 *Nagasaki-maru* cruise in 2010
5. Progress on EAST-II Program
 - 5.1 Report on PEACE
 - 5.2 Future plans
6. Proposal for a special session during PICES-2011
7. Next CREAMS-AP meeting
8. Miscellaneous items
9. Closing

CREAMS-AP Endnote 3

**Summary Report of the Meeting of
the Advisory Panel for a CREAMS/PICES Program
for East Asian Marginal Seas**

China Ocean University, Qingdao, China
May 11, 2010

1. Opening remarks

The meeting was held at the China Ocean University, Qingdao, China, and was hosted by Dr. Sumei Liu. Seven members of the CREAMS/PICES Advisory Panel, from China, Korea and Japan, attended the meeting (Annex 1).

Dr. Kyung-Ryul Kim, Co-Chairman of CREAMS-AP, opened the meeting on 8:30 h on May 11, 2010. After everyone introduced themselves, Dr. Kim mentioned that this was a meeting (Annex 2) following the one held at PICES-2009 in Cheju, Korea in October 2009. He also informed everyone that Co-Chairman, Dr. Vyacheslav B. Lobanov, could not attend the meeting. Dr. Sumei Liu expressed her welcome to members.

2. National reports on recent activities and plans related to the CREAMS/PICES program in China, Japan, Korea, and Russia*China*

Dr. Yu Fei reported on activities by the Institute of Oceanology, Chinese Academy of Sciences (IOCAS). As part of the work of EAST-II, a hydrology survey on the 3-dimensional structure of the Yellow Sea Warm Current (YSWC) was being done in the Yellow Sea (YS) and a long-term fixed point mooring system was introduced. It was found that the YSWC is strongly influenced by cold wind surges in the upper layer in winter, is quite stable near the bottom layer, and is located at the western edge of the YS central trough. Meanwhile, it is suggested, by combining the analyses of CTD data, that the core of the YSWC lies near the bottom. A similar distributional trend of the temperature and salinity in the surface and bottom layers implies that vertical mixing may play an important role in the formation of a warm water tongue. IOCAS was also

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studying the inter-annual variability of the Bohai Sea, Yellow Sea and East China Sea, which is included in the EAST-II area. It was found that SST has a notable variation period of 5 years in winter and 4 years in summer. The significant variation was found from the mouth of Changjiang River to Jeju Island. This variation should be given more attention in the EAST-II Program.

Dr. Dongfeng Xu talked about the activities of the Second Institute of Oceanography, SOA (State Oceanic Administration). Mooring and CTD profile observations along the Zhejiang coastal area (South of Yangtze River) in 2009 showed that along the 15-m isobath line, the continuously southwestward flow exits from January to March, while the flow changes to northeastward from May to June. Along the 50-m isobath line, the flow was continuously northeastward from May to June. A cross-section of a towed CTD on April 30, 2009 at about 27°N showed a much stronger temperature and salinity front (which happened simultaneously) than that from the Group for High-Resolution Sea Surface Temperature (GHRSSST), with a 5 km resolution in the Zhejiang area. The SST data also showed that along an across-shelf section at 29°N, the thermal front moved mostly eastward at the end of February. The interannual analysis of the GHRSSST front showed that the near-coast water was colder in 2008 and 2010 compared with that of 2007 and 2009. Two cruises in the Changjiang River Estuary region in summer 2009 shows hypoxia in this area. Three-dimensional modeling with a resolution of a quarter degree using an MIT GCM model was finished in the area of 32°S to 65°N and 30°E to 72°W. The model was forced by NCEP data from 1950 to 2007. The result is under analysis.

Dr. Liu reported on activities that took place this year with colleagues from the Ocean University of China (OUC), including two cruises in April–May and September or October for the Yellow Sea, and June and September or October for the East China Sea, supported by National Science Foundation of China. During those cruises, the interests were key nutrient regeneration processes in sediment. In 2011, four cruises will be carried out to reconstruct the history of the ecological environment in the Yellow Sea and East China Sea, and will be supported by the Ministry of Science and Technology of China.

Korea

Dr. Jae-Hak Lee spoke about recent activities in Korea. As a part of the Korea EAST-I Program, deployments of integrated moorings were conducted in the Ulleung Basin by Seoul National University (SNU), Korea Ocean Research Development Institute (KORDI) and other universities in February of 2010. The Super Station has a moored profiler designed to travel up and down in the upper layer to observe water properties repeatedly about two times per day. Subsurface mooring equipped with current meters and a sediment trap near the Super Station is focusing on a multidisciplinary oceanographic study in the region where a meso-scale eddy appears frequently. In the period from July to September of 2010, KORDI will have four hydrographic survey cruises in the Yellow Sea and East China Sea using the R/V *Eardo*. Each cruise is focusing on Yellow Sea Bottom Cold Water, the effect of the Three Gorges Dam, the oceanic response to the typhoon pass and the climatic connectivity between the North Pacific and the East China Sea. The National Oceanographic Research Institute has a plan to deploy a new buoy mooring in the mid East China Sea which will contribute to the collection of various atmospheric and oceanic time series data. A Geostationary Ocean Color Imager (GOCI) will be launched onboard Korea's Communication, Ocean, and Meteorological Satellite in June or July of 2010. GOCI, which is the first ocean color imager to operate from geostationary orbit, will provide a monitoring of ocean color in the EAST-I and EAST-II study region.

Japan

Dr. Joji Ishizaka introduced some of activities taking place in Japan. As a part of the Yellow Sea Large Marine Ecosystem (YSLME) ocean color (YOC) project, sea truth data for ocean color remote sensing in the Yellow Sea and East China Sea was shared among scientists from Japan, Korea and China and successfully used for verification. This is one of the good examples of international collaboration. Kyushu University and the

Korean National Fisheries Research and Development Institute (NFRDI) are monitoring currents, temperature, salinity and chlorophyll-*a* in Tsushima Strait by ferry boat. The data can be compared with ship observation data in the East China Sea taken by KORDI and other organizations. Nagasaki, Nagoya and Kyushu universities are conducting cruises in the East China Sea, focusing on Changjiang River Diluted Water, in collaboration with KORDI and other organizations, and the next cruise will be from July 17–27, 2010 as part of the EAST-II program (Agenda 4). Kyushu University is also collaborating with scientists from Taiwan regarding the Taiwan Warm Current. Giant jelly fish are a very serious problem in this area, and joint research of Japan-Korea-China is ongoing. There will be a survey of the Chinese coast by the Chinese Academy of Fisheries funded by the Japanese Fisheries Research Agency. The SOLAS group of Japan (Mitsuo Uematsu, University of Tokyo) and China (Gao Huiwang, OUC) received funding for three years starting from 2010, and a joint cruise of the R/V *Hakuho-maru* is taking place in May 2010.

Russia

Drs. Kyung-Ryul Kim and Ishizaka briefly introduced the V.I. Il'ichev Pacific Oceanological Institute contribution to EAST-I on behalf of Dr. Vyacheslav Lobanov. A cruise completed in the NW EAST-II area and Peter the Great Bay on the R/V *Professor Gagarinsky* (Ga46) from February 28–March 16, 2010 focused on how the extremely cold winter of 2010 affects ventilation of bottom water by slope convection, and primary production in the ice covered sea. They also conducted the final leg (Ga47) for long-term monitoring of deep and bottom water properties along 132°E section on April 22–29, 2010.

3. Capacity building activities in 2010 and later

3.1. Training course on satellite data analysis

Dr. Ishizaka introduced a proposal from NOWPAP/CEARAC (Northwestern Pacific Action Plan Special Monitoring and Coastal Environmental Assessment Regional Activity Center) to have a training course on satellite data analysis for coastal environmental assessments in Russia in 2010 together with the PICES Annual Meeting. A similar training course was held in Japan in 2006 and Korea in 2008. The Panel thinks this course is important, and supports it as part of a CREAMS-AP activity and recommends PICES to support their training course in 2010.

3.2. New developments

NOWPAP/CEARAC is seeking a host in China to have another remote sensing training course for 2011 or 2012. CREAMS-AP asked its Chinese members to help NOWPAP/CEARAC find a host and/or to find another possible training course other than remote sensing.

4. Status report and discussions on international co-operation

4.1. Hakuho-maru cruise in 2010

Dr. Toshitaka Gamo reported that a cruise by the R/V *Hakuho-maru* will take place from June 11 to July 23, 2010 as part of the Asian GEOTRACES investigation. Since Russian government did not permit observations in the Russian EEZ, it was decided to shift stations from the Russian EEZ to the Japanese EEZ. Stations in the Korean EEZ are still on schedule even though the Korean government has not yet issued permission. Thirty-five scientists from Japan, 6 from Korea, 5 from Russia and 1 from China are planning to participate in the cruise.

4.2. Nagasaki-maru cruise in the East China Sea

Dr. Ishizaka reported the situation of the R/V *Nagasaki-maru* cruise scheduled for July 17 to 27, 2010 in the East China Sea. Twenty-four scientists and students from Japan, 5 from Korea and 4 from China are planning to attend the cruise. Permission from the Korean government to have observations in the Korean

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EEZ is pending.

4.3. China-Japan-Korea GLOBEC Symposium

Dr. Liu reported that the 4th China-Japan-Korea GLOBEC/IMBER Symposium will be held in Cheju, Korea on May 18–20, 2010.

5. Progress on EAST-II Program

Dr. Ishizaka reported that an EAST-II workshop is planned on September 11 and/or 12, 2010 at Gangneung-Wonju University, Korea, as a joint effort with PEACE (Program of the East Asian Cooperative Experiment). Dr. Kim suggested that the presentations should be limited to recent national- and international-related activities, and time should be allowed for discussion. Drs. Ishizaka and Jae-Hak Lee agreed to draft an agenda for mid-July or earlier.

6. CREAMS-AP activities

6.1. Updating membership information

Addresses of the Panel members were checked, and corrections were made for Sumei Liu, Dongfeng Xu, Yu Fei, Toshitaka Gamo, and Jae-Hak Lee (see *Annex 1*).

6.2. New members

Dr. Kim reported that Dr. Sinjae Yoo expressed wishes to resign from the Advisory Panel and that Dr. Young-Shil Kang from NFRDI was recommended as a new member. The Advisory Panel fully endorsed Dr. Kang's membership. Dr. Kim also suggested that members consider the possibility of adding other members if it is felt necessary.

6.3. Next CREAMS-AP meeting

Dr. Kim reported that next Advisory Panel meeting will be a part of the 2010 PICES Annual Meeting in Portland, U.S.A. Since the date is not fixed yet, Dr. Kim will request that the PICES Secretariat set the Panel meeting for either October 22 or 24, 2010.

Dr. Xu expressed interest in hosting an Advisory Panel meeting in the spring of 2011 at the Second Institute of Oceanography, Hangzhou, China.

7. Miscellaneous items

Dr. Ishizaka noted the problem of naming the EAST-1 area. Possible alternative names may be the Tsushima-Liman Currents System (TLCS) or Liman-Tsushima Currents System (LTCS); the Panel hopes that PICES Governing Council will be able to solve the problem. Dr. K.-R. Kim will check the recently published *Marine Ecosystems of the North Pacific Ocean 2003–2008* (PICES Special Publication 4, 2010) for ideas.

Dr. Xu announced that there may possibly be funds from the China-Korea-Japan Cooperative Study, and members agreed to consider submitting a proposal in 2011.

Dr. Ishizaka mentioned a request from the PICES Secretariat for an article by the CREAMS-AP for PICES Press; the deadline for submission is the end of May. Dr. Kim will check with the Secretariat about the requirements for the article.

8. Closing

The Co-Chairman, Dr. KR Kim, closed the meeting at 16:00, May 11, 2019. Members expressed their appreciation to the local hosts, Drs. S.M. Liu and Y. Fei.

Annex 1

CREAMS-AP participation list

May 11, 2010, Qingdao, China

Members

Toshitaka Gamo (Japan)
 Yu Fei (China)
 Joji Ishizaka (Japan)
 Kyung-Ryul Kim (Korea)
 Jae-Hak Lee (Korea)
 Sumei Liu (China)
 Dongfeng Xu (China)

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 E-mail: sumeilu@ouc.edu.cn



Participants at the CREAMS/PICES workshop meeting held at the China Ocean University in Qingdao, China, (left to right) Yu Fei, Dongeng Xu, Jae-Hak Lee, Toshitaka Gamo, Sumei Liu, Kyung-Ryul Kim, and Joji Ishizaka.

Annex 2

CREAMS-AP meeting agenda May 11, 2010, Qingdao, China

1. Opening remarks
2. National reports on recent activities and plans related to the CREAMS/PICES program in China, Japan, Korea, and Russia
3. Discussion on capacity building activities in 2010 and later
 - 3.1 Possible training course on satellite data analysis
 - 3.2 New developments
4. Status report and discussions on international co-operation
 - 4.1 *Hakuho-maru* cruise in 2010
 - 4.2 *Nagasaki-maru* cruise in the East China Sea
 - 4.3 China-Japan-Korea GLOBEC Symposium
5. Progress on EAST-II Program
6. CREAMS-AP activities
 - 6.1 Updating membership information
 - 6.2 New members
 - 6.3 Next CREAMS-AP meeting
7. Miscellaneous items
8. Closing

CREAMS-AP Endnote 4**Proposal for a 1-day POC Topic Session at PICES-2011 on
“Recent advances in monitoring and understanding of Asian marginal seas:
5-years of CREAMS/PICES EAST-I Program”**

Under the auspices of the EAST-I program and the supervision of the CREAMS/PICES Advisory Panel, scientists from Japan, Korea, and Russia have carried out many successful cruises in the East Asian Marginal Seas over the last 5 years. With the active discussion and promotion by CREAMS/PICES of a new EAST-II program focusing on the Yellow and East China Seas, it is timely to have a forum summarizing some important results obtained by the international cooperative efforts of EAST-I. This session welcomes studies on hydrography, circulation, and ecology and their variability in East Asian Marginal Seas in the PICES area and on effect of climate and long-term changes in the abiotic and biotic environments of this region. Support for 3 invited speakers (MONITOR, POC, BIO) will be requested.

Recommended convenors: K.-R. Kim, (CREAMS-AP), T. Gamo, (CREAMS-AP), K.-I. Chang, (POC), V. Lobanov, (MONITOR), Y.-S. Kang (BIO)

REPORT OF THE ADVISORY PANEL ON *MARINE BIRDS AND MAMMALS*

The tenth meeting of the Advisory Panel on *Marine Birds and Mammals* (MBM-AP; under the auspices of BIO Committee) was held from 9:00–12:30 hours on October 27, 2010 in Portland, Oregon, U.S.A. The business meeting focused on accomplishments and new directions for the Advisory Panel, and other relevant matters including discussion of possible future workshops and topic sessions.

AGENDA ITEMS 1 AND 2

Welcome and adoption of agenda

Drs. William Sydeman and Hidehiro Kato, Co-Chairmen of MBM-AP, called the meeting to order and welcomed the members and observers (*MBM-AP Endnote 1*). Terms of reference were provided (*MBM-AP Endnote 2*). The agenda was reviewed and approved (*MBM-AP Endnote 3*).

AGENDA ITEM 3

Reports from participants

- a. Dr. Kato (Japan) reported on his activities as the PICES liaison to the International Whaling Commission (IWC) (*MBM-AP Endnote 4*). The AP thanked Dr. Kato for his efforts to integrate PICES science in the IWC science-policy arena, and recommends to BIO that Dr. Kato remain as the PICES liaison.
- b. Dr. Kato presented a summary of Japanese cetacean research in the North Pacific.
- c. Dr. Kaoru Hattori (Japan) presented a summary of Japanese research on Steller's sea lion.
- d. Dr. Seok-Gwan Choi (Korea) presented a summary of marine mammal research in Korean waters. Many marine mammal populations in Korean waters are of concern.

AGENDA ITEM 4

Discussions

a. MBM-AP leadership

Drs. Sydeman and Kato have been Co-Chairmen of the Advisory Panel on *Marine Birds and Mammals* for more than 7 years. Advisory Panel members and observers thanked both Chairmen for their long-term commitment to PICES and their leadership of the Panel. MBM-AP recommends to the BIO Committee that members, Dr. Yutaka Watanuki (Japan, seabirds) and Rolf Ream (U.S.A., mammals), become the new Co-Chairmen of the Advisory Panel, effective immediately. Drs. Sydeman and Kato will remain on the Panel for a period of transition.

b. Future directions

MBM-AP reviewed aspects of the new PICES science program, FUTURE. The Advisory Panel and observers considered how to best contribute to this program, which is focused on:

- i. understanding climate change and anthropogenic impacts on marine ecosystems in the PICES region,
- ii. forecasting future ecosystem change,
- iii. better communications with society.

MBM-AP noted that its primary mission is to provide advice to the PICES community about the role of marine birds and mammals in North Pacific marine ecosystems, especially as related to “top-down” (predation)

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controls of marine food webs. Secondly, the Advisory Panel was created to ensure that seabirds and marine mammals are included in PICES-related ecosystem research, including forecasting and communications.

MBM-AP discussed how the many long-term and large-scale datasets on marine birds and mammals in the North Pacific could and should be used in analyses and especially models of marine ecosystem change. It noted that to date, PICES modeling efforts, *e.g.*, NEMURO and NEMURO.FISH, have yet to integrate data on top predators. MBM-AP also concluded that marine birds and mammals often serve as excellent “near real time” indicators of marine ecosystem structure and function, and should be used more in this capacity. The Panel and observers agreed to support and promote the goals of FUTURE in all possible manners.

To facilitate the development of a new and well-defined program on marine birds and mammals, MBM-AP proposed forming 4 sub-committees. These subcommittees will work inter-sessionally to design and articulate their vision and to develop specific plans to meet its objectives and goals. The Panel plans to host a ½-day workshop during the upcoming PICES/ICES ESSAS meeting (Seattle, U.S.A., May 22–26, 2011) to work on developing its vision for the future.

Focal points for MBM-AP were defined as follows:

- Updating, enhancing, and integrating models of prey consumption for top predators in the North Pacific,
- Defining critical habitats and high use areas for top predators in the North Pacific,
- Using marine birds and mammals as indicators of ecosystem change in the North Pacific,
- Conserving threatened and endangered marine birds and mammals in the North Pacific.

MBM-AP is now working to select leadership for each of these focal areas. Leaders will then work with Panel members and observers to develop specific plans for activities for the next 5 years.

c. Workshop and Topic Session ideas

MBM-AP members and observers discussed potential workshops and theme sessions for future PICES conferences, including PICES-2011 in Khabarovsk, Russia. A consensus developed for a theme session on mesoscale variability in key marine structures and ecotones of the western North Pacific, and their importance to top predators (seabirds, marine mammals, and predatory fishes). Drs. Elliott Hazen and Robert Suryan (U.S.A.) volunteered to prepare a description for consideration by the BIO Committee (*MBM-AP Endnote 5*). Co-conveners from MBM-AP will be Drs. Hazen, Suryan, and Watanuki.

MBM-AP Endnote 1.

MBM-AP participation list

Members

Seok-Gwan Choi (on behalf of Korea)
 Hidehiro Kato (Japan, Co-Chairman)
 Oleg Katugin (on behalf of Russia)
 Peter Ross (Canada)
 William Sydeman (U.S.A., Co-Chairman)

Meredith Elliott (U.S.A.)
 Amanda Gladics (U.S.A.)
 Haoru Hattori (Japan)
 Elliott Hazen (U.S.A.)
 George Hunt (U.S.A.)
 Jaime Jahncke (U.S.A.)
 Jarrod Santora (U.S.A.)
 Hiroko Sasaki (Japan)
 Michael Sigler (U.S.A.)
 Robert Suryan (U.S.A.)
 Sarah Ann Thompson (U.S.A.)
 Atsushi Tsuda (Japan)
 Olga Tyurenva (Russia)
 Thomas Van Pelt (U.S.A.)
 Brian Wells (U.S.A.)
 Mikhail Zuev (Russia)

Observers

Beverly Agler (U.S.A.)
 Soeon Ahn (Korea)
 Harold Batchelder (U.S.A.)
 Steven Bograd (U.S.A.)
 William Crawford (Canada)
 Michael Dagg (U.S.A.)
 Kim Dietrich (U.S.A.)
 Ann Edwards (U.S.A.)

MBM-AP Endnote 2

Terms of Reference

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 in assessing the roles of marine mammals and seabirds in marine ecosystems;
3. Assemble relevant information on the biology of marine mammals and seabirds and disseminate it to the PICES community through scientific reports and symposia;
4. Develop strategies to improve collaborative, interdisciplinary research with marine mammal and seabird researchers and the PICES scientific community.

MBM-AP Endnote 3

MBM-AP 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. Interactions with IWC (Kato)
 - b. Other science reports/issues?
 - c. Status of AP/transition period (Sydeman, Hunt, Dagg)
4. Discussions
 - a. MBM-AP leadership
 - b. New Directions – how can/should MBM-AP contribute to FUTURE? Goals of FUTURE:
 - i. Understanding climate change, anthropogenic effects and ecosystem dynamics
 - ii. Forecasting and forecasting tool development
 - iii. Communicating to society

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- c. MBM-AP and PICES-2011 (Russia)
 - i. Workshop suggestions?
 - ii. Theme session suggestions?
 - d. Others ideas?
5. Wrap-up

MBM-AP Endnote 4

PICES Observer Report on the 62nd IWC Scientific Committee Meeting

Hidehiro Kato,

Tokyo University of Marine Science and Technology, Tokyo 104-8477, Japan

The 62nd Scientific Committee (SC) meeting of the International Whaling Commission (IWC) was held from May 30 to June 11, 2010 in Agadir, Morocco. A total of 109 participants from 30 contracting governments, including 54 invited experts and 7 observers from 5 international organizations (CCAMLR, ACCOBAMS, IUCN, NAMMCO and PICES), participated this year's annual meeting. PICES was especially welcomed by the IWC/SC. For the management of cetacean stocks, which is the most important task for the committee, the SC explored improvement of management methods for cetacean stocks after the enforcement of the commercial whaling moratorium in 1985, and had already agreed with the scientific basis of revised management procedure (RMP) in 1996 through long time series by many scientists. The IWC/SC is continuing work on checking its performance and implementation trial of the RMP for the stocks after completion of their comprehensive assessments.

The following sub-committees and working groups have been established under the IWC/SC:

Sub-committees:

- Revised management procedure
- Bowhead, right and gray whales
- In-depth assessment
- Southern Hemisphere whales
- Small cetaceans
- Whale watching

Working groups:

- Aboriginal whaling management procedure
- Stock definition
- By-catch and other human-induced mortality
- Environmental concerns
- Ecosystem modeling
- DNA testing
- IA-North Pacific minke whales.

Every substantial issue discussed at the sub-committee or the working group level then goes to plenary of the committee. After completion of its business at its annual meeting, the IWC/SC presents scientific advice and recommendations to the IWC.

This year, the following topics were noted:

1. RMP implementation

For Revised Management Procedure (RMP) implementation, the IWC/SC has focused on western North Pacific Bryde's whale, North Pacific common minke whale, North Atlantic fin whale and North Atlantic

common minke whale stocks. In the North Pacific region, preparations of the implementation were almost done for Western North Pacific Bryde's whales and commenced for North Pacific minke whales.

2. Comprehensive assessments

Under comprehensive assessments (CA), this year the IWC/SC continued reviewing the stock status of the southern blue and humpback whales, and right whales including the northern and southern hemisphere populations and the Antarctic minke whales, focusing on the comparison of population abundance between different stock assessment models.

3. Management of aboriginal and subsistence whaling

The IWC/SC has managed ongoing aboriginal and subsistence whaling by using the AWMP (Aboriginal and subsistence whaling management scheme) which includes the bowhead whale stocks in the Arctic region, fin whale, minke whale and humpback whale stocks of western Greenland, humpback whale off St. Vincent and the Grenadines, and the eastern stock of gray whales of Chukoto. Through examinations of updated scientific information, the IWC/SC concluded that the present catch levels for these respective stocks would not be harmful.

4. Environment issues

For environment issues regarding 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 in the E Working Group:

1. Status of the cetacean Environment Report,
2. Review progress in planning for POLLUTION 2000+, Phase II,
3. Review new information on anthropogenic sound,
4. Review progress on work from the 2nd Climate Change Workshop.

For ecosystem modeling, the EM Working Group dedicated its time to three general tasks: (1) reviewing ecosystem models and modeling approaches that were developed outside of the IWC/SC; (2) learning about the Climate Impacts on Oceanic Top Predators (CLIOTOP) project which is a global project implemented under two International Geosphere-Biosphere Programme (IGBP) research programmes: Global Ocean Ecosystem Dynamics (GLOBEC) and Integrated Marine Biogeochemistry and Ecosystem Research (IMBER). CLIOTOP and the IWC share many common scientific interests, including: studying the behaviour, movement patterns and habitat of large predators; developing and applying technology for animal tracking; estimating food consumption rates; understanding and modeling predation by, and competition among, large predators; modeling and acoustic monitoring of prey fields; investigating various approaches to ecosystem modeling; and addressing issues of by-catch. The IWC/SC encourages the establishment of collaborations between the IWC and CLIOTOP.

The IWC/SC also agreed, during the relevant sessions to ecosystem models, that the EM Working Group should be structured around the timetable of RMP assessments and implementations, enabling ecosystem models relevant to a specific stock being assessed to be reviewed prior to the assessment; the North Pacific is the appropriate region for 2011. The Working Group will make efforts during the inter-sessional period to engage researchers involved in the North Pacific Marine Science Organization (PICES) and the North Pacific Research Board (NPRB) to collaborate on primary papers for next year's meeting on how North Pacific ecosystem models can be used to inform the RMP process.

5. North Pacific Sighting survey cruise

It was agreed the comprehensive cetacean sighting survey project would commence in summer 2010 under cooperation between Japan, Republic of Korea and United States under the auspices of the IWC. The project

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includes line transect sighting for estimating population abundance, biopsy skin-sampling, and photo ID for stock structure on major large cetaceans. It was also agreed that for the years 2011 onwards, the project will be conducted by the IWC/SC directly as its own middle to long-term research project. A possible survey area to cover entire North Pacific region (north of 30°N) is planned.

6. Other issues

The IWC/SC also covers relevant issues on small cetaceans, whale watching, by-catch, humane-deduced mortality, *etc.*, as in other previous years.

Next year's annual meeting of the IWC/SC will be held at Tromso, Norway for two weeks from May 27 to June 14, 2011. The IWC meeting will take place in the middle to late June 2011 in the United Kingdom, place to be determined.

MBM-AP Endnote 5

Proposal for a 1-day BIO Topic Session at PICES-2011 on

“Mechanisms of physical-biological coupling forcing biological “hotspots” in the western North Pacific and western North Atlantic”

(later renamed to “Mechanisms of physical-biological coupling forcing biological “hotspots””)

This topic session will examine the physical and oceanographic factors that correspond to ecological or economic hotspots in the North Pacific and North Atlantic. Spatially, this session will focus on the Kuroshio/Oyashio extensions and ecotone, the intersection of the Sea of Okhotsk and the western North Pacific (Kuril Islands region), and the Western Bering Sea. For the Atlantic, this session will focus on the intersection of the Gulf Stream and Labrador Current in addition to tidally driven systems such as the Gulf of Maine and Gulf of St. Lawrence. “Hotspots” can broadly be defined as areas encompassing high species diversity, high abundance of individuals, especially of important indicator species, or areas of high economic value. More specifically, we seek interdisciplinary contributions on physical-biological coupling and resulting seasonal or year-round “hotspots” in primary to tertiary productivity. This includes data on physics, phyto- and zoo- plankton, forage fish, and upper trophic level predators (*e.g.*, fish, seabirds, mammals, humans). We are particularly interested in simultaneous multi-species multi-use hotspots (*i.e.*, sites of ecological importance that overlap highly with sites of economic value) and potential changes in hotspots under future climate change scenarios. Modeling and empirical studies are encouraged. We would solicit a special publication in the primary literature pending subscription to the session.

We request funding for conveners, 2 invited speakers (PICES) and 2 invited speakers (ICES).

PICES Committee sponsorship: BIO/POC with potential for FIS

Recommended Co-conveners:

Elliott Hazen, Robert Suryan (U.S.A.)

Suggested: Yutaka Watanuki (MBM co-chair), Ichiro Yasuda (Japan)

Suggested: Oleg N. Katugin, Vladamir Radchenko (Russia-TBD)
(ICES – TBD)

Potential Invited Speakers:

Sei-Ichi Saitoh (Japan)

Jum Nishioka (Japan)

Yuri Artukin (Russia)

Gail Davoren (Canada/ICES)

Per Fauchald (Norway/ICES)

Andrew Pershing (U.S.A./ICES)

REPORT OF THE STUDY GROUP ON *HUMAN DIMENSIONS*

Background and Terms of Reference

The Implementation Plan for the new PICES integrative science program on Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems” (FUTURE) calls for PICES scientists to make the societal implications of their science more explicit and accessible through long-term engagement and communication activities among scientists, decision makers, stakeholders, and across sectors. Because different marine sectors view ecosystems in terms of their own economic, cultural and societal needs, the objective of ecosystem conservation is “a societal choice” (Principle 1 of the Ecosystem Approach of the Convention on Biological Diversity). herefore, the social significance of predicted impacts from climate or ecosystem changes, and the types of information, advice and guidance that might be requested of FUTURE might differ from country to country and sector to sector.

The objective of the Study Group on *Human Dimensions* (SG-HD), established at PICES-2009 in Jeju, Korea, under the direction of Science Board (Decision 09/S7/(iii)), is not to design management systems or planning and outreach steps, but to review the role of social sciences practices applied in decision-making in marine sectors around the world. In order to fully utilize the limited time frame of the Study Group (one year), the main focus will be on ecosystem-based fisheries management (EBFM).

The Study Group intends to:

- Review how social science has been used/applied globally and regionally in EBFM, and the theoretical basis for these practices;
- Review the social scientific tools and information available for EBFM in PICES member countries;
- Develop an inventory of practices for use of social economic information appropriate to the circumstances in each PICES member country (the term “best practice” is not used because it is expected that what is considered “best” will vary and be determined according to the circumstances in each of PICES member country);
- Prepare a final report on activities and findings of the Group and make recommendations on the desirability of establishing an expert group related to socio-economic sciences within PICES, and on the role of such a group. For example, based on sound social and economic science, the potential expert group should first survey/assess the needs of potential stakeholders for FUTURE products, and scientifically clarify differences in societal objectives among stakeholders in different sectors and member countries.

The approved membership of the Study Group can be found in *SG-HD Endnote 1*.

Study Group process

SG-HD completed, or will complete, the following tasks, as described in the seven steps shown below.

1. April 15, 2010: A draft table of categories and tools in social sciences was made.
2. June 23, 2010: Each Study Group member reviewed applications/experiences of social science tools for EBFM in his/her country.
3. June 24–25, 2010: An inter-sessional meeting was held in Yokohama, Japan, to review results of each member country’s applications/experiences. Based on the results, a table of categories in social science disciplines and their tools was finalized.
4. end of August 2010: Based on the results from the Yokohama meeting, the Chairman proposed that each Study Group member conduct a review on his/her specialty, and make a brief report.
5. beginning of October 2010: Draft manuscript of final report (review results, inventory of practices, and recommendations) was circulated by the Chairman to the Study Group.
6. October 22, 2010: Final SG-HD meeting was held at PICES-2010 in Portland, U.S.A. to finalize the contents of the report.

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7. End of January 2011: Submit the final report to the PICES Secretariat.

Results of activities in 2010

SG-HD first discussed the “conventional” social science disciplines related to EBFM (Step 1). They are:

1. Anthropology/Ethnology,
2. Economics (bioeconomics, decision theory, non-market valuation, commons, accounting, *etc.*),
3. Geography/Area studies,
4. Law/Political science,
5. Sociology,
6. Psychology,
7. Inter-disciplinary methodologies (Impact analysis, GIS, management science, *etc.*).

The Study Group also made a table of social scientific tools in each discipline which can be applied to EBFM studies.

Each member of the Study Group reviewed applications of the social scientific tools identified in Step 1, and reported the results at its inter-sessional meeting held in Yokohama in June 2010 (Steps 2 and 3). The travel costs of two participants were covered by PICES, and other expenses were covered by each PICES member country and the Fisheries Research Agency of Japan.

At the Yokohama meeting Canada discussed marine use, demographic analysis, *etc.* in the Pacific North Coast Integrated Management Area (PNCIMA), a guidance document on the use of socio-economic objectives for the creation of MPAs. China presented the new development of Marine Ecosystem Service Evaluation Software, and its application to the Yellow Sea, South China Sea, East China Sea, and Bohai Sea. Social analysis in Sato-Umi (village sea) initiatives and institutional analysis of the Shiretoko World Natural Heritage site were summarized by Japan. Korea talked about the application of the IFRAME (integrated fisheries risk assessment, forecasting and management for ecosystems) for large purse seiners and bio-economics for Resource Recovery Plan, *etc.* Russia showed a case study of non-market valuation of ecosystem values at Kamchatka, or economic losses from water pollution in Primorsky Kray. The United States reviewed NOAA’s Annual Stock Assessment, the NEPA Environmental Assessment, and Integrated Ecosystem Assessment in the Puget Sound.

Based on the results of the Step 3 (from the Yokohama inter-sessional meeting), the Study Group members conducted an additional review of social scientific tools for EBFM (Step 4), and discussed the contents of the final report via e-mail (Step 5).

On October 22, 2010, the Study Group held its final meeting at PICES-2010 (Step 6). At this meeting, the detailed structure of the Study Group final report was decided. The Study Group also discussed the role of social sciences in EBFM as follows: 1) to make scientific inputs on how to define/select the goals, objectives, indicators, targets, *etc.*, 2) to make scientific inputs on how to judge/asses the performances of specific EBM measures, 3) to improve the value of bio-physical information (for better understanding by the public, management and fishers), 4) to propose spatial/temporal/organizational scales for EBFM, coordinating with existing institutional scales (stake holders) and natural scientific knowledge.

Finally, the Study Group drafted the recommendations. In order to better understand and communicate the societal implications of the conditions and future trends of North Pacific marine ecosystems (FUTURE vision), it is desirable to organize a new expert group related to social sciences. The Terms of Reference for the new group would include a survey/assessment of the needs of potential stakeholders for FUTURE products, and scientific clarification of differences in societal objectives and needs among stakeholders in different sectors and countries. For example, the new expert group will be engaged in vulnerability analysis, indicators on human dimensions for EBFM, bioeconomics, *etc.* The Study Group also agreed that the new expert group can make a contribution to the next North Pacific Ecosystem Status Report, and organize a symposium on Human Dimensions for EBFM.

The draft of the final report with recommendations will be finished by the end of January 2011 (Step 7). However, because the issue of human dimensions is important and relevant to the FUTURE program (especially to SOFE-AP) and several other groups within PICES, we suggested it is important to circulate this draft to other groups for their comments and suggestions. The revised version, which includes comments, will be submitted to the inter-sessional Science Board meeting (expected to be held in April 2011). Based on the comments received at the inter-sessional meeting, SG-HD will finalize the final report and recommendations for PICES-2011.

SG-HD Endnote 1

SG-HD membership

Shang Chen (China)
Keith R. Criddle (U.S.A.)
David L. Fluharty (U.S.A.)
Masahito Hirota (Japan)
Dohoon Kim (Korea)
Olga N. Lukyanova (Russia)

Mitsutaku Makino (Japan, Chairman)
Jongoh Nam (Korea)
Rowena Orok (Canada)
Ian Perry (Canada)
Ningsheng Yang (China)

FINAL REPORT OF THE STUDY GROUP ON *RESTRUCTURING OF THE PICES ANNUAL MEETING*

1. Rationale

Article VI(3) of the PICES Convention states that “*The Chairman of the Council shall convene a regular annual meeting of the Organization*”. The PICES Annual Meeting is the largest and most important event for both the science and administration of the Organization. The Annual Meeting consists of two parts: a regular meeting and some preliminary activities that occur in the days before the regular meeting. The regular meeting includes a formal Opening Session, various scientific sessions organized by the Science Board and the Scientific and Technical Committees, and the administrative meetings of the Governing Council and permanent committees. The preliminary meeting includes workshops convened by the PICES expert groups, business meetings of expert groups, and other events.

With the expansion of PICES activities, its Annual Meeting has also expanded in scale and duration. Since 2000, the Annual Meeting usually runs for 10 days (7 days for the regular meeting and 3 days for preliminary activities). Inter-sessional activities (between Annual Meetings) such as symposia and workshops co-sponsored with other organizations, such as ICES and FAO, have increased. This growth has imposed additional demands on the Contracting Parties to support travel for their scientists and on the Secretariat to arrange the events, even though the scale of the Annual Meeting has been stable. Since there are some limitations in the number of scientists who can participate in PICES activities and in financial support from the Contracting Parties, there is a need to review the Organization’s current practices and consider cost-saving ways for sustaining PICES activities.

Council recognized the importance of this issue at the 2007 Annual Meeting. At the 2008 Annual Meeting, Council addressed this issue formally and established, under the direction of Council, a Study Group to review the present practice and structure of the Annual Meeting, and to consider options to allocate time and order among various events in the Annual Meeting, while shortening the meeting duration. Clarifying the responsibilities of the permanent committees in the PICES decision-making process should also be considered as part of the restructuring of the Annual Meeting, as a secondary task of the Study Group.

2. Terms of Reference and Membership

Council approved the following terms of reference for the Study Group on *Restructuring of the PICES Annual Meeting* (SG-RAM):

1. To review the current practice and structure of the PICES Annual Meeting to
 - (a) Consider ways of improving the time balance and order among various events of the Annual Meeting.
 - (b) Shorten the duration of the Annual Meeting, and
 - (c) Assess other issues related to the Annual Meeting.
2. To develop recommendations on the Annual Meeting and report to the Governing Council by March 31, 2009.

It was agreed that SG-RAM will be led by the Chairman of PICES, and its membership should include the Vice-Chairman of PICES, the Chairmen of Science Board and Finance and Administration Committee, one representative from each Contracting Party, and the Executive Secretary and Deputy Executive Secretary. At a later date, the United States respectfully offered to forgo its nomination to SG-RAM to keep its size as manageable as possible, since two members of the U.S. delegation will be on the group *ex-officio* (Science Board and F&A Chairmen). The full SG-RAM membership is listed in *Endnote 1*.

3. The Course of Discussion

The nomination process of SG-RAM members was completed in late November of 2008. Because the time for preparing recommendations to Council was limited, the group worked by correspondence. The SG-RAM Chairman prepared a draft report based on the comments from the SG members and opinions on this issue from Council members at the 2008 Annual Meeting. On March 22, 2009, the draft report (*Appendix 1*) was circulated among the SG-RAM members for review. In the meantime, the Secretariat kindly provided a statistical analysis of past Annual Meetings as background information for the SG discussion, and suggested that the current practices had evolved to their current state as a consequence of trial and error (*Appendix 3*). The Chairman of Science Board expressed concern about the negative effects of drastic changes to the style of the Annual Meeting on PICES science, and he also pointed out a need for further discussion in Science Board.

At the 2009 inter-sessional meeting (April 2009, Qingdao, PR China), Council discussed the draft report with all SG-RAM members in attendance. Council decided to extend the term of SG-RAM until the 2009 Annual Meeting (October 2009, Jeju, Korea), and asked the SG to prepare its final report taking account of the comments from Science Board. Among the recommendations in the draft report, Council decided to implement immediately the proposed changes in the format of the Opening Session. Beginning with PICES 2009, the Opening Session will include remarks from a representative of the host country, remarks by the Chairman of PICES, and such activities as Science Board and/or Council may wish to include. Remarks by Contracting Parties will now occur at the beginning of the Governing Council meeting.

Science Board presented its comments on the draft report on May 22, 2009 (*Appendix 2*). The comments were constructive with some alternative recommendations for improving the current practices of the Annual Meeting, but cautious of shortening the meeting duration. Taking into account the comments, the SG Chairman prepared a draft of the final SG-RAM report for review by the SG members. After some revision, the final report was submitted to Council.

4. Review of the Current Structure and Practices of the Annual Meeting

Council last dealt with the issue of the structure of the Annual Meeting at PICES-1999. Aspects of the current structure and related practices have followed the discussion and decision there (Decision 99/S/7, *Endnote 2*).

A typical schedule of recent Annual Meetings is as follows:

1. Days 1–3 (Fri. to Sun.) are the preliminary part of the Annual Meeting (Preliminary Meeting). Four to six workshops plus meetings of the subsidiary bodies of the permanent committees are convened concurrently. A Science Board Lunch Meeting is held on Sunday.
2. Days 4–10 (Mon. to Sun.) are the main part of the Annual Meeting (Regular Meeting). The first five days (Mon. to Fri.) is the PICES Science Conference (ASC).
 - a. The Regular Meeting starts with the Opening Session on Monday morning, followed by the Science Board Symposium on the overall theme of the Annual Meeting as a plenary session. In the evening of Monday, a Welcome Reception is held by the host country for all participants.
 - b. From Tuesday to Friday, Scientific Sessions convened by Scientific/Technical Committees and Steering Committee of the PICES Integrative Scientific Program are convened concurrently (three concurrent sessions per day).
 - c. On Wednesday (Day 6), the Finance and Administration Committee meets (0.75 day), and all Scientific/Technical Committees have their formal meetings in the afternoon (3.5 hours). The Finance and Administration Committee meets again for a short time on Thursday (Day 7) to review their report and to develop recommendations to Council.
 - d. Poster Session is held on Thursday evening (Day 7), with some wine and snacks served by the host country.
 - e. On Friday (Day 8), immediately after Scientific Sessions, the Closing Session is convened in plenary. After the Closing Session, the Chairman of PICES holds a reception, by invitation, for officials of the

- host country and PICES, invited speakers, group Chairman and representatives of international organizations/programs.
- f. On Saturday (Day 9), meetings of Science Board and Governing Council are held concurrently. Science Board discusses the scientific business of the Organization including the planning of the next Annual Meeting, and prepares its recommendations to Council. Council discusses and makes decisions on financial and administrative issues based on the report from the Finance and Administration Committee.
 - g. On Sunday (Day 10), Council meets again to hear the results of the Science Board meeting and to discuss and make decisions on scientific matters based on the report and recommendations from Science Board.

The current style of the Annual Meeting is a consequence of a kind of “natural evolution” due to limitations on time and budget for the activities of the Organization. Many scientists have multiple roles in the Organization, and they can fulfill most of their obligations by attending one meeting where many things are achieved. Therefore, the current scheduling of the workshops and meetings of the permanent committees, immediately prior to the Regular Meeting, is the most cost-effective approach.

During the early period of PICES, the number of participants at the Annual Meetings increased year by year. Since 2000, however, it has been stable at around 400–450, and this indicates that the PICES Annual Science Conference (ASC) has matured into a scientific forum that has demonstrative value to scientists in the North Pacific. The Science Board Symposium on the first day (Monday) of the Regular Meeting is the only plenary session and therefore the only opportunity for a diverse and broad set of speakers from multiple disciplines and from regions beyond the North Pacific to reach the broadest PICES audience.

An inter-sessional Science Board Meeting has been held every spring (April or May) since 2003, and it has become a custom of the Organization. The meeting provides a good opportunity to discuss long-term strategies of the Organization, such as cooperation with other organizations/programs and planning of the integrative scientific programs, as well as an interim review of PICES activities, which are difficult to discuss in depth at the Annual Meeting.

5. Problems and Recommendations on Possible Measures

Even though Council agreed with the changes in the format of the Opening Session and the current structure and practices have certain rationality, still there are some problems in the operational and scientific aspects of the Annual Meeting. The following are problem areas and recommendations for their possible solution.

5.1 Increase of time and economical expenses of Scientists, Contracting Parties, and Secretariat

The increase of inter-sessional events co-sponsored with other organizations, such as ICES and FAO, have imposed additional demands on scientists for attending the events, on the Contracting Parties to support travel for scientists, and on the Secretariat for arranging the events, even though scale of the Annual Meeting has been stable. To maintain a broader range of activities of PICES, the Organization should seek ways of reducing the scope of the Annual Meeting, as far as possible (at least not to enlarge it), while keeping the present high quality and quantity of PICES science.

SG-RAM recommends shortening and fattening the Annual Meeting by increasing the number of concurrent scientific sessions during the ASC and reducing its duration as follows:

- a. To increase the number of concurrent scientific sessions from the current practice (three per day) to four per day;
- b. To maintain the current practice of holding the Opening Session and Science Board Symposium on Monday;
- c. To hold the Closing Session immediately after the Friday morning scientific sessions, a reduction of 0.5 day.

5.2 Insufficient time for Science Board discussion

Currently, Science Board meets at the lunch time on Sunday just prior to the Regular Meeting and has its main meeting on Saturday (Day 9) just after the ASC. Planning of the next Annual Meeting is the most time-consuming issue of the meeting. With the implementation of the FUTURE Program and with Science Board serving as the Scientific Steering Committee (SSC) of the Program, the Organization should consider extending the meeting duration from 1 day, current practice, to 1.5 days or more.

SG-RAM recommends expanding the duration of the main meeting of Science Board from 1 day (Saturday) to 1.5 days (Friday afternoon and Saturday) to provide more time to accommodate its new role as the FUTURE SSC, and to complete its agenda in time for the Science Board Chairman to present his report to Council on Sunday morning (the current practice).

5.3 Insufficient time for Scientific/Technical Committee Discussion

Scientific/Technical Committees have their official meetings on the Wednesday afternoon during the Regular Meeting. Even though they have many issues to discuss and resolve, currently it seems that much time is spent bringing committee members up to speed on the activities that need to be discussed. As a consequence, in-depth discussions of proposed topic sessions and reviews of the activities of subsidiary bodies are difficult. Collaboration among the Committees on their mutual interests will be a key issue, especially for the success of the FUTURE Program.

SG-RAM recommends holding overture meetings of Scientific/Technical Committees to examine and confirm the points of discussion in preparation for their official meetings on Wednesday.

- a. Overture meetings (1 to 1.5 hours) could occur just prior to the Opening Session (*e.g.*, 08:30 – 09:30) or immediately after the Science Board Symposium (*e.g.* 17:00 – 18:00) on Monday;
- b. Scientific/Technical Committee Chairmen should circulate to members of the committee a description of the key issues and topics to be covered at the overture and formal meetings, prior to the Annual Meeting;
- c. Scientific/Technical Committees should assign priorities for the proposed scientific sessions of the next Annual Meeting.

5.4 Overloading Preliminary Events prior to the Regular Meeting

Workshops and meetings scheduled immediately prior to the Regular Meeting are a good opportunity for PICES expert groups to accomplish their tasks in a cost-effective way. These activities should have the highest priority for the expert groups, and the individual event should have a high probability of success. However, some preliminary events are not well focused and do not provide substantial results because essential members do not attend, and some workshops are simply topic sessions that could not be accommodated in the current format of the ASC. The growth of unproductive events enlarges the scale of the Annual Meeting without providing equivalent returns. It seems that a lack of discussion on topic session priorities and insufficient review of the activities of subsidiary bodies at Scientific/Technical Committees and Science Board meetings are the cause of this problem.

SG-RAM recommends improving the results of events that occur just prior to the Regular Meeting by having:

- a. Science Board and Scientific/Technical Committees carefully examine proposals from expert groups that occur prior to the Regular Meeting to ensure a higher probability of a successful result,
- b. Science Board should refrain from converting topic sessions to workshops in the days before the Regular Meeting [this recommendation does not preclude high priority workshops be held in the days before the Regular Meeting].

6. Other Recommendations for Restructuring the Annual Meeting

6.1 Strategic Planning at inter-sessional Science Board Meetings

Science Board should use the inter-sessional meeting as an opportunity to do some strategic planning on the types of scientific sessions for future Annual Meetings. The objective is to ensure that PICES uses its Annual Meetings to meet the objectives that are set out in Committee Action Plans and the PICES Strategic Plan. A key focus for Science Board at its inter-sessional meeting is to fulfill its role as the Science Steering Committee for the FUTURE program. Also, collaboration among Scientific/Technical Committees will be an important topic for accomplishing the goal of the FUTURE Program.

6.2. Explore the possibility of video and web conference

Science Board and Scientific/Technical Committees should explore the possibility of holding an inter-sessional conference using video and web systems among the member countries, especially for PICES expert groups. This approach must be beneficial for cost savings, but also for focusing discussion at the Annual Meeting.

6.3. Strict management of PICES expert groups

Governing Council and Science Board should carefully check the performance of each expert group and reorganize or disband it, if necessary. Careful examination by Governing Council and Science Board is also important for the requests of new expert groups.

6.4. Other Issues Related to the Annual Meeting

With the expansion of PICES activities, the annual budget of the Organization has also increased, and now reaches nearly CDN\$1,400,000. However, the annual contribution from the Contracting Parties covers less than ~50% of the budget. The remainder depends on the voluntary contributions from the Contracting Parties and funds from various scientific foundations and partnerships. In addition, the permanent staff of the Secretariat has been restricted to four since 1995, and it seems not enough to provide sufficient logistical service to every activity of PICES. Therefore, it is clear that there is a “carrying capacity” problem of the Contracting Party’s finances and the logistical capabilities of the Secretariat. The restructure of the Annual Meeting under consideration will somewhat ease this problem.

SG-RAM recommends that PICES develop a long-term strategy to accommodate the growing financial and logistical demands on the Organization.

- a. It will require sincere effort by both Council and Science Board through their collaborative discussion at the Annual and inter-sessional meetings.
- b. It is also important to maintain the tireless communication among the Council, Science Board and Finance and Administration Committee members on interests and financial situation in each Contracting Party.

Endnote 1

Membership of the Study Group on Restructuring of the PICES Annual Meeting

Tokio Wada (PICES Chairman)
 Lev Bocharov (PICES Vice-Chairman)
 Patricia Livingston (F&A Chairman)
 John Stein (Science Board Chairman)
 Laura Richards (Canada)
 Yukimasa Ishida (Japan)

Gongke Tan (People’s Republic of China)
 Jeonghwa Kim (Republic of Korea)
 Igor Shevchenko (Russian Federation)
 Alexander Bychkov (Executive Secretary)
 Skip McKinnell (Deputy Executive Secretary)

Endnote 2

Main components of Decision 99/S/7 (Structure of PICES Annual Meetings)

1. To promote inter-committee sessions – Science Board should select a “main theme” for each Annual Meeting and proposed Topic Sessions must then fit the overall “theme” of the meeting;
2. To advance the role of the Science Board Symposium – it should be arranged as the first scientific session of the Annual Meeting, immediately following the Opening Session;
3. To upgrade image and position of poster presentation – the poster sessions should be arranged to have a formal poster viewing time near the end of each day in conjunction with a social hour; poster presenters for that session would be required to stand by their poster at that time;
4. To increase the participation of young scientists – a Young Scientists’ Travel Grant (as a part of the Trust Fund) should be advertised.

Appendix 1

Draft Report of the Study Group on *Restructuring the PICES Annual Meeting* (Draft of March 22, 2009)

1. Background

With the expansion of activities of PICES, its Annual Meeting* has also expanded in scale and duration. This is evidence that PICES has become an internationally renowned scientific organization. The expansion of the Annual Meeting, however, compresses the time for deliberations by the Governing Council, Science Board, Finance and Administration Committee, and Scientific/Technical Committees, even though their responsibilities have also increase. Such discussions are very important for planning and coordinating relevant activities among Contracting Parties to achieve the Organization's objectives and facilitate international cooperation in the North Pacific Ocean. The increasing scale and duration of the Annual Meeting is also a burden for the host countries, participants and the PICES Secretariat. [Annual Meeting means not only the plenary and subsequent scientific sessions (Annual Science Conference), but also the meetings of the Governing Council, Science Board, Finance and Administration Committee, Scientific/Technical Committees and their subsidiary bodies, as well as workshops and other pre-annual meeting obligations.]

The importance of this issue has been recognized by Council since the 2006 PICES Annual Meeting. At the 2008 Annual Meeting, Council addressed this issue formally and established, under the direction of Council, a Study Group to review the present structure of the Annual Meeting and to consider options to allocate time and order among various events in the Annual Meeting, while also shortening the meeting duration.

The following terms of reference for the Study Group on *Restructuring of the PICES Annual Meeting* (SG-RAM) were approved:

- To review the current practice and structure of the PICES Annual Meeting to (a) consider ways of improving the time balance and order among various events of the Annual Meeting, (b) shorten the duration of the Annual Meeting, and (c) assess other issues related to the Annual Meeting.
- To develop recommendations on the Annual Meeting and report to the Governing Council by March 31, 2009.

Council also agreed that the SG-RAM membership will include one representative from each Contracting Party, as well as the Chairman and Vice-Chairman of PICES, the Chairmen of Science Board and Finance and Administration Committee, and the Executive Secretary and Deputy Executive Secretary. The Study Group will be led by the Chairman of PICES. The nomination process was completed in late November of 2008. Because the time for preparing recommendations to Council was limited, the Study Group worked by correspondence.

2. Review of the Structure and Current Practices of the Annual Meeting

2.1. Current Practices and Structure

A typical schedule of recent Annual Meetings is as follows:

- The overall meeting duration is 10 days.
- During the first three days (Fri. to Sun.), four to six meetings and workshops of the Scientific/Technical Committees and their subsidiary bodies are convened concurrently. Science Board Lunch Meeting is held on Day 3 (Sun.).
- The next five days (Mon. to Fri.) are the formal part of the Annual Meeting (Regular Meeting).
 - The Regular Meeting starts with the Opening Session on Monday morning, followed by the Science Board Symposium on the overall theme of the Annual Meeting as a plenary session. In the evening of Monday, a Welcome Reception is held by host country for all participants.

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- From Tuesday to Friday, Scientific Sessions planned by the Scientific/Technical Committees and the Steering Committee of the Integrated Scientific Program of PICES are held concurrently (three concurrent sessions per day).
- On Wednesday (Day 6), the Finance and Administration (F&A) Committee has its official meeting in the morning, and all Scientific/Technical Committees have their formal meetings in the afternoon.
- Poster Session is held in the evening of Thursday (Day 7), with some wine and snacks served by the host country.
- On Friday, in the early evening immediately after scientific sessions, the Closing Session is held as a plenary session. After the Closing Session, a reception is held by the Chairman of PICES for officials of the host country and PICES, invited speakers, group Chairman and representatives of international organizations/programs.
- On Saturday (Day 9), meetings of Science Board and Council are held concurrently. Science Board discusses the scientific matters of the Organization and prepares recommendations to Council. Council discusses and makes decisions on financial and administrative issues based on the report from the Finance and Administration Committee. On Sunday (Day 10), Council meets again to discuss the Science Board report.

2.2. Problems and Implications

- (1) Increase of time and economical expenses of participants
Because the total meeting period stretches over 10 days, and even the scientific part is as long as 8 days, time and economical expenses of participants have been quite substantial. The members of Council and Science Board must stay at least 7 days (Mon. to Sun.). It is a burden for the members of Council who are not scientists, because they must wait for the Council meeting on Saturday and Sunday, after attending the Opening Session on Monday.
- (2) Increase of economical expenses of the host countries
The total number of participants at the most recent Annual Meetings is from 400 to 500. This is not so large a figure for an international scientific conference. However, because the meeting period is long and many meeting rooms are needed for concurrent scientific sessions, workshops and business meetings, it is not only difficult to secure a venue to fulfill the requirements, but it is also a financial burden for the host country.
- (3) Insufficient time for discussion on scientific matters at business meetings
In spite of the expansion and diversification of activities of PICES, the lack of frequency and length of the Scientific/Technical Committee and Science Board meetings results in insufficient time for discussion to focus and prioritize the activities, and to select topics for scientific sessions/workshops to be held at the next Annual Meeting. As a consequence, there are overlaps of themes and contents of the Topic Sessions, and a remarkable and disordered increase in the number of events prior to the formal part of the Annual Meeting. In addition, under the current structure of the Annual Meeting, time to prepare a well-focused Science Board report to Council is also insufficient. This is not only inconvenient for Science Board, but is also an obstacle for discussion and decision making on scientific issues in Council.
- (4) Increase in the number of meetings and workshops prior to the Annual Meeting
Increase in the number of workshops and working group meetings immediately prior to the Regular Meeting is the main reason for the extension of the overall duration of the Annual Meeting. An aim to have workshops and meetings in conjunction with the Annual Meeting is to reduce the meeting cost in time and finance. Among the workshops and meetings, there are some that produce good fruits for collaboration among the Contracting Parties (e.g., events planned by the HAB Section). However, there are some workshops/meetings that could not provide substantial results because of a lack of attendance of essential members. Besides, there are many cases when workshops are held on themes that were not adopted for the Topic Session.

3. Recommendation on Possible Measures

3.1. Improvement of Time Allocation among Various Events

The idea that the meetings of the Governing Council and Finance and Administration Committee should be held a few weeks/months after the Annual Meeting (the current practice of ICES) was proposed at the early phase of the discussion on this issue. This approach has the merit of ensuring sufficient time for preparing a well-focused Science Board report to Council. However, for many members of Council and F&A Committee who have close relationship with scientific activities and are interested in attending scientific sessions or meetings, this option results in great expenses in time and finance to attend two meetings. This approach also increases the workload of the Secretariat. Therefore, the Study Group considers that reduction of the total meeting period and improvement of time allocation among various events is a practical way to restructure the Annual Meeting, and recommends the following:

- (1) **Implementation of workshops and WG meetings at the Regular Meetings**
The Study Group recommends that the Scientific/Technical Committees and Science Board carefully examine the proposals for workshops and working group meetings, and select only those that should be held during the Annual Meeting. The Study Group also recommends that these workshops and meetings be held concurrently with scientific sessions during the Regular Meeting.
- (2) **Meetings of the Scientific/Technical Committees**
The Study Group recommends that the Scientific/Technical Committees should have a short (1.5-hour) overture meeting immediately prior or just after the Opening Session of the Regular Meeting to confirm the points and directions for discussion at the Annual Meeting. At that time, proposals for scientific sessions/workshops for the next Annual Meeting and proposals for new subsidiary bodies should be tabled and confirmed by the Committee members. These overture meetings would be quite helpful for the smooth discussion at the Committee meeting to be held during the Regular Meeting.
- (3) **Moving up the Science Board meeting**
The Study Group recommends moving the Science Board meeting from Saturday (current practice) to Friday to ensure that sufficient time is available for preparing a well-focused report to Council. The Study Group also recommends that, if necessary, Science Board should meet again in the morning of Saturday.

3.2. Reduction of the Overall Meeting Duration

In principle, the overall duration of the Annual Meeting should be set a few days shorter (*e.g.*, 8 days), and various events should be accommodated within this shorter duration according to the recommendations mentioned above. The Study Group recommends the following possible ways to reduce the meeting duration:

- (1) **Simplification and delaying the start time of the Opening Session**
The Study Group recommends abolishing the opening remarks by the Contracting Parties, except the host country, to exempt the national delegates from attending the Opening Session. This would reduce the burden of the time commitment for the national delegates, especially for those who are not scientists. At the same time, it is important for each Contracting Party to express its own view and expectations of the activities and administration of PICES. Therefore, the Study Group recommends allocating time at the beginning of the Council meeting for the statements by the Contracting Parties. The Study Group also considers delaying the start time of the Opening Session from the morning (08:30 or 09:00) to the afternoon (13:00), and having overture meetings of the Scientific/Technical Committees in the morning.
- (2) **Increasing the number of concurrent scientific sessions**
The Study Group recommends increasing the number of concurrent scientific sessions from three per day (current practice) to four or five per day. This will accommodate some workshops that are now held

prior to the formal part of the Annual Meeting. Currently, 6 meeting rooms have to be prepared for the concurrent Scientific/Technical Committee meetings, and it would not be so difficult for the host country to increase the number of concurrent sessions during the formal part (Mon. – Fri.) of the Annual Meeting.

- (3) **Review of the Science Board Symposium**
The Study Group suggests that the Science Board Symposium should be an exhibition of the scientific achievement of PICES on the overall theme of the Annual Meeting to not only scientists but also administrators and stakeholders, and recommends a review of the current practice of the Symposium to make talks more understandable and shorter.
- (4) **Application of evening events**
The Study Group recommends the use of evenings (from 18:00 to 20:00 or 20:30 hours) for workshops and working group meetings.

3.3. Possible Images of Restructuring and Timing of Its Implementation

Table 1 shows two possible examples of the restructured Annual Meeting based on the recommendations mentioned above. The Study Group recommends that Council restructures the Annual Meeting starting from PICES-2010.

4. Other Issues Related to the Annual Meeting – Improvement of Communication

- (1) **Communication among Council, F&A Committee, and the Secretariat**
The Finance and Administration Committee has a half-day meeting a few days prior to the first session of the Council meeting on Saturday. Even though the schedule for the F&A meeting is tight, the discussion proceeds smoothly because of the excellent leadership of the F&A Chairmen and well prepared background materials by the Secretariat. Many of the F&A members attend the Council meeting as national delegates or advisors, and this is also beneficial for good communication among the Council, F&A Committee, and the Secretariat.
- (2) **Communication among Council, Science Board, and the Secretariat**
Incubation of scientific seeds is one of the major tasks for the Scientific/Technical Committees. When planning activities, such as scientific sessions/workshops to be convened at the Annual Meeting and Working Groups to be established, however, the Committees should select the seeds appropriately and direct their activities according to the expectations of the Contracting Parties and trends of the world. To meet the requirements anticipated from the Committees, not only discussion within the Committees, but also the directions and suggestions from Council via Science Board are important. From this point of view, communication between Council and Science Board has not been sufficient. The Study Group recommends that Council informs Science Board, *via* the Secretariat, of its concerns and the financial situation of the Organization prior to the Annual Meeting based on the meeting agenda and the Science Board briefing book.

Table 1 Possible examples of the restructured Annual Meeting.

Example 1

Day	Time	Events	
Day 1(Sun.)	M	Workshops/WG Meetings (Max. 6 concurrent)	
	L	SB Lunch Meeting	
	A	Scientific/Technical Committees Overture Meetings	
Day 2(Mon.)	M	Opening Session (plenary)	
	A	SB Symposium (plenary)	
	E	Welcome Reception	
Day 3(Tues.)	M	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
	A	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
Day 4(Wed.)	M	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	F&A Meeting
	A	Scientific/Technical Committee Meetings (6 concurrent)	
	E	Poster Session	
Day 5(Thu.)	M	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
	A	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
Day 6(Fri.)	M	Scientific Sessions (4-5 concurrent)	SB Meeting
	A	Scientific Sessions (4-5 concurrent)	
	E	Closing Session (plenary)/Chairman's Reception	
Day 7(Sat.)		GC Meeting	
Day 8(Sun.)		GC Meeting	

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Example 2

Day	Time	Events	
Day 1(Mon.)	M	SB Overture Meeting	
		Scientific/Technical Committee Overture Meetings (6 concurrent)	
	A	Opening Session/SB Symposium (plenary)	
	E	Welcome Reception	
Day 2(Tues.)	M	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
	A	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
Day 3(Wed.)	M	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	F&A Meeting
	A	Scientific/Technical Committee Meetings (6 concurrent)	
	E	Poster Session	
Day 4(Thu.)	M	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
	A	Scientific Sessions/Workshops/WG Meetings (4-5 concurrent)	
Day 5(Fri.)	M	Scientific Sessions (4-5 concurrent)	SB Meeting
	A	Scientific Sessions (4-5 concurrent)	
	E	Closing Session (plenary)/Chairman's Reception	
Day 6(Sat.)		GC Meeting	
Day 7(Sun.)		GC Meeting	

Appendix 2

PICES Science Board comments on draft report of the Study Group on *Restructuring of the PICES Annual Meeting* (May 27, 2009)

As Science Board Chairman I have collated and synthesized comments from the Board, which follow below.

Preface

We want to offer the following written comments on the draft report of the SG-RAM as a follow-up to remarks made during the recently completed inter-sessional Science Board (2009-ISB) meeting. These comments come from newly appointed SB members and from members that have up to seven years of experience as a Science Board member and as co-chairs of the CCCC scientific program. This breadth of experience we believe provides appropriate institutional history with regard to the Annual Meeting as well as a fresh perspective.

First, we preface the comments by noting that the trends shown in Figure 1 (duration of ASC), Figure 2, Figure 4 (pages in annual report), and Figure 5 (annual participants) in *Appendix 3* are all indications of a vibrant, healthy organization that is clearly beyond its infancy, and judging from annual attendance (Fig. 5) nearly at a steady state. These data indicate that the PICES Annual Science Conference (ASC) has matured into a scientific forum that has demonstrative value to scientists in the North Pacific. From the background information provided by SG-RAM, and some of the comments in materials provided by the, it is also clear that we have what could be called a ‘carrying capacity’ problem. The demand for presentation of oral paper sessions and workshops is now exceeding the Contracting Party’s finances and the logistical capabilities of PICES Secretariat.

As I mentioned at the ISB-2009, we believe that the solution to this issue is multifaceted, and requires effort by both the Science Board and Council to resolve the concerns. Fundamentally, Science Board should implement changes that are possible and that do not compromise the integrity and collegiality of the science aspects of the ASC, while producing efficiency improvements. We conclude, however, that the current problem is a symptom of PICES success, and we have outgrown our current financial and logistical support base.

It is our general understanding that the base financial support for PICES from the Contracting Parties has not kept up with the rate of inflation over the past decade, much less accounted for the ever-increasing number of tasks that are being tackled by PICES. If demand exceeds resources, then either demand must decrease (fewer PICES activities engaged in, which is not a good outcome from Science Board’s perspective), efficiency must increase (Science Board may be able to help with this as described below) or resources available must increase (a task for Governing Council and National Delegates). We feel that Science Board could assist Council in marketing the usefulness and demonstrated value of PICES to the funding agencies in the member states.

Where Science Board agrees with the current draft of the report

Certainly, there are efficiency improvements and changes that can be discussed and implemented by Science Board that will lead to shorter, and perhaps less expensive, PICES ASC. Each of these changes [(1)–(6)] are discussed in the next few paragraphs.

We favor (1) SG-RAM’s suggestions for eliminating contracting party statements during the opening session, except for the host country statement. This change alone will lead to time savings in the opening session. It does seem that for some countries this change will also enable some Council members to arrive as late as the Friday or Saturday of the second weekend (after most if not all of the sessions). For some countries, delegates are not scientists, and they do not wish to spend an entire week (or more) at the ASC.

We also (2) think that SG-RAM’s suggestion that Scientific and Technical Committees have short overture meetings on the Sunday preceding the meeting merits consideration by the Science Board. It is worth noting, however, that we used to have business meetings for the Committees before the ASC, and we did find that

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attendance was low. We agree that currently too much time in committee meetings is spent bringing committee members up to speed on the activities that need to be discussed. These overture meetings could be used to remind the committees of the key topics that require their attention at the current ASC meeting. We propose that these overture meetings occur for 1.5 hours, from perhaps 4:30 - 6:00 PM, on Sunday night, rather than as an activity on the first Monday.

Thirdly (3), we agree that having more than 3 concurrent parallel sessions during the Tuesday-Friday time frame of the main meeting merits serious consideration by Science Board. By increasing the number of parallel sessions from 3 to 4 during these days, we gain four additional full-day sessions within the main part of the meeting. SB does not agree with increasing beyond 4 concurrent sessions.

Finally, we concur (4) that there is merit in Science Board giving due consideration to the SG-RAM idea of having some of the workshops within the main 5-days of the meeting. We feel strongly, however, that because workshops and topic sessions have fundamentally different purposes, they should not be scheduled in parallel. For workshops to lead to effective discussion and products, the attendees of workshops should be in the workshop all day, and not skipping out at various times to attend a 15- to 20-minute talk that particularly interests them in a parallel topic session. If the decision is made to schedule 4 concurrent workshops on one day, for example on the Tuesday of the ASC week, then that day should be only workshops, and have no topic sessions. That would lead to workshops that are more likely to retain their participants throughout all of the presentations and discussions.

The above four recommendations were in the SG-RAM report. The next two recommendations were not in the report and are offered for consideration by Science Board.

We suggest (5) that the individual committees and FUTURE Advisory Panels (AICE, COVE, SOFE) and Science Board need to be more realistic about expectations and more conservative or strict in making their decisions about which topic session proposals and workshop proposals can be accommodated within a framework that extends from the Saturday prior to the meeting to the Friday of the main meeting [7 days, not including the Saturday (Science Board and Council) and Sunday (Council) meetings following the closing session]. In recent years, there has been a tendency for Scientific Committees to bring 3–5 topic session proposals to Science Board. It is not possible to accommodate all of these within the four days available. Consequently, after the Tuesday through Friday slots have been filled with topic sessions, some remaining sessions are changed from topic sessions to a workshop format and scheduled for Friday to Sunday preceding the main meeting. We propose to instruct the Committees that because we have a limited number of slots for sessions and workshops, they must show restraint in the number of proposals they bring to Science Board for consideration. Likewise, we propose that Science Board will refrain from converting topic sessions to workshops scheduled prior to the main meeting. All Scientific and Technical Committees should prioritize topic session proposals as they currently do, and after balancing slots among the committees, the convenors of the remaining (unsuccessful, lower priority) topic sessions can be informed that their session could not be accommodated.

An alternative strategy that could be useful in some circumstances is available. If the desire is to include many topic sessions, then (6) some topic sessions that request a full-day could be converted to half-day sessions, with overflow abstracts being relegated to poster format. Both of these options (5 and 6) should result in fewer “topic sessions” from the main meeting period being moved to the weekend prior to the main meeting.

Where Science Board has concerns

There are some ideas/recommendations currently in the SG-RAM draft that Science Board does not support.

First, Science Board members are scientists first, and they need to be able to attend scientific sessions or workshops that are held anytime during the main part of the meeting. Consequently, they are (1) strongly opposed to the idea that Science Board should meet on the Friday of the main meeting while workshops or topic sessions are still being held. Having Science Board members attend a business meeting cuts the Chairmen off from one of the most important committee activities, which are the topic sessions/workshops,

and the collegial scientific discussions that arise during these events. We believe that the earliest when Science Board should meet for the main portion of their discussions is on the Saturday following the main meeting week, which has traditionally been the case. With the FUTURE program coming online and Science Board serving in a new capacity as the responsible steering and decision-making body for the FUTURE program, it is possible that a 1-day Saturday Science Board meeting may need to be extended to 1.5 days and include Sunday (AM) as well; this is not currently a proposal but rather we are just highlighting the need to consider this option. If Council wishes to have a 2-day meeting following the ASC, then it might be best to have the Science Board meeting on Saturday (all day) and Sunday (AM), while Council meets all day Sunday and for as much of Monday as is needed to complete their business. In this option the Science Board Chairman would need a 3-hour period on Sunday afternoon to compile all of the recommendations for presentation to Council on Sunday no earlier than 3:30 PM. This would make for a long day on Sunday and would most likely extend the Council meeting to Monday.

As noted at the 2009-ISB, the Science Board session on Day 1 (Monday) of the main meeting is not to exclusively highlight the accomplishments of PICES, but rather to provide the only plenary oral forum within the PICES ASC that enables a diverse and broad set of speakers from multiple disciplines (and from regions beyond the North Pacific (*e.g.*, Europe and elsewhere) to reach the broadest PICES audience. Science Board supports the view that the Science Board plenary session be used to bring speakers to PICES to present ideas generated from other disciplines or regions. For this reason we (2) do not support the SG-RAM recommendation to use the Science Board session for the primary, or sole, purpose of highlighting PICES recent accomplishments. This would be looking too much inward to PICES and not using this important session to look outward and to bring new ideas and science to our organization.

Exploring new technologies

The experience of current and past Committee Chairmen suggests that attempts to conduct business via email before the main meeting usually elicits a very limited response. Some of the Science Board members have recently been part of video and web conference calls with up to six participants that have been very successful. In addition, Anne Hollowed has found that teleconferences have been an effective means of communicating and reaching decisions with the new PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*. We therefore suggest that PICES should investigate these technologies for transferring some business that is conducted at the Annual Meetings to other times. Member countries could explore whether institutions in their countries could provide video conference capabilities and share them with the Secretariat. For discussions of only a few hours, this expense would be much less than funding, for example, travel to inter-sessional committee meetings.

Future concerns

It is likely that the activities of PICES, which include Science Board and Council meetings; meetings of Standing Committees and expert groups, the annual science topic sessions; and workshops, that occur at the ASC will become more hectic with increasing demands, such as with the start of FUTURE. It is also possible that with level or decreasing financial resources, more PICES expert groups may increase their requests for more workshops or lengthier workshops immediately prior to the ASC. The alternative to having workshops in the days preceding the ASC is to have them inter-sessionally. The concern with inter-sessional workshops is that they impose substantially greater demands on PICES member nations to support additional travel for Expert Group members and place increasing demands on the Secretariat for arranging venues. The efficiency improvements that may result from the positive recommendations provided in the SG-RAM report and others discussed above may alleviate some of these stresses in the near-term, but eventually, increasing demand will likely eat into the efficiency-based savings. This capacity erosion will be in time commitment, financial resources and Secretariat logistical support. It seems that the long-term strategic objective has to be securing additional resources to sustain PICES leadership in marine science in the North Pacific in the future.

Dr. John Stein
PICES Science Board Chairman

Appendix 3

Secretariat Comments

on the Draft Report of the Study Group on *Restructuring of the PICES Annual Meeting* (SG-RAM)

1. Annual Meeting

The PICES Convention (Article VI(3)) states simply that an Annual Meeting will be convened by the Chairman of PICES, and that it will normally be held at the seat of the Secretariat unless otherwise decided by Council (Council routinely decides otherwise). The Convention does not prescribe what an Annual Meeting should include, other than a meeting of Council.

The Secretariat's view is that an Annual Meeting of the Organization includes: a meeting of its Governing Council, meetings of its permanent committees, and its annual science conference. Through most of its history, Annual Meetings¹ begin on a Monday with the Opening Session, and end the following Sunday, a period of 7 days, with the final meeting of Council. Other activities such as workshops and meetings of some (but not all) subordinate groups of the permanent committees have been scheduled immediately prior to the Annual Meeting (typically Friday-Sunday) as the Organization has found this to be the most cost-effective scheduling of activities throughout the year.

Council last dealt with the issue of structure of Annual Meetings in 1999. Aspects of the current structure and related practices have followed from Decision 99/S/7. Its main components were:

- To promote inter-committee sessions – Science Board should select a “main theme” for each Annual Meeting, and proposed Topic Sessions must then fit the overall “theme” of the meeting;
- To advance the role of the Science Board Symposium – it should be arranged as the first scientific session of the Annual Meeting, immediately following the Opening Session;
- To upgrade image and position of poster presentations – the poster sessions should be arranged to have a formal poster viewing time near the end of each day in conjunction with a social hour; poster presenters for that session would be required to stand by their poster at that time;
- To increase the participation of young scientists – a Young Scientists' Travel Grant (as a part of the Trust Fund) should be advertised.

2. Comments on SG-RAM Background

The background section of the report introduces a number of issues that are associated with the terms of reference of the Study Group, particularly as they relate to Annual Meetings. The Secretariat offers the following observations on the draft to help to clarify the situation. The first step was to identify the issues raised in the background:

1. The increasing activity of PICES scientists has expanded the scale and duration of its Annual Meeting;
2. This expansion has compressed time for deliberations by Council, Science Board, and Permanent Committees;
3. The increased scale and duration is a burden to the host country, participants, and Secretariat.

2.1. The increasing activity of PICES scientists has expanded the scale and duration of its Annual Meeting

Analysis:

- The first two Annual Meetings of PICES were 6 days long and the last two Annual Meetings (2008/09) were 7 days long. Even if preliminary activities are included there has been no statistically significant increase in the duration of the Annual Meeting since its inception in 1992 ($P > 0.06$). Without including the

¹ Throughout this report, we have attempted to use “Annual Meeting” with capital letters when referring to the Secretariat's definition, and “annual meeting” with small letters when referring to the Annual Meeting plus preliminary activities.

first two years, the rate of growth in the duration of the annual meeting approaches 0.0 ($P > 0.69$). Figure 1 shows the temporal history of the Annual Meeting duration (with and without preliminary activities).

- The total number of days of activities scheduled before an Annual Meeting describes only part of the story of activities. It is also necessary to reflect how much activity occurs during those days. The scale (interpreted to mean: the number and diversity of activities) of annual meetings increased dramatically between 1995 and 1996, but has remained relatively constant since 1996. This happened as a consequence of groups meeting/workshops prior to the Annual Meeting at the venue (Fig. 2). This occurred for two reasons: (1) in recent years, the scale of the Annual Meeting did not increase significantly under the direction from Council to limit the number of concurrent activities/sessions at an Annual Meeting to 3, and (2) as previously mentioned, the Organization has found it to be more cost-effective to have their scientists travel to one PICES meeting, and perhaps stay a little longer, than to travel internationally several times.
- It should be noted that rate of growth of extramural activities is not uniform among all of the Standing Committees (and Scientific Program). If one uses the number of pages in an Annual Report to gauge the degree of activity of a Permanent Committee (Fig. 3), FIS and TCODE have very low increases in their activities since PICES-I, while the Climate Change and Carrying Capacity (CCCC) Program had the highest rate of increase of activity of any committee or program because of its later start (1996) and an active program. Please note that at present, there is no active Science Program.

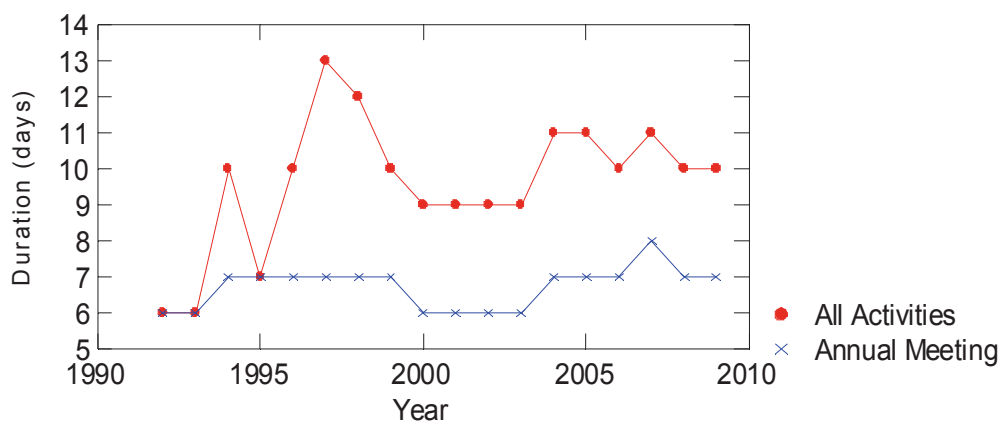


Fig. 1 Duration of PICES Annual Meetings (1992-present).

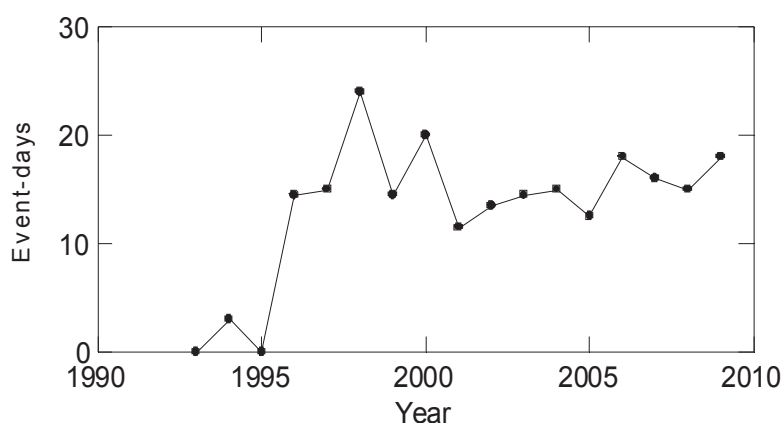


Fig. 2 Number of “event-days” of activities scheduled during an Annual Meeting.

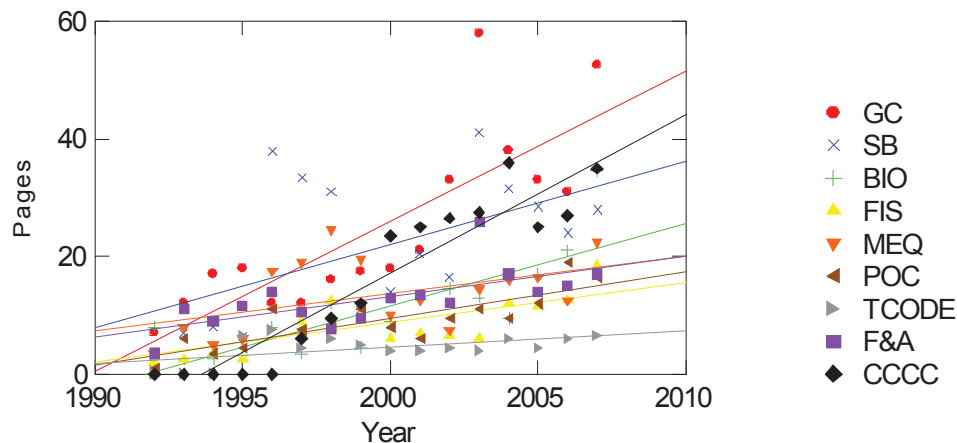


Fig. 3 Pages in the Annual Report describing activities of the Standing Committees, Science (CCCC) Program, and Council.

2.2. Expansion has compressed time for deliberations by Council, Science Board, and Committees

Analysis:

- The main cause of compression of time for deliberations is because the Permanent Committees have not adjusted their schedules to accommodate the growth of PICES science (Fig. 4). As a consequence more issues receive less attention.
- Council is the only group that increased their total meeting time.
- Finance and Administration Committee meetings are short and have decreased of late because:
 - financial decisions precede the activities proposed by Science Board
 - zero nominal growth target for the Organization
- This situation will get worse rather than better as FUTURE comes on-line, and overall responsibility for product delivery lies with the Permanent Committees rather than an SSC.

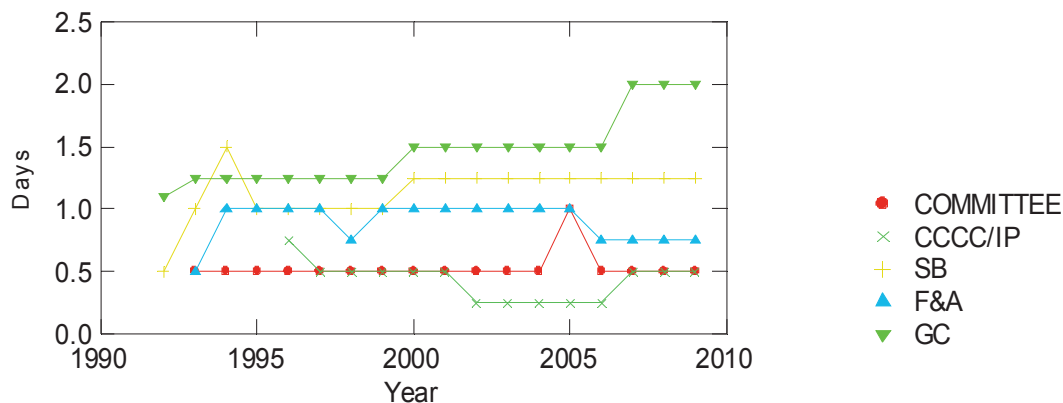


Fig. 4 Durations of meetings by Standing Committees and CCCC EC/IP.

2.3. The increased scale and duration is a burden to the host country, participants, and Secretariat

Analysis:

- Most scientists are free to arrive and depart from an annual meeting based on their own schedule. The average participation at an Opening Session is typically less than half of the total number of participants at an annual meeting, and the general lack of award winners present at the Closing Session indicates that most scientists take advantage of this freedom.

- Host countries had an increasing burden from growth in participants during the first half of PICES existence. The annual rate of increase of annual meeting participants was 39 people per year ($P < 0.002$) until the Tenth Anniversary annual meeting. Since 2000, there has been no significant increase in number of participants ($P > 0.55$) at annual meetings. The average number of participants over the entire duration including preliminary activities is currently ~400 but not all are present simultaneously (Fig. 5).
- The Secretariat is paid to organize and attend the Annual Meeting so it is their legitimate burden.

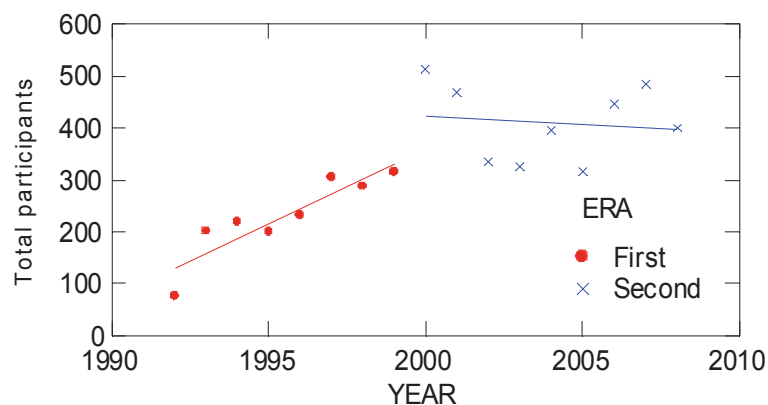


Fig. 5 Total numbers of participants at all events at annual meetings.

2.4 Summary

The major reason for the historical analysis was to distinguish whether the existing structure of the Annual Meeting was caused by incorrect or unthoughtful top-down planning, or was a consequence of evolution, when natural selection pressures on the Organization resulted in certain practices considered as the most cost effective. We concluded that the current state of PICES annual meetings is generally a consequence of evolution, not planning. Natural selection pressures on the Organization have extirpated certain practices. The selection pressures occurred quickly because, after 1993, there has been no significant increasing or decreasing trend in the duration of an annual meeting.

3. Comments on SG-RAM Problems and Implications

In addition to the Background, this section on Problems and Implications raises some additional concerns and some that are repeated from the Background.

3.1. Burden on Governing Council

Analysis:

- Council members have 2-hour work on the Monday of an Annual Meeting, followed by a 4-day interval, followed by 1.5–2 days of meetings. As most Council members are senior executives, the burden of their time commitment and expense far exceeds requirements for discussion and decision making.
- From the outset (PICES I), Council members requested that the schedule of activities be prepared in such a way as to allow Delegates and Committee members to attend the scientific sessions.
- For various reasons, some Council members are not scientific executives, making the 7-day obligation, plus travel time, unbearable for them.
- The cost and distance involved for Council members to travel to an Annual Meeting makes two trips (one for the Opening Session/Science Board Symposium and one for the Council meeting) nearly impossible and delegates have been reluctant to pass on either responsibility to a scientist.

3.2. Increasing expenses

Analysis:

- As previously mentioned, the average total number of participants at all events, since 2000, is 400.
- Host countries are offered up to CDN\$40,000 from the PICES budget to offset the cost of Annual Meetings, but this is frequently refused or (partially) returned to PICES.
- Some countries share a greater burden of the costs than others (Fig. 6).
- Because there are two times more Asian than North American member countries in PICES, the latter must travel to Asia twice for every one in the other direction.

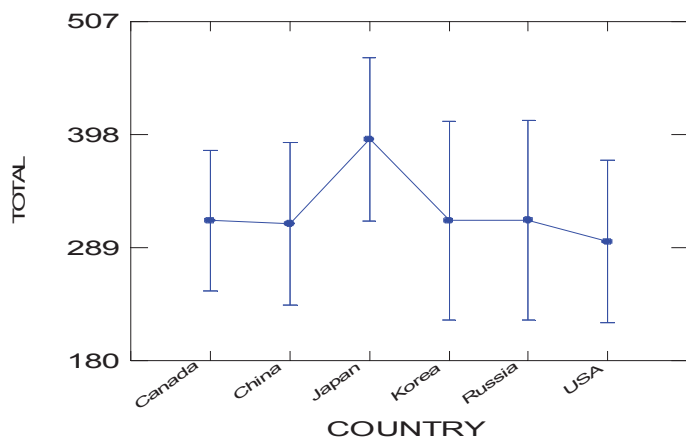


Fig. 3 The results of an analysis of the variance of total numbers of participants at annual meetings by meeting location from 1992-2008. The vertical lines indicate the 95% confidence intervals on the average number of participants (dots), by host country.

3.3. Insufficient discussion on scientific matters

(In general, this item should be left for Science Board to comment, but some limited comments are possible.)

Analysis:

- The amount of time allocated by the Secretariat for scientific discussion at annual meetings of Permanent Committees is whatever amount of time the committees have requested. Requests by Committee Chairmen for additional time have been rare, and requests for additional days have been non-existent.
- At final Science Board meetings, each Committee is responsible for presenting, in order of priority, its scientific activities for the upcoming Annual Meeting. Science Board typically asks Committee Chairmen to merge scientific sessions on similar topics into a single Topic Sessions, as was done in Dalian. But recall that Council endorsed the concept of having a general theme for each Annual Meeting, of significant interest to the host country. Committees were encouraged, but not obliged, to find topics that aligned with the theme. Topics of strong scientific interest for a Committee that did not fit well with the theme ended up as workshops. So some of the similarities among topic sessions (real or apparent) have arisen from Council’s policy regarding annual meeting themes.
- The development and presentation of the Science Board report to Council on the last day is acknowledged to be a problem, on many levels:
 1. Science Board cannot meet until all of its scientific activities at an Annual Meeting have ended because Committee Chairmen often have obligations at sessions, either as co-convenors, as selection committee member for awards, or to appreciate the full scope of scientific activities related to their committee’s interests. In spite of spilling some of Science Board business to the inter-sessional meeting and a lunch meeting, the final Science Board meeting is always rushed to get through all of the business on the agenda. The main items of business taking the most time are the annual review of committee’s activities, and the planning for the next Annual Meeting.

2. The Science Board report consists of a Powerpoint presentation. No written document is produced and Science Board members never see the final presentation before it is presented to Council.
 3. No time is allotted at the Annual Meeting to prepare the Science Board presentation/report.
 4. Council has no time to review the report in detail before being asked to make decisions on its content.
 5. The Finance and Administration Committee reviews the budget of the Organization without having seen what Science Board is proposing to do for the upcoming year.
- The current version of the Implementation Plan of FUTURE are leaning toward Science Board taking the main leadership role in the delivery of the program. Chairmen and Vice-Chairmen of Permanent Committees are being asked to assume leadership roles on Steering Groups. For the last year or two, the activities of the CCCC Program have diminished significantly. The current SG-RAM report does not acknowledge the additional demands on Science Board should they also be asked to run FUTURE.

4. Comments on SG-RAM Options 1 and 2

- We strongly support the proposed changes in the format of the Opening Session – keeping only the opening remarks by the host country and the Chairman of PICES, and moving remarks by other Contracting Parties to the beginning of the Governing Council meeting.
- To start the Opening Session in the afternoon on Monday looks acceptable, if combined with (1) the overture meetings of Science Board and Standing Committees in the morning, and (2) including in this session, in addition to a keynote lecture, a couple of invited talks to demonstrate scientific achievement of PICES on the overall theme of the Annual Meeting to scientists, administrators and stakeholders.
- We feel that this “extended” Opening Session cannot replace the Science Board Symposium (it would certainly be more appropriate for Science Board to comment on that). Currently this symposium is the most exciting session at the Annual Meeting with high-profile world-class invited speakers, and it would be a pity to lose this session. As an alternative, we could consider having a 0.75-day or 1-day Science Board Symposium on Friday to wrap up the Annual Meeting on a high note (as was the case until 1999).
- Assuming that 6 parallel events (meetings/workshops/field trips) will occur in each of the 3 days before the Annual Meeting, the total number of “event-days” is 29.5 (11.5 during the Annual Meeting). Option 1 reduces this to 19.5 and Option 2 to 18. Using the maximum of 5 parallel events proposed in these options, the amount of “science” conducted at the site of the Annual Meeting will be reduced to 66% and 61% of present levels, respectively.
- Increasing the number of concurrent scientific sessions and having workshops and business meetings concurrently with these sessions during the Annual Meeting is also problematic, as it goes against the integrative scientific approach promoted by PICES, and could limit the development of collaborative projects that cut across disciplines. The situation will become worse after FUTURE is in place and will start planning its activities.
- The decision by Council to limit Annual Meetings to 3 parallel sessions has had an additional benefit of limiting simultaneous demands on the Secretariat for preparing agenda, schedules, collecting and testing presentation files, *etc.* Options 1 and 2 attempt to increase “the diameter of the pipe” by increasing the number of simultaneous sessions during the Annual Meeting. Additional resources will be required by the Secretariat to accommodate the larger “pipe”.
- It is the Secretariat’s view that an Annual Meeting serves an equally important role in the sociology of marine science in the Pacific. While the original model for PICES was ICES, it is essential to recognize that the mixture of cultures in PICES is dramatically different from ICES. English language competencies are also very different. As a consequence, collaborative international marine science in the Pacific does not arise as spontaneously as it should. In some cases, the PICES Annual Meeting provides one of the few opportunities for scientists from the same country to meet. This brings special meaning and importance to the role of social events in PICES where, if only briefly once every year, we try to communicate with each other and learn from each other. When combined with jet lag, full days of concentration on science, it seems inadvisable to rely on evening meetings for productive results.
- We think that moving the Science Board meeting to Friday will create more harm than good (again it would be more appropriate for Science Board to comment on that). The intent is good – to ensure that Science Board has sufficient time to prepare a well-focused report to Council, but the proposed solution

does not seem acceptable, as Science Board members often have obligations at sessions (see 3.3). One possible option to provide Science Board more time is to delay the Council meeting by one day, and have it on Sunday and Monday. But a more preferable option from our perspective is to move the selection and approval of scientific sessions and workshops to the inter-sessional meeting. The planning for the next annual meeting is the most time-consuming item of business at the Science Board meeting. If sessions and workshops for Year (N+1) are decided at the inter-sessional meeting in Year N, it will ease the burden substantially. If the proposed Option 3 (see below) is found reasonable, then recommendations on host-obligation and host optional events could be made at the same time.

5. Option 3 (The hybrid model)

The current format of annual meeting activities has evolved (and “evolved” is the key word) because it has proven to be the most economically cost-effect scheduling of activities for the Organization. Multiple trans-Pacific flights are expensive for scientists and managers, so there has been tremendous pressure on groups to align their meetings and discussions with the Annual Meetings. Furthermore, if an individual scientist has multiple roles in the Organization (and this is not uncommon), they can achieve most of their obligations to the Organization by attending one meeting. Unfortunately, this has placed increasing demands on the agencies hosting the Annual Meeting.

An alternative to what has been proposed is to shift the decision-making responsibility for these preliminary events to the host country. Not all host countries have the same interest or capacity, but those who are willing to accommodate preliminary events at the Annual Meeting venue should be given the opportunity to do so. The process might work as follows:

- Secretariat divides its request to a host country into two categories:
 - requirements for the Annual Meeting (host-obligation)
 - requests for preliminary activities such as workshops, meetings (host -optional)
- The host will advise the Secretariat which, if any, of the preliminary activities can be accommodated. To accommodate schedules for booking venues, these activities will likely need to be known before the previous Annual Meeting. The proposed approach will require advanced planning – selecting topic sessions and workshops for Year (N+1) at the inter-sessional meeting in Year N. But this might be a good thing as Science Board will have more time at the Annual Meeting for strategic discussions and for preparing the report.
- Organizers of preliminary activities will be advised of the decision.
- Scientific groups that cannot organize their event at the venue of the Annual Meeting will have various options:
 - For business meetings – members of scientific groups in the host country of the Annual Meeting can invite the meeting to their institute during the week immediately prior to the annual meeting; scientists can then move to the Annual Meeting on the weekend. PICES is doing this presently (*e.g.*, WG-21-Rapid Assessment Surveys).
 - For workshops – convenors may invite their colleagues in the host country to make arrangements for a venue for the workshop during the week before the Annual Meeting. PICES has done this in the past (*e.g.*, PICES-2000, Tsukuba/Hakodate).
 - Meetings or workshops might be scheduled inter-sessionally in association with other major events that are occurring at a date and location other than the Annual Meeting (*e.g.*, WG-25 will have the first meeting at GLOBEC Open Science Meeting). This will not work for groups whose members do not meet routinely at some other event.

REPORT OF THE ADVISORY PANEL ON *ANTHROPOGENIC INFLUENCES ON COASTAL ECOSYSTEMS*

AGENDA ITEM 1

Opening remarks and introductions

The FUTURE Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems* (AICE-AP) met on October 22, 2010 from 09:00–12:00 h to review and discuss the meeting agenda. The Chairman of AICE-AP, Dr. Thomas Therriault, welcomed Advisory Panel members and observers (*AICE-AP Endnote 1*) to the meeting. The draft agenda was reviewed and agreed upon (*AICE-AP Endnote 2*).

AGENDA ITEM 2

Review of AICE-AP Terms of Reference and workplan

Since less than half of the Advisory Panel members were present, it was decided that this task would be accomplished by e-mail. AICE-AP recognized the need to develop a detailed workplan before the next inter-sessional Science Board meeting in 2011. The Terms of Reference seemed acceptable and AICE-AP felt that changes were not required at this time.

Action: Is there a need for quorum at these meetings? If so, what is it?

AGENDA ITEM 3

Report from the inter-sessional FUTURE workshop

All AICE-AP members present attended the inter-sessional FUTURE workshop held August 16–18, 2010 in Seoul, Korea, so only a brief review was required. Dr. Therriault provided a brief overview of the goals of the FUTURE program, especially how AICE will contribute, how new expert groups will be developed, how AICE will identify topics of interest, AICE goals and challenges (http://www.pices.int/members/scientific_programs/FUTURE/Materials/2010-inter-sessional-FUTURE/Day%202/AICE/AICE-AP%20Day2.pdf). He then provided a brief review of existing expert groups associated with AICE, notably the Section on *Harmful Algal Blooms in the North Pacific* (HAB-S), Working Group on *Aquatic Non-indigenous Species* (WG-21), and Working Group on *Environmental Interactions of Marine Aquaculture* (WG-24) (see http://www.pices.int/members/scientific_programs/FUTURE/Materials/2010-inter-sessional-FUTURE/FUTURE-2010-wsh.aspx).

AGENDA ITEM 4

Identification of high priority topics for PICES/FUTURE

At the inter-sessional FUTURE workshop held in Seoul (see Agenda Item 3), AICE-AP spent considerable time identifying anthropogenic (and natural) stressors. Immediately following this meeting the three FUTURE Advisory Panel Chairmen (Dr. Therriault, Mr. Robin Brown – SOFE, and Dr. Hiroaki Saito – COVE) met with the Science Board Chairman-elect, Dr. Sinjae Yoo,) and PICES Executive Secretary, Dr. Alexander Bychkov, to develop a strategy to circulate a survey to rank the relative importance of stressors in coastal and oceanic ecosystems of the North Pacific. Dr. Therriault sent the survey (with instructions) to each of the PICES Standing Committee Chairmen to circulate to their members but due to a minor logistical hiccup, this survey was late in being distributed, possibly impairing the survey results (see below). He collected and collated the survey responses but these were very limited (approximately 12) and significant gaps in responses were evident based on country and expertise (Committee relationship) identified by respondents. To ensure an adequate sample size for decision making, it was decided that additional responses were needed, notably from

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China (whose members were absent from the inter-sessional workshop). (Following discussion of this topic at the joint FUTURE Advisory Panel meeting, immediately following the individual Panel meetings, Dr. Therriault agreed to develop a paper version of the survey, focusing only on ranking stressors, to be circulated at the Standing Committee meetings (October 27) during PICES-2010.)

Action: Dr. Therriault to collate responses to survey.

AGENDA ITEM 5

Mechanisms to address high priority topics

AICE-AP felt that high priority topics identified by the survey on ranking stressors in coastal and oceanic ecosystems in North Pacific and building on discussions of this topic at the inter-sessional FUTURE workshop was a good basis to suggest changes to the Terms of Reference for existing expert groups. It was recognized that some expert groups are nearing completion and that it may not be possible/feasible for them to incorporate FUTURE-related terms at this point. There was discussion about the exact mechanisms that the FUTURE Advisory Panels are to use to accomplish this task. It was recognized that it would be much easier to have input to new expert groups being proposed and that these groups should have some elements of their Terms of Reference that are applicable to FUTURE. Subsequent discussion at the joint FUTURE Advisory Panel meeting highlighted there is still some progress to be made on mechanisms and how they are to interact with the Standing Committees and other elements of the PICES organization.

Action

- request AICE-related expert groups to modify/expand their existing Terms of Reference to include: how ecosystems respond to their specific stressor (*e.g.*, WG-21, How do ecosystems of the North Pacific respond to the introduction of non-indigenous marine species?) and how might these stressors change in the future? (*e.g.*, are species introductions expected to increase in the future?)
- This suggestion to be made at the MEQ meeting, as relevant expert groups are derived from this Committee.

AGENDA ITEM 6

Proposals for new expert groups

A proposal to establish a new working group on “Jellyfish Blooms around the North Pacific Rim: Causes and Consequences” via the BIO Committee was received by AICE-AP. The request was forwarded to Panel members for information and review at PICES-2010. AICE supports this proposal. No additional proposed expert groups were identified at this time.

Action

- suggests that the Terms of Reference for new working group be clarified to include a component related to how jellyfish might serve as an important indicator of ecosystem change. (Perhaps a standardized metric could be developed for use within PICES member countries dealing with this emerging issue.)
- AICE-AP suggests that the proposed working group clarify the mechanisms behind these jellyfish blooms as discussions at our meeting suggest that differences are likely between Asia and North America and that difference may exist among Asian countries as well. (AICE-AP recognized the need for Chinese involvement in this working group in order to succeed on some of the proposed Terms of Reference, so perhaps the emphasis on Term 7 could be decreased.)

AGENDA ITEM 7

Linkages to the other FUTURE Advisory Panels

AICE-AP recognizes the need to keep COVE-AP and SOFE-AP advised of our activities and progress. All three FUTURE Advisory Panel Chairmen routinely circulate relevant information. AICE-AP supports the development of a joint working group on “Ecosystem Responses to Multiple Stressors” as discussed with COVE-AP and the inter-sessional workshop (see Agenda Item 8).

AGENDA ITEM 8

Potential second inter-sessional FUTURE workshop

A draft proposal to hold a second FUTURE workshop (Ecosystem Indicators) was developed immediately following the first inter-sessional workshop in Seoul. The proposal was drafted by Dr. Therriault, representing AICE-AP, and by Dr. Jacquelynne King, representing COVE-AP. The primary goal of this workshop will be to identify ecosystem resilience and vulnerability as highlighted in the FUTURE Science Plan based on the implementation of a suite of ecosystem indicators. This proposed workshop will build upon previous efforts, including the Paris meeting on indicators in 2004 (ICES Journal of Marine Science 62(8), 2005) and activities of the recently completed PICES WG19 report on ecosystem based management (PICES Scientific Report No. 37, 2010).

AICE-AP strongly supported the proposed workshop. The Panel felt it would provide a strong basis for the proposed new working group on “Ecosystem Responses to Multiple Stressors”. It was suggested that a summary of the MEQ/FUTURE Topic Session (S12) on “*Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function*” (co-sponsored by IMBER) at PICES-2010 be presented at this workshop.

Action: Identify Asian member(s) to co-convene a second FUTURE workshop to present at the Science Board meeting on Saturday, October 30, 2010.

AGENDA ITEM 9

Potential Topic Sessions for PICES-2011

AICE-AP felt the first session (S12; see Agenda Item 8) at PICES-2010 was successful. Abstracts received greatly exceeded (approximately three times) available slots. This resulted in a number of oral presentations being converted to poster presentations or referred to Working Group meetings for presentation. AICE-AP felt it was important to develop a proposal for a Topic Session for PICES-2011 to continue to highlight the relevance and importance of the FUTURE program for PICES. The Advisory Panel discussed a Topic Session related to land–sea interactions, notably how human activities in upland locations of the Amur River (meeting location next year in Khabarovsk, Russia, on the banks of this major Asian river) alter iron transport to the Sea of Okhotsk, thereby affecting primary productivity.

Action

- Dr. Kaeriyama to develop a draft Topic Session proposal and work with Dr. Therriault to finalize it before Committee meetings, including broadening the scope to include parallel to large North American river land–sea issues.
- Dr. Therriault to seek MEQ co-sponsorship and present at MEQ Committee meeting as a potential joint MEQ/FUTURE Topic Session, similar to the S12 Topic Session developed for PICES-2010.

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AGENDA ITEM 10

Addressing action items and working outside the Annual Meeting

Lack of participants made this discussion difficult and highlighted the need for input both during and outside PICES Annual Meetings. The participants present felt that e-mail was the best option at this point but felt that alternative methods (conference calls, Skype) could be explored as needed.

Action: Advisory Panel members will strive to respond to ALL correspondence in a timely manner.

AGENDA ITEM 11

Other issues

The Advisory Panel discussed the lack of participation of members, notably from China, who missed the inter-sessional FUTURE workshop in Seoul in August and who have failed to respond to recent requests for information (*e.g.*, survey) and input (*e.g.*, workplan, proposed expert groups, *etc.*). AICE-AP deliberated on the poor timing of the meeting slot assigned during the Annual Meeting. Some Panel members suggested that if the meeting times were embedded during the week of the Annual Meeting, more members would be present to be able to fully participate. Alternatively, if FUTURE Advisory Panels could meet on the Sunday, rather than on the Friday, before the Annual Meeting it might be easier (less of a request) to travel in time to attend the Panel meetings.

Dr. Shevchenko suggested TCODE could be a good source of data/information on stressors. TCODE routinely collects metadata and this could be linked to real data. This could be a valuable tool to archive stressor-related information/data in support of FUTURE.

AGENDA ITEM 12

Meeting adjourned and participants to attend the joint FUTURE Advisory Panel meeting

Dr. Therriault adjourned the meeting at 12:00 h as participants prepared to attend the joint FUTURE Advisory Panel meeting scheduled for 14:00–18:00 h.

AICE-AP Endnote 1

AICE-AP participation list

Members

Masahide Kaeriyama (Japan)
Igor Shevchenko (Russia)
Thomas Therriault (Chairman, Canada)

Observers

Yoichiro Ishibashi (Japan)
Darlene Smith (Canada)

AICE-AP Endnote 2

AICE-AP meeting agenda

1. Opening remarks and introductions (Therriault)
2. Review of AICE-AP Terms of Reference and workplan
3. Report from the inter-sessional FUTUREworkshop
4. Identification of high priority topics for PICES/FUTURE
5. Mechanisms to address high priority topics
6. Proposals for new expert groups
7. Linkages to the other FUTURE Advisory Panels
8. Potential second inter-sessional FUTURE workshop
9. Potential Topic Sessions for PICES-2011
10. Addressing action items and working outside the Annual Meeting
11. Other issues
12. Meeting adjourned and participants to attend the joint Advisory Panel meeting

REPORT OF THE FUTURE ADVISORY PANEL ON *CLIMATE, OCEANOGRAPHIC VARIABILITY AND ECOSYSTEMS*

AGENDA ITEM 1

Welcome, introductions, opening remarks

The FUTURE Advisory Panel on *Climate, Oceanographic Variability and Ecosystems* (COVE-AP) met on October 22, 2010 from 09:00–12:00 h to discuss the meeting agenda. Dr. Hiroaki Saito, COVE-AP Chairman, welcomed Advisory Panels members and observers (*COVE-AP Endnote 1*) before giving an overview of the aims of the meeting.

AGENDA ITEM 2

Changes to, adoption of, agenda

The agenda was reviewed and no changes were made (*COVE-AP Endnote 2*).

AGENDA ITEM 3

Review and discussion of COVE-AP Terms of Reference and workplan

Dr. Saito reviewed the COVE-AP Terms of Reference and workplan. He stated that one of the Terms of Reference, “AICE and COVE APs will recommend priority tasks to PICES SB” is the most important purpose of the meeting to move FUTURE forward.

AGENDA ITEM 4

Report of the FUTURE inter-sessional workshop

Dr. Saito reported the discussion and decisions of the 2010 inter-sessional FUTURE workshop held August 16–18 in Seoul, Korea (http://www.pices.int/members/scientific_programs/FUTURE/Materials/2010-inter-sessional-FUTURE/Day%203/COVE-AP%20Report.pdf and http://www.pices.int/members/scientific_programs/FUTURE/Materials/2010-inter-sessional-FUTURE/Day%203/COVE-AP%20Summary.pdf).

COVE-AP selected two primary topics to be developed as a working group:

- *Mechanism of North Pacific Variability*
- *Ecosystem Responses to Multiple Stressors*

It was suggested that the latter be considered a joint proposal of COVE-AP and AICE-AP.

Recommendation: COVE-AP recommends to Science Board the new working groups “Mechanism of North Pacific Variability” and “Ecosystem Responses to Multiple Stressors” to carry out FUTURE science.

AGENDA ITEM 5

Selecting high priority topics/new expert groups

In addition to the high priority topics selected at the FUTURE workshop in Seoul, Dr. Saito explained the activity of the proposed working group on “Sensitivity of the North Pacific to Atmospheric Iron Deposition in a Low pH Ocean” put forward by Dr. Maurice Levasseur (Canada). The central objective is to determine how the predicted decrease in ocean pH will impact the response of the HNLC ecosystems to atmospheric iron deposition in the North Pacific. The main comments provided by Panel members to the newly proposed working group were that: (1) it was well focused but too narrow as PICES working group activity and (2) it could potentially be included into the proposed working group on “Ecosystem Responses to Multiple Stressors”. A concern raised by the Panel was that no potential members were nominated from Korea and Russia.

COVE-AP-2010

Action: COVE-AP encourages Dr. Levasseur and colleagues to consider carrying out their proposed activities within “Ecosystem Responses to Multiple Stressors” working group.

AGENDA ITEM 6

Potential FUTURE workshop in conjunction with a 2011 inter-sessional Science Board meeting

Dr. Jacquelynne King explained the intentions for holding a proposed workshop titled “*Indicators of status and change within North Pacific Marine ecosystems: a FUTURE workshop*” in conjunction with an inter-sessional Science Board meeting. All Panel members supported the idea. It was also mentioned that the workshop would be a good opportunity to initiate the activities of the proposed working group on “Ecosystem Responses to Multiple Stressors”.

Recommendation: COVE-AP recommends holding a FUTURE workshop in conjunction with ISB-2011.

AGENDA ITEM 7

Potential Topic Sessions at PICES-2011

No Topic Session was proposed.

AGENDA ITEM 8

Planning activities after PICES-2010

Dr. Saito announced the schedule of activities planned for COVE-AP after PICES-2010.

AGENDA ITEM 9

Other business

No other business was discussed.

COVE-AP Endnote 1

COVE-AP participation list

Members

Liqi Chen (China)
Jung-Hoon Kang (Korea)
Jacquelynne King (Canada)
Hiroaki Saito (Chairman, Japan)
Toru Suzuki (Japan)

Observers

Chan Joo Jang (Korea)
Toshiro Saino (Japan)

COVE-AP Endnote 2

COVE-AP meeting agenda

1. Welcome, introductions, opening remarks
2. Changes to, adoption of, agenda
3. Review and discussion of COVE-AP terms of reference and workplan
4. Report of the FUTURE inter-sessional workshop
5. Selecting high priority topics/new expert groups
6. Potential FUTURE workshop in conjunction with a 2011 inter-sessional Science Board meeting
7. Potential Topic Sessions at PICES-2011
8. Planning activities after PICES-2010
9. Other business

REPORT OF THE ADVISORY PANEL ON *STATUS, OUTLOOKS, FORECASTS AND ENGAGEMENT*

The Advisory Panel on *Status, Outlooks, Forecasts and Engagement* (hereafter SOFE-AP) was established at PICES 2009 as part of the implementation of the FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems) program. All three FUTURE Advisory Panels (Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems* – AICE-AP, Advisory Panel on Climate, Oceanographic Variability and Ecosystems – COVE-AP, and SOFE-AP) had a brief inaugural meeting (individually and in aggregate) at PICES-2009. The Chairmen of the three FUTURE Advisory Panels met again for one full day as part of the Inter-sessional Science Board Meeting (ISB-2010) held from April 23–24, 2010, in Sendai, Japan to review the draft work plans for the Advisory Panels and to clarify the process for revising terms of reference for existing expert groups and approving new expert groups to meet FUTURE goals. The Advisory Panels met for an inter-sessional workshop from August 16–18, 2010, in Seoul, Korea, to (1) identify priority topics and activities for FUTURE's first triennium (2010–2012) and (2) discuss the potential for existing and new expert groups to address these priorities; attendance (across all three FUTURE Advisory Panels) was limited.

The meeting of the SOFE-AP was held from 09:00–12:30 h on October 22, 2010, followed by a joint meeting of the three FUTURE Advisory Panels from 14:00–18:00 h on October 22, 2010. The Chairman, Mr. Robin Brown, welcomed members and observers (*SOFE-AP Endnote 1*). Dr. Phillip R. Mundy served as rapporteur. Several changes were made to the draft agenda. A revised agenda was adopted (*SOFE-AP Endnote 2*).

AGENDA ITEM 2

Review of SOFE-AP Terms of Reference

SOFE-AP members reviewed their draft Terms of Reference and accepted this version (*SOFE-AP Endnote 3*).

AGENDA ITEM 3

Review and update workplan

The workplan was expected to be completed by the end of the year.

AGENDA ITEM 4

Review of progress and reports of key expert groups

The Chairman provided a brief report on the inter-sessional FUTURE workshop that took place August 16–18, 2010 in Seoul, Korea (http://www.pices.int/members/scientific_programs/FUTURE/Materials/2010-inter-sessional-FUTURE/Day%203/SOFE-AP%20Report.pdf).

SOFE-AP reviewed the draft final report and a summary presentation from the Study Group on *Communications* (SG-COM; Agenda item 4a). The Advisory Panel agreed with most of the recommendations of SG-COM and included many of these recommendations in the draft workplan. The Advisory Panel supported the concerns raised by SG-COM that a significant new focus on engagement/outreach will stress/overload the current capacity and expertise of the PICES as it is currently configured.

The progress of the Study Group on *Human Dimensions* (SG-HD) and potential follow-on expert groups was reviewed and discussed (Agenda Item 4b). SOFE-AP recommended that it was premature to recommend any

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follow-on activities from SG-HD at this time, but anticipate that a recommendation on a future Human Dimension expert group will be developed in the period prior to PICES-2011.

Ms. Nora Deans, Communications and Outreach Director from the North Pacific Research Board, provided a stimulating presentation outlining the outreach/engagement strategy and tools of the North Pacific Research Board (Agenda Item 5b). She outlined some outreach tools, including Research Summaries (10–20 pages) (<http://www.nprb.org/education/summaries.html>) and Project Synopses (2 pages) (<http://www.nprb.org/education/synopses.html>) and noted that these publications had a lot of uptake by diverse audiences. SOFE-AP members found this to be a most useful presentation and expressed their appreciation for the contribution from Ms. Deans and the North Pacific Research Board.

A report from the Joint PICES/ICES Working Group on Forecasting Climate Change Impacts on Fish and Shellfish (WG-FCCIFS), was presented by its Co-Chairman, Dr. Anne Hollowed.

AGENDA ITEM 5

Identification of high priority topics

Panel members supported the completion of the “poll” of PICES members on their views on priorities (Agenda Item 5a). This work was begun at the 2010 Inter-sessional FUTURE Workshop held August 16–18, 2010 in Seoul, Korea.

SOFE-AP strongly supported the proposed inter-sessional FUTURE Workshop on “*Indicators of status and change within North Pacific marine ecosystems*” and drew special attention to the issues of resilience and vulnerability. These are specifically included in the FUTURE Science Plan and are relatively new focus areas within PICES (and elsewhere). SOFE-AP anticipates that presentations at this Workshop will influence priority setting for future expert groups.

Dr. Skip McKinnell, Deputy Executive Secretary of PICES, reviewed progress on the PICES report on aspects of the marine ecosystem relevant to the declining productivity/returns of sockeye salmon returning to the Fraser River. This report was commissioned by the Cohen Commission of Inquiry in Canada.

AGENDA ITEM 6

Mechanisms to address high priority topics Creation of expert groups

Existing expert groups

- The continuation/renewal of the Section on *Carbon and Climate* was strongly supported. SOFE-AP looks forward to working with the Section to clarify any SOFE-related deliverables (status reports, outlooks, forecasts).
- SOFE-AP members were strongly supportive of the progress made by WG-FCCIFS and recommended that much of this work needs to continue as a major thrust within FUTURE. Specific recommendations on the exact form of this “follow-on” work was deferred, due to the upcoming PICES/ICES meeting (in conjunction with the proposed Inter-sessional Science Board Meeting in 2011) on how to coordinate this activity in the future.

New expert groups

Discussion of the formation of new expert groups was conducted at various points in the agenda. SOFE-AP recommendations are summarized as follows:

- The proposed working group on “Jellyfish Blooms around the North Pacific Rim: Causes and Consequences” is supported. SOFE-AP looks forward to working with the new group to clarify SOFE-related deliverables (status reports, outlooks, forecasts).

- As noted in Agenda Item 4, the need for some follow-on activity for the Study Group on *Human Dimensions* was acknowledged, but it was recognized that it was premature to specify the Terms of Reference for such a group at this time.

AGENDA ITEM 7

Linkages to the other FUTURE Advisory Panels

Interaction and communication issues with the other FUTURE Advisory Panels, and with Committees and Science Board were briefly noted and it was acknowledged that there have been some (predictable) teething pains.

AGENDA ITEM 8

Potential second inter-sessional FUTURE workshop

SOFE-AP supported holding a second FUTURE workshop on ecosystem indicators, resilience and vulnerability. The Panel felt the proposed workshop would build well on previous activities, including the results for Working Group on *Ecosystem-based Management Science and its Application to the North Pacific* (WG 19) and PICES co-sponsored International Symposium on “Quantitative ecosystem indicators for fisheries management” held in Paris, France from March 31–April 3, 2004.

AGENDA ITEM 9

Potential Topic Sessions for PICES-2011 in Khabarovsk, Russia

The Panel agreed that all Topic Sessions will still be proposed via Committees to Science Board..

AGENDA ITEM 10

Actions for SOFE-AP

- develop and complete a more specific workplan,
- PICES outreach and engagement – at present, focus on ocean management organizations, agencies and decision makers and the broader science community,
- investigate potential mechanisms for communication.

AGENDA ITEM 11

Other issues

No other issues were discussed.

SOFE-AP Endnote 1

SOFE-AP participation list

Members

Robin Brown(Canada, Chairman)
Dr. Shin-ichi Ito (Japan)
Dr. Oleg Katugin (Russia)
Prof. Chang-Ik Zhang (Korea)
Dr. Hal Batchelder (U.S.A.)
Dr. Phillip Mundy (U.S.A.)

Observers

Ms. Nora Deans (U.S.A.)
Mr. Brian Voss (U.S.A.)
Dr. Michael Dagg (U.S.A.)
Dr. Anne Hollowed (U.S.A.)
Dr. Sukgeun Jung (Korea)
Dr. Sinjae Yoo (PICES)
Dr. Skip McKinnell (PICES)
Dr. Guimei Liu (China)

SOFE-AP Endnote 2

SOFE-AP meeting agenda

- 1) Welcome, introductions, opening remarks (Appendix 1: Membership)
- 2) Review SOFE Advisory Panel Terms of Reference (Appendix 2: SOFE-AP Terms of Reference)
- 3) Review and Update workplan (Appendix 3: Draft workplan)
- 4) Report from the FUTURE Intersessional Meeting - (Seoul, Aug. 2010 Appendix 4: Report from Interim Meeting and ATTACHMENT 1: SOFE-AP –Aug 18 2010.PPT)
 - a. Report from the Study Group on Communications (Appendix 5: PICES WG-COMMUNICATIONS Draft Final report and ATTACHMENT 2: SG-COM-2009.PPT)
 - b. Review progress of the Study Group on Human Dimensions
 - c. Engagement/Outreach strategy for the North Pacific Ecosystem Status Report (printed version coming soon; posted on the PICES web site at:
http://www.pices.int/publications/special_publications/NPESR/2010/NPESR_2010.aspx)
 - d. Peer Review – Which publications and how? (recommended reading – The Sir Muir Russell Report on leaked emails from the Climate Research Unit at the University of East Anglia - <http://www.cce-review.org/pdf/FINAL%20REPORT.pdf> – particular Appendix 5 – page -127- on Peer Review).
- 5) Identification of high priority topics
 - a. Continued discussion/population of Excel Tables started in Seoul and feedback from AP members since
 - b. Outreach – presentation by Nora Deans from the North Pacific Research Board
 - c. Cohen Commission report
- 6) Mechanisms to address high priority topics identified above
 - a. Existing Working Groups - Joint PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* – Presentation/report from Dr. Anne Hollowed
 - b. Modification of ToRs of Existing Expert Groups (e.g., CC-S, HAB-S)
 - c. Creation of Expert Groups (SG, WG)
 - i. A joint ICES/PICES Theme Session on “*Surplus Production Models: Quantitative Tools to Manage Exploited Fisheries and Compare the Productivity of Marine Ecosystems*” at the 2011 ICES ASC (ATTACHED)
 - ii. An inter-sessional WMO workshop on “*Climate and Oceanic Fisheries, and Development of Climate Tools for Fisheries*” (ATTACHED).
 - iii. BIO - proposed WG on Jellyfish (Appendix 6: MISSING FROM THE ORIGINAL APPENDICES – included as attachment to this message)
- 7) Linkages to other FUTURE-APs
 - a. Anthropogenic Impacts/Coastal environment from AICE
 - b. Ecosystem Indicators with COVE
- 8) Potential second Intersessional FUTURE workshop (Spring 2011)

- 9) Potential Topic Sessions for PICES-2011 in Khabarovsk, Russia (Oct. 2011)
NOTE: Sessions will still be proposed via Committees to Science Board
- 10) Actions for SOFE-AP
 - a. Develop more specific Workplan for SOFE-AP
 - b. Working outside Annual/Intersessional Meetings
 - c. Potential Mechanisms for Communication (e.g., Skype, GeoPortal)
- 11) Other issues (Roundtable)

SOFE-AP Endnote 3

**FUTURE Advisory Panel on *Status, Outlooks, Forecasts and Engagement* (SOFE-AP)
 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.

* Terms of Reference 1, 2, 3 and 4 are common to all the FUTURE Advisory Panels; 5, 6, 7 and 8 are specific to SOFE-AP

SUMMARY OF SCIENTIFIC SESSIONS AND WORKSHOPS

Science Board Symposium (S1)

North Pacific Ecosystems Today, and Challenges in Understanding and Forecasting Change

Co-Convenors: *John Stein (SB), Michael Dagg (BIO), Mikhail Stepanenko (FIS), Steven Rumrill (MEQ), Hiroya Sugisaki (MONITOR), Michael G. Foreman (POC), Toru Suzuki (TCODE), Thomas W. Therriault (AICE), Hiroaki Saito (COVE), Robin Brown (SOFE), Fangli Qiao (China) and Sinjae Yoo (Korea)*

Background

Climate change and increasing development of coastal areas and their watersheds are two of the most serious threats to marine ecosystems in the North Pacific. It is probable that interactions between these stressors will be complex and consequences unknown and difficult to predict. Knowledge of the sensitivity and adaptability of natural and managed ecosystems to climate change is limited and confounded by the interaction of climate change with additional stressors such as fishing, habitat loss, and pollution. While inter-annual and decadal variability are dominant sources of climate variability in the North Pacific, global warming is expected to contribute significantly to future climate change. To improve our understanding of marine ecosystems of the North Pacific, it is imperative we identify the contribution of climate change to overall ecosystem change, and to strengthen our ability to forecast how marine and coastal ecosystems will adjust or respond to ongoing stresses from climate change and other human activities.

This symposium will focus on a series of major issues that are affecting North Pacific marine ecosystems including, but not limited to: changes in cycling of carbon and other elements, increasing acidification, decreasing oxygen concentrations, eutrophication, chemical and biological pollution, changing patterns of oceanic circulation, changes in the productivity and distribution of species (including shifts in migratory routes), shifts in species interactions, increased sea-level rise, and coastal erosion. Ideally, the contribution of climate change to ecosystem characteristics can be quantified and the information made available to the 5th assessment of the Intergovernmental Panel on Climate Change scheduled for 2013–2014.

Summary of Presentations

Due to the overwhelming response to the Science Board Symposium by PICES scientists, this year it was necessary to convene an additional half-day session of the symposium. Thus, the Science Board Symposium was held on Monday, October 25, 2010 (full day) and Friday, October 29, 2010 (half day) and consisted of 25 oral presentations (including one keynote address and seven invited talks) and 12 poster presentations.

The keynote address was given by Jack Barth (Oregon State University) and his presentation set the stage for the entire symposium in that as PICES moves forward with FUTURE implementation, it is imperative that fundamental physical and biological changes in North Pacific ecosystems are characterized and understood such that forecasts can be made. In his presentation, Jack used the hypoxia zone off the Oregon/Washington coast as an example. He showed how multiple platforms have contributed to increased spatial and temporal resolution of dissolved oxygen data over the continental shelf, especially the near-bottom layers where this phenomenon appears more prevalent in recent years. The availability of this high-resolution data will be essential for developing forecasts at regional and basin-level scales. He further showed how real-time data acquisition can be used to modify sampling programs “on the fly” such that impacts due to dramatic changes in dissolved oxygen concentrations can be linked to ecosystem responses. Given that ecosystem responses to multiple stressors is likely to be very complex and potentially difficult to forecast, Jack outlined the need to increase the number and type of physiochemical and biological variables that are measured and the need to collaborate and share data within the broader scientific community. Doing this well will ensure success of the PICES FUTURE program.

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There is little doubt that human activities will change as ecosystems respond to a variety of stressors, most notably climate change. Enrique Curchister took up the challenge of including the human dimension in ecosystem responses to climate change, a primary focus of FUTURE. He presented on-going work showing how models can be used to forecast environmental/ecological changes and how by overlaying human activity models it is possible to develop scenarios whereby dynamic feedbacks between sub-components of the larger model become possible. Ultimately, it will then be possible to infer human responses (and forcing) as a result of climate variability but there remain a number of challenges to ensure predictions/forecasts are accurate and informative.

Yasuhiro Yamanaka introduced us to COCO-NEMURO, a 3-D high resolution ecosystem model. He used this model to show how small pelagic fish would respond to climate change under two CO₂ scenarios (current state and double (1% per year)). For transition and subarctic regions, the double CO₂ scenario resulted in a significantly earlier spring bloom that in turn reduced the spawning and juvenile growth periods for Japanese sardine that increased mortality and potentially lowering stock productivity. Again, this presentation showed how ecosystem responses are complex and can differ at different trophic levels.

Minhan Dai's presentation outlined the current understanding and challenges in understanding how coastal ocean carbon cycles work and how this is related to modulation of CO₂ in general. Carbon cycling in coastal systems is extremely complex, varying with spatial and temporal scales and oceanic domains (*e.g.*, river plumes, upwelling, eddies) but it is complicated further by extreme changes in upland systems and the interaction between terrestrial and aquatic carbon sources. Characterizing and forecasting the interaction between climate change and anthropogenic forcing will present unique challenges to FUTURE.

Continuing on the ecosystem response to stressor theme, James Orr outlined potential impacts of ocean acidification on North Pacific ecosystems. In his presentation, James showed specific locations where ocean acidification, fuelled by anthropogenic sources of CO₂, has resulted in corrosive conditions for some marine calcifiers that depend on aragonite or calcite for shell/skeleton formation, such as shell communities off Oregon and Alaska. Pacific cold-water corral communities are at risk of corrosion and it will be important to understand how other biological communities are responding to the shallowest saturation horizons in the world.

Coupled physical-biological models, although imperfect, can be useful to explore bottom-up and/or top-down changes due to climate change. Albert Hermann showed how his group has used multivariate Empirical Orthogonal Functions to characterize emergent properties from coupled models of the North Pacific, specifically predicted effects of climate variability on pelagic *vs.* benthic food webs on the Bearing Sea shelf and their dependence on ice cover. Applying this type of analysis should result in greater predictability at the ecosystem level over univariate analyses of fixed location data.

Frank Whitney showed how declining oxygen in the subarctic Pacific has weakened ocean ventilation over the past 25–50 years and resulted in ecosystem responses to this change. For example, biological communities compress or migrate to avoid deoxygenated waters but perhaps a less studied phenomenon is reduced transport of nutrients to surface waters resulting in increased storages of these nutrients at depth. Although changes in nitrate cycling had been noted at Ocean Station Papa, it now appears this phenomenon is more widespread, with similar observations off Japan and California. It is still too early to fully understand how these chemical changes might influence biological productivity and additional research is needed.

Human activities have resulted in significant stress to coastal ecosystems, often resulting in negative impacts. Mingjiang Zhou showed how the application of fertilizers in upland systems has resulted in significant eutrophication in some coastal systems due to biogeochemical changes to nitrogen and phosphorous cycling. In some cases, this anthropogenic eutrophication has resulted in increased harmful algal bloom (HAB) events, many of which are composed of nuisance species. Further, in some cases the blooms are so prolific that trophic impacts are realized. To better understand the entire process, end-to-end studies were proposed that could result in predictive models.

The remainder of the symposium included a variety of presentations related to the theme of understanding and forecasting ecosystem responses to natural or anthropogenic stressors, primarily climate change. This included presentations on various models that could be applied to characterize how ecosystems might respond to climate change and how societies around the North Pacific might be affected by these changes (*e.g.*, changes in fisheries resources and the need for management changes). A number of presentations used a variety of methods to explore how changes in the physical environment would result in biological changes, especially commercially harvested fish populations. A universal aspect of the presentations in this symposium highlighted the need to continue to monitor key variables at a variety of spatial and temporal scales while attempting to fill identified gaps. This will ensure scientists and managers fully appreciate how stressors are affecting different ecosystems around the North Pacific and how societies are responding to these changes. Although considerable challenges and gaps were identified in this symposium, it clearly showed that much thought and effort is already underway to better understand and forecast how human activities are changing our marine ecosystems. The diversity of data already collected by PICES scientists and monitoring programs currently under way in PICES member countries will prove invaluable for advancing FUTURE.

List of Papers

Oral Presentations

John A. Barth (Keynote)

Observing change in the Northeast Pacific: Past, present and FUTURE

Enrique N. Curchitser (Invited)

Modeling the Earth System: Are we ready?

Yasuhiro Yamanaka, Takeshi Okunishi, Taketo Hashioka, Hiroshi Sumata and Shin-ichi Ito (Invited)

Predicting marine ecosystem responses to climate change by a 3-D high-resolution ecosystem model

Neil S. Banas

Limits on predictability in a diversity-resolving plankton model: A strategy for ensemble ecosystem forecasting

Evan A. Howell, Jeffrey J. Polovina and John Dunne

Modeling the central North Pacific ecosystem response to predicted climate variations and fishery management scenarios

Minhan Dai (Invited)

Coastal ocean carbon cycling – Current understanding and challenges

James C. Orr (Invited)

Chemical potential for impacts of ocean acidification on Pacific Ocean ecosystems

Jeffrey J. Polovina, John Dunne, Phoebe Woodworth and Evan A. Howell

Projected expansion of the subtropical biome and contraction of the temperate and equatorial upwelling biomes in the North Pacific under global warming

Kenneth O. Coyle, Sarah Hinckley, Wei Cheng, Georgina Gibson, Albert J. Hermann and Kate Hedstrom

Production on the Gulf of Alaska shelf: Spatial-temporal expansion of GLOBEC field measurements using an ecosystem model embedded in a circulation model

Emanuele Di Lorenzo, Julie E. Keister, Sanae Chiba, Vincent Combes, Andrew C. Thomas, P. Ted Strub, Harold Batchelder, Steven J. Bograd, Peter J.S. Franks and William T. Peterson

The Pacific Boundary Ecosystems and Climate Study (POBEX)

Albert J. Hermann, Kerim Aydin, Nicholas A. Bond, Wei Cheng, Enrique N. Curchitser, Georgina A. Gibson, Kate Hedstrom, Ivonne Ortiz, Muyin Wang and Phyllis J. Stabeno (Invited)

Modes of biophysical variability on the Bering Sea shelf

Michael A. Litzow and Franz J. Mueter

Hare and Mantua updated: Four decades of climate-biology covariation in the Northeast Pacific

Muyin Wang, James E. Overland and Nicholas A. Bond

Contributions of episodic events in decadal climate variation of the Bering Sea

George L. Hunt, Jr., Kenneth O. Coyle, Lisa Eisner, Edward V. Farley, Ron Heintz, Franz J. Mueter, Jeffrey M. Napp, James E. Overland, Patrick Ressler, Sigrid Salo and Phyllis J. Stabeno

Climate impacts on eastern Bering Sea food webs: A synthesis of new data and an assessment of the Oscillating Control Hypothesis

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Hiroaki Saito, Shin-ichi Ito, Atsushi Kawabata, Mitsutaku Makino, Shoshiro Minobe, Masami Nonaka, Takeshi Okunishi, Kazutaka Takahashi and Ichiro Yasuda

Forecasting fish species alternation: Results of the SUPRFISH programme and remaining issues

Shin-ichi Ito, Takeshi Okunishi, Michio J. Kishi and Muyin Wang

Projection of Pacific saury response to future climate change

Frank Whitney, Steven Bograd and Tsuneo Ono (Invited)

How does expanding hypoxia affect the nutrient budget of the subarctic Pacific?

Tsuneo Ono

Oxygen decline in the continental slope waters off-Japan and its potential influence on groundfishes

Steven J. Bograd, Carmen G. Castro, Francisco P. Chavez, Curtis A. Collins, Vincent Combes, Emanuele Di Lorenzo, Mark Ohman, Ryan Rykaczewski and Frank Whitney

The California Undercurrent: 1949–2009 and beyond

J. Anthony Koslow, Ralf Goericke and William Watson

Climate and fish assemblages of the southern California Current, 1951–2008

William W.L. Cheung, Thomas A. Okey and Richard D. Brodeur

Projecting future changes in distributions of pelagic nekton along the west coast of North America

Mingjiang Zhou (Invited)

Understanding harmful algal blooms in eutrophic coastal waters: Necessity of end-to-end studies

Jun-ya Shibata, Ryu Isonaka, Hideki Hamaoka, Kazumasa Matsumoto, Tetsuya Nanko, Todd W. Miller, Hidejiro Onishi, Tadao Kunihiro and Koji Omori

Relationship between food web structure of a lower trophic level community and transfer efficiency in a coastal sea

Sophia C. Johannessen and Robie W. Macdonald

Effects of local and global change on an inland sea: The Strait of Georgia, Canada

Poster Presentations

Svetlana Monakhtina

Skillfish (*Erelepis zonifer*): Traits of biology from a fishery near the Emperor Seamounts in the north-west Pacific Ocean

Fu-xin Sun, Ying Wang and Zhi-hong Wu

Study on bioaccumulation and elimination of *Chlamys farreri* to copper

Daoji Li, Haixia Liu and Ping Wang

Formation of summer hypoxia in the Yangtze River Estuary of China: “cold pool” and “thermal barrier” effects

Sayaka Matsumura, Hiroya Sugisaki, Hiroaki Saito, Yuji Okazaki and Tomohiko Kikuchi

Spatio-temporal changes in species diversity and assemblage structure of Euphausiids (Oyashio to Oyashio-Kuroshio Transition Region in the western north Pacific)

Kaoru Aoki, Kazuya Takeda, Satoshi Yamada, Takayoshi Yamashita and Tomohiko Kikuchi

Spatial-temporal distribution of *Aurelia aurita* in Mikawa Bay inferred from net sampling with a fish finder

Vladimir F. Krapivin and Ferdinand A. Mkrтчvan

Development of the simulation model of pollutant propagation in the Arctic Basin

Donhyug Kang, Hyungbeen Lee, Hye seon Kim, Woongseo Kim and Se-Jong Ju

Vertical signatures in acoustic estimates of zooplankton around the Yellow Sea Bottom Cold Water, Korea

Jeffery M. Napp, Carin Ashjian, Rodger Harvey, Mike Lomas, Mike Sigler and Phyllis Stabeno

Understanding ecosystem processes in the Bering Sea

Nora Deans, Thomas Van Pelt, Francis Wiese and Carolyn Rosner

Communicating ecosystem science: The Bering Sea Project

BIO Topic Session (S2)***Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean***Co-sponsor: *SOLAS*Co-Convenors: *Angelica Peña (Canada), Toshi Saito (Japan) and Mark Wells (USA)*Background

Iron plays a key role in regulating the biogeochemical cycles of carbon and nitrogen, and pelagic ecosystem structures in the North Pacific Ocean, yet our understanding of these effects remains limited. External sources of iron, such as Asian dust, rivers, sediments, and volcanoes, supply large amounts of iron to the North Pacific, while the physical processes of upwelling, meso-scale eddies, boundary currents, and tidal mixing transport deep waters with high iron concentration to the upper ocean. Biological uptake, zooplankton grazing, remineralization, and iron chemistry change the forms of iron and its distribution in the North Pacific Ocean. This session invited papers that address physical, biological and chemical processes controlling iron distribution and transformation, linkages between iron and ecosystem responses, and impacts on carbon and nitrogen cycles. Of special interest were papers that combine recent progress from field observations and modeling studies that relate iron cycling to ecosystem structures and carbon fluxes in the North Pacific Ocean.

Summary of presentations

The BIO Topic Session was held on Tuesday, October 26, 2010 and consisted of 11 oral presentations (including 2 invited talks). About 50 persons attended the session and generated interesting discussion. The papers presented at this session covered a wide range of topics from iron chemistry, sources, and distribution and iron impacts on plankton dynamics and DMS production. The first invited talk gave an introduction to iron chemistry and presented an overview on recent progress in studying how the chemical form of iron impacts its bioavailability. The second invited talk addressed the response of the marine ecosystem to natural iron fertilization by Asian dust. Dust storms carry a large amount of aerosol particles to the ocean which substantially affects surface biological production. The remaining talks covered a wide range of topics including mechanisms controlling dissolved iron distribution, sources and transport of iron by vertical winter mixing, eddies and currents, impact of Asian dust on DMS production, the role of zooplankton in smoothing the geographical heterogeneity of primary productivity generated by iron availability and the potential of ocean fertilization to sequester carbon. In addition, an overview of the activities of the international Surface Ocean-Lower Atmosphere Study (SOLAS) project was presented, including those which plans for iron related work.

List of papers*Oral presentations***Jay T. Cullen and Maria T. Maldonado** (Invited)

Iron speciation and bioavailability: Insight gained from analytical chemistry and microbial Physiology

Eric G. Roy and Mark L. Wells

Evidence for regulation of Fe(II) oxidation rates by organic complexing ligands in the Eastern Subarctic Pacific

Kazuhiro Misumi, Daisuke Tsumune, Yoshikatsu Yoshida, Takeshi Yoshimura, Keisuke Uchimoto, Tomohiro Nakamura, Jun Nishioka, Humio Mitsudera, Frank O. Bryan, Keith Lindsay, J. Keith Moore and Scott C. Doney

Mechanisms controlling dissolved iron distribution in the North Pacific: A model study

William Crawford

Advection of deep-sea and coastal water into the HNLC region of the northeast Pacific Ocean

Huiwang Gao, Xiaohong Yao, Jinhui Shi and Jianhua Qi (Invited)

Response of marine ecosystem to Asian dust fertilization from coastal sea to open ocean

Josiane Mélançon, Maurice Levasseur, Martine Lizotte, Jean-Éric Tremblay, Gui-Peng Yang, Marjolaine Blais, Guangyu Shi, Hui-Wang Gao, Michael Arychuk, Keith Johnson, Nes Sutherland, Marie Robert and Wendy Richardson

Impact of Asian dust on plankton and DMS production in the Northeast Subarctic Pacific

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Jun Nishioka, Tsuneo Ono, Hiroaki Saito, Keiichiro Sakaoka and Takeshi Yoshimura

Oceanic iron supply mechanisms supporting the spring diatom bloom in the Oyashio region, western subarctic Pacific

Hiroaki Saito, Jun Nishioka, Atsushi Tsuda and Hiroaki Tatebe

The role of zooplankton in buffering geographical heterogeneity of primary productivity

Fei Chai, Peng Xiu, Huijie Xue, Lei Shi and Yi Chao

Modeling impacts of mesoscale eddies on iron cycle and biogeochemical processes in the Gulf of Alaska

Emilie Brévière

The international Surface Ocean - Lower Atmosphere Study (SOLAS) project and its midterm strategy

Hong Chen, Jianbo Han and Xiaomeng Wang

A review of the influence of ocean fertilization on marine biodiversity

BIO Topic Session (S3)

The Practical Handbook at 50: A celebration of the life and career of Tim Parsons

Co-Convenors: *James Christian (Canada) and Tsuneo Ono (Japan)*

Background

The importance of Strickland and Parsons' *A practical handbook of seawater analysis* to the development of oceanographic science is difficult to overstate. The first version of the manual, *A manual of sea water analysis*, was published by the Fisheries Research Board of Canada in 1960. Half a century on, we are in a position to examine the role that this manual and its descendants have played in the development of biological and chemical oceanography. This session explored the role that the development and standardization of analytical methods has played in the evolution of oceanography, and the evolution of our understanding of planktonic ecosystems that methodological innovation has catalyzed.

Summary of presentations

Topic Session S3 was held on Wednesday, October 27, 2010 and consisted of 7 oral presentations (3 invited and 4 contributed). We were fortunate to have had Tim Parsons in attendance. He made some introductory remarks that set the tone for the session: a wide ranging discussion that often focused on how much we still do not know.

Dr. David Mackas gave a presentation entitled "*You can learn a lot by looking*" in which he defended the role of observation unencumbered by stated hypotheses, as Dr. Parsons advocated throughout his career, but noted that Parsons had also been a strong advocate for controlled experiments (*e.g.*, CEPEX).

Dr. Yukihiro Nojiri gave a presentation on carbon system measurements, noting the substantial progress in this area over the past decades, the efforts at cross-calibration (*e.g.*, $p\text{CO}_2$ intercomparison experiments hosted by NIES), and the development of global data products.

Dr. Andrew Dickson discussed the measurement of pH and emphasized that maintaining consistent measurement quality requires ongoing effort and absolute standards against which differences among laboratories can be tested still do not exist.

Dr. Michio Aoyama discussed the development of Certified Reference Materials for nutrients in seawater, and the ongoing effort to develop methods by which measurements made by different laboratories can be compared.

Dr. Frank Whitney presented historical nutrient and oxygen data from Line P and discussed the efforts to maintain quality control in that long-standing program, also noting the importance of CRMs, open data sharing, and international efforts at cross-validation.

List of papers

Oral presentations

Yukihiko Nojiri (Invited)

Good on board practice for ocean carbon measurement and efforts toward international collaboration

David L. Mackas (Invited)

“You can learn a lot by looking”: The importance of exploratory observation (and occasional surprise) in biological oceanographic discovery

Michio Aovama and David J. Hydes (Invited)

The new era of nutrients measurements in seawater with RM/CRM and the new manual: The joint IOC-ICES Study Group on Nutrient Standards (SGONS) and recent progress

James R. Christian

Evolution of marine microbial ecology

K. Banse, S.W.A. Naqvi, J.R. Postel and P.V. Narvekar

Twists in estimating temporal O₂ changes in oxygen minimum zones from old O₂ data

Frank Whitney and Janet Barwell-Clarke

Challenges in observing long term trends in oxygen and nutrients: Ocean Station P as an example

Andrew G. Dickson

Measuring pH in seawater: Prejudice, practice and pitfalls

BIO Topic Session (S4)

Census of Marine Life - Exploring ocean life: Past, present and future

Co-Convenors: *Michael Feldman, Clarence Pautzke, Andrew Rosenberg (U.S.A.) and Sinjae Yoo (Korea)*

Background

The Census of Marine Life (CoML) is a global scientific initiative to assess and explain the changing diversity, distribution, and abundance of marine species in the past and present, and to build the capacity to project future diversity. CoML is the initiative of unprecedented size and scope, engaging more than 2700 scientists and ocean professionals from over 80 countries with a common mission towards improving the understanding of life in the ocean. This session summarized the past 10 years of results and achievements from the global CoML program, and highlighted specific products and programs of CoML and how this new technology and data can be used and applied. The session included an overview talk, followed by representatives from many of the CoML projects including the seamounts project, the Mid-Atlantic ridge project, the tagging and tracking projects, the historical component of CoML, and the CoML synthesis team. Speakers discussed findings and discoveries, with particular attention to the information released at the CoML ‘Decade of Discovery’ events in London in early October 2010. Discussion focused on additional ways to apply the newly released CoML information to answer the growing global questions of ocean acidification and climate change, and the role of marine biodiversity information with managing through ecosystems approaches and marine spatial planning. The session concluded with a consideration of lessons learned from CoML, exploring some of the most successful (and some not-so successful) aspects of the program in the context of developing any future coordinated marine biodiversity efforts.

Summary of presentations

The session entitled “*The Census of Marine Life - Exploring ocean life: Past, present and future*” was held Friday, October 29 from 9:00–13:05. The session consisted of 10 oral presentations (3 invited) and included 2 posters. The goals of the session were to both disseminate the cumulative results of the decade long Census of Marine Life effort while exploring possible future directions and next steps for the science and the technology. The first speaker, Dr. Vera Alexander, provided an overview of the CoML leadership and

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explained some of the critical mechanisms which were needed to manage a global program consisting of over 2,700 participants in 80 different countries, including the unanticipated importance of the regionally led efforts. She also highlighted some of the legacies of CoML such as the network of scientists, the tools and technology developed (tagging and tracking, pyro-sequencing, *etc*), and the Ocean Biogeographic Information System or OBIS which contains 30 million individual observations of marine life. The second speaker, Dr. Tim Smith, focused on the historical component of CoML, highlighting that the human impact on the ocean began much earlier than previously thought, and that these long-term impacts need to be accounted for when managing the ocean. The next two speakers discussed some of the deep sea efforts of CoML, the number of new species discovered, and how much still remains unknown, as highlighted by Dr. John Dower's point of the 10s of thousands of known seamounts in the ocean, of which only about 400 have been explored. The next three speakers discussed the tagging and tracking projects of CoML, one of which utilized satellite tags on charismatic megafauna, the other which follows fish stocks with acoustic tags combined with an infrastructure of listening curtains along the Pacific continental shelf. The Tagging of Pacific Predators (TOPP) Project developed technologies to enable the use of animals as oceanographers, for example utilizing elephant seals to create temperature profiles of the Pacific as they migrate across the ocean. Dr. Elliot Hazen applied the TOPP results to develop models to measure seasonal and long-term habitat shifts of marine life as they relate to ocean temperature. This technology, combined with that of the Pacific Ocean Shelf Tracking project, have broad reaching applications toward making national and international observing systems operational, which Dr. Reginald Beach reinforced during his presentation of the recent National Ocean Partnership Program-sponsored workshop to obtain an operational biodiversity observing network. Dr. Paul Snelgrove, the final invited speaker, concluded the session by reviewing who led the CoML Synthesis team and by providing suggestions as to the next challenges in our oceans. Hiroko Sasaki, the lone early career scientist speaker of the session, from Hokkaido University, Japan, also presented on her cetacean research in the Bering and Chukchi Seas.

Overall, the session highlighted the value of communication across regions and disciplines with many of the speakers stressing that CoML would not have been nearly as successful without encouraging an atmosphere of collaboration. In addition, scientists should not ignore the value of communicating science, whether through visualizations or through images, art, and music to capture the public's imagination and support. Dr. Snelgrove closed by stating that the pressures on the ocean will worsen, not lessen, making it ever more important to continue the work of CoML to establish a baseline of what is in the ocean; figure out which species make the oceans function; and better provide managers with rational criteria for spatial management.

List of papers

Oral presentations

Vera Alexander, Patricia Miloslavich and Kristen Yarincik (Invited)

The Census of Marine Life – Evolution of a decade of worldwide marine biodiversity research

Tim D. Smith (Invited)

Confessions of a Convert: From fishery biology to historical marine ecology

John Dower

A World Census of Marine Life on Seamounts

Jose Angel A. Perez, Andrey Gebruk, Alexei M. Orlov, Stanislav Kobylansky and André Lima

Surveying the patterns of life in the understudied depths of the South Atlantic: Continuing the legacy of the MAR-ECO project (CoML) into the southern mid-Atlantic ridge

Steven J. Bograd, Barbara A. Block and Daniel P. Costa

Building a marine life observing system: Lessons from the Tagging of Pacific Pelagics (TOPP)

Elliott L. Hazen, Salvador Jorgensen, Ryan Rykaczewski, John Dunne, Steven Bograd, Dave Foley, Ian Jonsen, Arliss Winship, Daniel Costa and Barbara Block

Potential habitat shifts in Pacific top predators in a changing climate

John C. Payne

The future of POST

Reginald Beach, Daphne Fautin, J. Emmett Duffy, Heidi Sosik, John J. Stachowicz, Linda Amaral-Zettler, Tatiana Rynearson, Gustav Paulay and Hilary Goodwin

A national marine biodiversity observing network to inform ecosystem based management and science

Hiroko Sasaki, Keiko Sekiguchi and Sei-Ichi Saitoh

Cetacean habitat distribution in the eastern Bering Sea and Chukchi Sea

Paul V.R. Snelgrove (Invited)

Marine biodiversity in the 21st century: Making ocean life count

Poster Presentations

Hiroko Sasaki, Keiko Sekiguchi and Sei-Ichi Saitoh

Cetacean habitat distribution in the eastern Bering Sea and Chukchi Sea

Joon Sang Park, Jang-Seu Ki and Jin Hwan Lee

The genus *Thalassiosira* (Bacillariophyceae): The surface ultrastructures of marginal fucoxanthin and nuclear rDNA phylogenetic relationship

FIS Topic Session (S5)

Oceanographic and Demographic Processes Affecting the Reproductive Biology of Exploited Marine Stocks

Co-convenors: *Dr. Paul Spencer (USA), Dr. Chang Ik Zhang (R Korea) and Dr. Jin-Yeong Kim (R Korea)*

Background

Recent research has demonstrated several complexities in the reproductive processes of marine fish. First, for some cod and rockfish stocks there is evidence of a maternal effect upon larval quality such that larval viability increases with spawner age. Second, some iteroparous stocks show evidence of skipped spawning (*i.e.*, not all mature fish spawn in each year) that is related to environmental conditions and the life-history of the stock. Third, temporal changes in age at reproduction have occurred for some exploited stocks, and researchers are attempting to attribute this pattern to some combination of 1) demographic changes in age and size structure; 2) plastic responses to a changing environment; or 3) evolutionary responses to selective pressures. These complexities indicate that the production of reproductive output of marine stocks may be more complex than typically assumed in population models, and researchers are beginning to more fully incorporate reproductive biology in assessment procedures. The purpose of this symposium was to review field, laboratory, and modeling studies that may reveal how oceanographic variability, life-history pattern, and fishing pressure may affect the reproductive biology for North Pacific fish stocks, and consider how reproductive biology can best be incorporated into fishery assessment and management.

Summary of presentations

The topics identified above were addressed in 9 presentations and 7 posters which provided examples from a wide range of locations in the Pacific Ocean, as well the Antarctic Ocean and the east and west Atlantic Ocean.

Edward Trippel presented the keynote address in which he considered the implications of stock “juvenation” (the decrease in age structure) and increased temperatures upon reproductive output. A reduction in age structure is often associated with changes in spawning time, and reduced egg/larvae viability and survival. Additionally, increases in temperature are often associated with lower egg production, smaller egg size, and lower fertilization rates. Taken together, these two factors could combine to result in lower estimates of reproductive output, which could lead to erroneous interpretations of stock productivity when simple metrics such as spawning stock biomass are used.

Research on the relationship between environmental factors and spawning and larval distributions for eulachon and Pacific mackerel was also presented. For eulachon (an anadromous species), Doug Hay presented

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information indicating earlier spawning in northern rivers (*i.e.*, Alaska), which is hypothesized to be necessary to match the spring bloom, given the longer incubation periods in colder water. Additionally, spawning in traditional rivers has declined in nearly all areas south of Alaska, which could be attributed to climate change. However, marine abundances remain high, suggesting that the spawning locations may be changing. Ed Weber presented results from a Generalized Additive Model (GAM) that predicted Pacific mackerel larval distribution as a function of several environmental indices, including temperature, salinity, oxygen, and mixed layer depth. The current survey design for monitoring larval distribution and abundance does not consider environmental factors, which could be useful for allocating sampling effort for future surveys.

Cindy van Damme and Steve Parker presented research on reproductive processes. Van Damme proposed a conceptual model in which fecundity type (*i.e.*, determinate or indeterminate spawning) is affected by a number of factors, including spawning period, body condition, relative fecundity, latitude, temperature, and food availability. Principal component analyses applied to European groundfish indicate that fecundity type is not fixed, and can be regulated by food availability. Steve Parker presented research on Antarctic toothfish in the Ross Sea, which illustrated both the complexity of oogenesis and difficulty in obtaining samples at the optimal time and location. Oogenesis for this species is a multi-year process, but due to ice extent samples, are limited to a brief period in the summer in the northern and slope areas (which undersamples the smaller fish). Skipped spawning does occur, but primarily in the younger fish and not in fish in the northern area. The age at 50% maturity has been updated from 9 years to 16 years, which has decreased yield by about 15%.

Studies on measures of reproductive output, and their management implications, were presented by E.J. Dick and Joel Webb. For Pacific rockfish, Dick observed weight-specific relative fecundity (*i.e.*, relative fecundity increases with size), which is not consistent with the commonly used assumption that spawning stock biomass is proportional to egg production. A state-dependent life-history model was used to model allocation between growth and reproduction, and the pattern of increasing relative fecundity with size is consistent with survival costs associated with reproduction. These results suggest that stock assessments could be improved by utilizing observations on weight-specific relative fecundity and evaluating variable natural mortality rates with age. Joel Webb presented research on snow crab in the Bering Sea shelf, and demonstrated that fecundity is affected by both female age and temperature. Lower temperatures increase the embryo incubation time and can change the reproductive cycle from an annual cycle to a biennial cycle. Cold temperatures also disproportionately affect younger crabs due to their spatial distribution, and older crabs have an increased proportion of barren egg clutches. These factors affect both the magnitude and the pattern of estimated time series of reproductive output, which can affect fishery management reference points.

Other topics presented during this session included a study presented by You Jung Kwon on the growth of rock bream in the Jeju marine ranching area of South Korea, and a study presented by Peng Sun on the effect of gill net fisheries upon phenotypic traits such as size at age and age at maturity. A variety of topics were presented in the poster session, including 1) examination of life-history patterns for Gulf of Alaska species; 2) several studies examining size at maturity, fecundity, and spawning distributions of marine groundfish and invertebrates; 3) a study examining how the embryonic survival rate could affect size-dependent mortality; and 4) a study on the efficacy of closed areas for stocks with a maternal effect in larval survival.

List of papers

Oral presentations

Edward A. Trippel (Invited)

Demography, degrees and development of scientific advice for fisheries management

Doug Hay, Megan Moody, Bruce McCarter and Thomas W. Therriault

Is climate change responsible for changes in the distribution, abundance and spawning of the anadromous eulachon (*Thaleichthys pacificus*) in the North Pacific? A synthesis of available information

Edward D. Weber and Sam McClatchie

Effect of water-mass properties on the spawning location of Pacific Mackerel *Scomber japonicus* in the California Current

Steven J. Parker and Paul Grimes

Oogenesis in Antarctic toothfish and implications for fisheries management

You Jung Kwon, Chang Ik Zhang and Hyeok Chan Kwon

Estimation of biological parameters for rock bream, *Oplegnathus fasciatus*, in Jeju marine ranching area of Korea

Cindy J.G. van Damme, Mark Dickey-Collas, Olav S. Kjesbu and Adriaan D. Rijnsdorp

Fecundity regulation mechanisms in fish with different spawning strategies

Edward J. Dick

Modeling the reproductive potential of rockfishes (*Sebastes* spp.)

Joel B. Webb, Laura M. Slater, Ginny L. Eckert and Gordon H. Kruse

Variability in reproductive potential of eastern Bering Sea snow crab, *Chionoecetes opilio*, demographic and environmental effects

Peng Sun, Zhenlin Liang, Wei Yan and Huaming Yu

Chief cause for the change of fish phenotypic traits: Fishing gear selectivity

Poster Presentations

Miriam J. Doyle and Kathryn L. Mier

Species life history patterns and early life ecology as indicators of vulnerability and response of fish populations to climate change in the Gulf of Alaska

Jie Zheng, Gordon H. Kruse and Bill Bechtol

Temporal changes in size at maturity and their impacts on stock assessment and fishery management for eastern Bering Sea Tanner crab

Laura M. Slater, Joel B. Webb, Kirsten A. MacTavish and Douglas Pengilly

Preliminary analysis of demographic and geographic processes influencing Tanner crab fecundity in the eastern Bering Sea

Paul Spencer, Sarah Kraak and Edward A. Trippel

Evaluation of closed areas for fish stocks with maternal effects in larval survival

Rui-Jing Wan, Feng Zhou and Xiujuan Shan

Impacts of temperature and salinity on species composition of ichthyoplankton and distribution of fish spawning ground in the Changjiang River estuary and its adjacent waters

Susanne F. McDermott, Daniel W. Cooper, Jared L. Guthridge, Ingrid B. Spies, Mike F. Canino, Pamela Woods and Nicola Hillgruber

Effects of maternal growth on fecundity and egg quality of wild and captive Atka mackerel (*Pleurogrammus monoptyeri*)

Sukgeun Jung and Il Su Choi

Size-dependent mortality of Pacific cod (*Gadus macrocephalus*) based on their reproduction and growth

FIS/BIO Topic Session (S6)

Observations of ecosystem mixing under climate change

Co-Convenors: *Sanae Chiba (Japan), John Field (U.S.A.), Jin-Yeong Kim (Korea), Franz Mueter (U.S.A.) and Laura Richards (Canada)*

Background

As the ocean environment changes, we expect species to respond by changing their distribution. Species could expand into habitats newly made available to them and avoid or shrink their abundances in habitats that are no longer viable. Because species respond to these environmental changes at different rates, previously isolated species now interact. We coin the term “ecosystem mixing” to describe the pulling apart and re-mixing of ecosystems and species interactions in a changing environment. For example, Humboldt squid expanded their range northward along the west coast of North America in recent years, encountering new prey species, potentially including important stocks of juvenile salmon. In this session, we considered the consequences of ecosystem mixing. Papers were invited that describe case studies of ecosystem mixing from a physical, biological and/or socio-economic perspective, especially as they impact the predators and/or prey of key species (such as those important for fishery harvests).

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Summary of Presentations

The session consisted of 16 oral presentations with contributions from all PICES countries and from several ICES countries. Invited presentations focused on large-scale bio-geographic shifts in the North Atlantic linked to variability in the subpolar gyre (Hátún), two case studies from the Bering Sea on how changes in the extent of cold bottom waters modulate predator-prey interactions (Ciannelli) and a review of how a highly plastic species, the Humboldt squid (*Dosidicus gigas*), may benefit from a rapidly changing world due to its high tolerance of environmental variability, the ability to migrate rapidly, a very plastic diet, high fecundity, a very rapid growth rate and a short life span (Gilly). Hátún *et al.* showed how large-scale exchanges in water masses driven by atmospheric variability, and the consequent mixing of Arctic, Boreal and Lusitanian biological provinces result in changes to the food web from phytoplankton through to pilot whales. Beyond the regional effects, Hátún *et al.* also discussed the likelihood of hemispheric teleconnections (based on similar productivity patterns between the North Atlantic and the North Pacific), a theme that was echoed by Alheit and Wagner, who discussed the importance of low frequency oscillations driven by atmospheric forcing of ocean gyres and the consequent impacts to species distributions, productivity and interactions (particularly of small pelagics) in the Northeast Atlantic.

Changes in spatial distribution in response to temperature variability were also reported from the North Pacific for all trophic levels from phytoplankton in the East China Sea (ECS, Cai *et al.*), over zooplankton in the Gulf of Alaska (Batten and Walne), Eastern Bering Sea (Pinchuk and Coyle), and ECS (Cai *et al.*), to fishes off Korea (Kim *et al.*) and in the ECS (Cai *et al.*). While most studies considered changes in horizontal distribution, Kulik discussed the potential effects of changes in vertical distribution of mesopelagic fishes in the northwestern Pacific. The effect of temperature-related changes in spatial distribution on trophic interactions was a recurring theme and is a concern in many regions where such changes affect commercially important species. Examples included predation by arrowtooth flounder on walleye pollock in the eastern Bering Sea (EBS, Ciannelli and Hunsicker), feeding success and energy density of juvenile walleye pollock in the EBS (Whitman *et al.*), predation of mackerel on blue whiting (Loeng *et al.*), predation of Humboldt squid on Pacific hake, sardine, rockfish and salmon in the California Current (Field *et al.*), and changes in zooplankton dynamics that alter the prey field for fish and other predators (Pinchuk and Coyle). To the extent that climate variability drives these changes in distribution and trophic interactions, such linkages may provide an opportunity for prediction. For example, Loeng *et al.*, hypothesized that blue whiting recruitment is driven by gyre-mediated changes in their distribution that affect the spatial overlap and predation of mackerel on eggs and larvae of whiting. A combination of field observations, hypothesis testing, and modeling studies will be needed to quantify these and similar relationships to produce reliable predictions.

A variety of modeling studies were presented to explore the effects of climate change on zooplankton productivity (Hjøllo *et al.*, presented by H. Loeng), on the feeding, growth and survival of larval cod (Kristiansen *et al.*), on the probability of range expansions in eastern *versus* western boundary currents (Kowalke *et al.*), and on changes in the distribution of skipjack tuna in the western North Pacific (Mugo *et al.*). The latter study used a novel application of Ecological Niche Factor Analysis (ENFA) to model skipjack tuna habitat in the western North Pacific, concluding that future warming trends are likely to drive both distributional (northward) and ontogenetic (earlier) changes in skipjack migration relative to current patterns.

While most presentations focused on the effects of temperature changes, at least two studies discussed the importance of oxygen levels in determining the abundance and spatial distribution of fish and invertebrates. Low oxygen conditions on the continental shelf off the U.S. west coast were generally associated with reduced abundances and a lower diversity of demersal fish and invertebrates (Keller *et al.*). However, the Humboldt squid can tolerate low oxygen conditions and appears to take advantage of the reported shoaling of the oxygen minimum layer and other changes in the mesopelagic environment off California (Gilly and Markaida). Such adaptations highlight the complex responses of biological communities to a changing climate and the difficulties of predicting the effects of climate change on spatial distributions and trophic interactions. Reliable predictions will require not only a better understanding of the mechanisms controlling the vertical and horizontal distribution of marine organisms, but also improved models to predict future oxygen levels and other chemical properties that provide important physiological limits on distribution.

List of papers

Oral presentations

Hjálmar Hátún (Invited)

Large-scale shifts in the North Atlantic bio-geography forced by the subpolar gyre

Jürgen Alheit and Carola Wagner

Impact of Atlantic Multidecadal Oscillation (AMO) on NE Atlantic ecosystems

Lorenzo Ciannelli and Mary Hunsicker (Invited)

Predator-prey spatial distribution patterns and spatial overlap in relation to climate driven environmental variability

Jin Yeong Kim, Heeyong Kim and Il Su Choi

Variation in occurrence of warm and cold water species in response to climate changes off Korea

Robinson Mugo, Sei-Ichi Saitoh, Akira Nihira, Tadaaki Kuroyama, Takahiro Toyoda, Shuhei Masuda, Hiromichi Igarashi, Toshiyuki Awaji and Yoichi Ishikawa

Potential impact of global warming on skipjack tuna habitat in the western North Pacific

Luke D. Whitman, Neal E. McIntosh, Scott A. Heppell and Kelly J. Benoit-Bird

Variation in the distribution and energy density of juvenile walleye pollock in the southeastern Bering Sea

William Gilly and Unai Markaida (Invited)

Adaptability and plasticity of Humboldt squid, *Dosidicus gigas*, in conjunction with environmental perturbation

John C. Field, Ken A. Baltz, William Matsubu, Graham E. Gillespie, Julia S. Stewart, William F. Gilly and William A. Walker

Foraging ecology of the Humboldt squid in the California Current

Gregory Kowalke, David L. Mackas and Julie Keister

Do circulation patterns make the eastern North Pacific especially susceptible to zoogeographic shifts?

Vladimir Kulik

The role of mesopelagic fishes in ecosystem vertical mixing in the north western Pacific

Trond Kristiansen, Charles Stock, Ken Drinkwater and Enrique N. Curchitser

Effects of climate change on the phenology of spring blooms and consequences for the survival of larval cod

Alexei I. Pinchuk and Kenneth O. Coyle

Emergence of the Arctic hyperiid *Themisto libellula* on the southeastern Bering Sea shelf as a result of the recent cooling and their potential impact on pelagic food web

Sonia Batten and Anthony Walne

Variability in northwards extension of warm water copepods in the NE Pacific

Harald Loeng, Hjálmar Hátún, Jens Christian Holst, Mark Payne and Aril Slotte

The rise and fall of the northern blue whiting stock

Aimee Keller, Victor Simon, W. Waldo Wakefield, Keith Bosley, M. Elizabeth Clarke, John A. Barth and Stephen D. Pierce

Expansion and shoaling of the oxygen minimum zone off the U.S. west coast in relation to demersal fish distribution and biomass

Rong-shuo Cai, Hongjian Tan, Qing-liang Yang and Ji-long Chen

The response of sea surface temperature in the offshore area of China to variations in the East Asian Monsoon under global warming and its marine ecological effects

FIS/MEQ Topic Session (S7)

Economic relation between marine aquaculture and wild capture fisheries

Co-Convenors: *Ingrid Burgetz (Canada), Dohoon Kim (Korea), Minling Pan (U.S.A.) and Qingyin Wang (China)*

Background

Considering the growing role of marine aquaculture in both seafood production and consumption as well as the close relationship between marine aquaculture and wild ocean capture fisheries, this session focused on the economic relationships of marine aquaculture to capture fisheries. Such relationships include (1) marine

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aquaculture products as a substitute and/or complement for wild caught products owing to consumer preference, price, and availability; (2) the synergies between aquaculture and fishing (use of fish processing trimmings, resilient coastal communities and maintaining working waterfronts), and (3) economic considerations regarding potential environmental effects (positive and negative), interactions between capture fisheries and marine aquaculture (*e.g.*, feed inputs in marine aquaculture derived from captured fisheries, aquaculture stock enhancement, and aquaculture structures as fish aggregating devices).

Summary of Presentations

This session was the first topic session on economics and social science at a PICES Annual Meeting. The past activities of PICES had mainly focused on physical and biological sciences, such as ecology, ecosystems, fisheries, oceanography, and biogeochemistry, *etc.* Topic session S7 was developed in response to the new FUTURE science program endeavors to provide a greater role for social and economic scientists in PICES. It was an important step toward enhancing research and management of marine living resources from a socio-economic perspective.

The session attracted broad participation of economists and experts from all the PICES member countries. This session consisted of 12 oral presentations, including 7 invited papers. The lead convenor, Minling Pan (U.S.A.), gave a brief introduction on the background and objectives of the topic session in the opening. The keynote speaker, Michael Rubino (U.S.A.), manager of the NOAA Aquaculture Program, outlined the economic issues and research needs raised by the potential expansion of domestic marine aquaculture, and in particular, the potential economic effects of marine aquaculture on capture fisheries. Dr. Rubino indicated that the economic ramifications of expanding aquaculture in the United States, along with environmental and food safety concerns, are the subject of much debate and widely differing views. Aquaculture may be a way to substantially increase domestic seafood production. Hatchery-based stock replenishment may be a way to restore depleted commercial and recreational fisheries. Associated economic benefits of these aquaculture activities may include the creation of jobs from coastal communities to the agricultural heartland, maintenance of working waterfronts, and synergies with commercial fishing such as use of fish processing trimmings. But concerns have been raised that domestic aquaculture may compete with domestic wild fisheries depressing prices for wild caught fish. Additional concerns include the economic consequences of potential environmental and social effects of aquaculture on wild capture fisheries and traditional fishing communities.

Other contributed papers reported case studies that discussed economic relations between marine aquaculture and wild capture fisheries from different aspects or demonstrated analytical models to measure the linkage/trade-off between these two. For example, Di Jin (U.S.A.) presented an integrated economic-ecological model developed for coastal New England by incorporating an aquaculture sector in the CGE model and by examining the forage fish and aquaculture link in a marine food web context. Yajie Liu (Norway) presented an analytical framework that aims to explore the ecological and economic impacts of genetic interaction between farmed and wild salmon over generations. The model was constructed based on the Atlantic salmon fishery and salmon farming in Norway. Hisashi Kurokura (Japan) illustrated how the development of the aquaculture industry (tuna culture) had influenced the consumer preference and consumption behaviors by cultured tuna in Japan. Kelly Davidson (U.S.A.) presented a study on consumer preferences for farm-raised *versus* wild-caught fish in Hawaii. Seong-Kwae Park (Korea) presented the historical trends of wild caught fish and farmed (marine) fish consumption in Korea. His study predicted that farmed fish would replace wild fish gradually, not rapidly, over time. Chen Sun (China) addressed the influence of marine aquaculture on the fishery industry supply chain and consumption in China. Both studies noticed that the economic trade-off between costs of sacrificing marine environmental quality and benefits from marine culture aquaculture expansion.

List of papers

Oral Presentations

Michael C. Rubino (Invited)

Potential economic effects on wild capture fisheries from an expansion of marine aquaculture in the United States

Di Jin (Invited)

Aquaculture and capture fisheries: An integrated economic-ecological analysis

Yajie Liu, Ola Diserud, Kjetil Hindar and Anders Skonhøft (Invited)

An ecological-economic model of genetic interaction between farmed and wild Salmon

Masahito Hirota and Yoshinobu Kosaka

The TASC (Total Allowable Scallop Culture) in Japan: An approach for the issue on the overproduction in Yezo giant scallop cultivation in Mutsu Bay

Heedong Pyo

Analyzing recovered effects of marine contaminated sediment cleanup project on wild capture fisheries in Korea

Galina S. Gavrilova

Capture fisheries and mariculture of the marine invertebrates in Peter the Great Bay (Japan Sea)

Toyomitsu Horii

Impacts on fishery products of the Tiger Puffer, *Takifugu rubripes*, by stock enhancement

Shang Chen, Li Wang, Tao Xia, Guoying Du and Dachuan Ren (Invited)

Quantification of maricultural effects on coastal ecosystems services: Sanggou Bay case from China

Seong-Kwae Park and Dong-Woo Lee (Invited)

Economic relation between marine aquaculture and wild capture fisheries: Case of Korea

Hisashi Kurokura, Akira Takagi, Yutaro Sakai and Nobuyuki Yagi (Invited)

Tuna goes around the world on sushi

Chen Sun (Invited)

The influence of marine aquaculture to the fishery industry chain in China

Kelly Davidson and Minling Pan (Invited)

Consumers' willingness to pay for aquaculture fish products vs. wild-caught seafood – A case study in Hawaii

FIS/POC/BIO Topic Session (S8)

Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting

Co-sponsored by: ICES

Co-Convenors: Jürgen Alheit (Germany), Suam Kim (Korea), Harald Loeng (Norway), James Overland (U.S.A.) and Yasunori Sakurai (Japan)

Background

Understanding the role of natural variability, occurring over a variety of temporal and spatial scales, is essential for effective management of marine ecosystems in the wake of predicted global change. Evidence suggests that climate variability can trigger regime shifts in marine ecosystems. Regime shifts are characterized by a reorganization of marine communities, species dominance, and tropho-dynamic relationships. Often, synchronous shifts occur in aquatic ecosystems that are separated by thousands of kilometers. This finding suggests that atmospheric teleconnections are mediating regional system changes. We postulate that comparative studies of ecosystems that have experienced regime shifts will provide insights into the expected responses of marine organisms to climate change. Papers were invited that went beyond simple pattern matching. The primary focus was on understanding shifts in the pelagic realm, including phytoplankton, zooplankton, small pelagic fishes, gadids, and squids, with preference given to research that provides evidence of the functional responses and relationships that underlie regime shifts, and to statistical or modeling studies that successfully simulate observed shifts.

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Summary of presentations

This session was held on Tuesday, October 26, 2010 and consisted of 20 oral presentations (including 4 invited talks) plus 15 posters. The session was jointly organized by PICES and ICES, as a part of 2010 WG-FCCIFS activities. The first invited paper, by Hans O. Pörtner, described that the whole organism responses to warming or cooling link to ecosystem response, and that climate warming emphasizes the need for a common understanding of thermal limitation by physiologists and ecologists nowadays. He introduced the concept of oxygen and capacity limited thermal tolerance (OCLT) in relation to climate change. His recent works showed that a mismatch in oxygen supply *versus* demand causes a limitation in aerobic scope and finally transition to anaerobic metabolism, paralleled by the development of molecular stress events. In fact, functional characters in polar species may reflect adaptation to excess oxygen availability rather than limitation.

The second invited paper by Kazuaki Tadokoro showed geographical comparison of the decadal-scale variations in marine ecosystems in the North Pacific Ocean. A decreasing trend in nutrients was observed in the surface layer of the Gulf of Alaska, Oyashio waters, Kuroshio-Oyashio Transition waters, Kuroshio, western subtropical waters, and East China Sea, and Chl-*a* concentration and zooplankton biomass also represented a significant decreasing trend in the waters, which suggest that global warming decreases the productivity of the lower ecosystems simultaneously among the regions.

The third invited speaker, Shin-ichi Ito, talked about multi-trophic level ecosystem modeling for understanding the mechanism of small pelagic fish species alternation associated with climate regime shifts. Various modelings and statistical techniques were used for coupling physical, biochemical-plankton (NEMURO: North Pacific Ecosystem Model for Understanding Regional Oceanography) and Japanese sardine (*Sardinops melanostictus*). His model reasonably reproduced weight decrease of sardine during the higher stock period. Moreover, the model reproduced expansion of the habitat area and decrease of prey plankton during the period.

The fourth invited paper by Franz J. Mueter showed long-term forecasts of walleye pollock dynamics in the eastern Bering Sea based on estimated responses of recruitment and growth to climate variability. Recent advances in our understanding of the role of climate variability in regulating lower trophic levels in the eastern Bering Sea support a dome-shaped relationship between the recruitment of walleye pollock and surface temperatures during late summer. He also speculated that future recruitment may not be reduced as much as the temperature relationship alone would suggest because of (1) reduced cannibalism on larval and early juvenile stages and (2) larger size-at-age of older juveniles and adults, which is likely to increase reproductive output.

The remaining talks covered a wide range of topics and geographical regions. Most oral presentations showed regional examples on ecosystem responses in relation to climate variability, and geographical coverage was well balanced: 4 from the Atlantic Ocean, and 15 from the Pacific Ocean (6 focused on the eastern Pacific, 6 on the western Pacific, and 3 on the Bering Sea). In the Poster Session, one presentation co-authored by C.J. Jang and S. Yoo, which received the Best Poster award for a POC-sponsored topic session (see list at the end of the Session Summaries report), demonstrated variability of mixed layer depth (MLD) and its relation with chlorophyll (CHL) concentration in the North Pacific Ocean on seasonal to year-to-year timescales. The variability of MLD is well correlated with CHL variability in some regions in the North Pacific Ocean, including the Kuroshio Extension (KE) region. The good correspondence between MLD and CHL suggests that increased MLD helps to entrain deep nutrients into the upper ocean and thus to maintain high CHL in the KE.

The Best Poster award was shared between Sarah Ann Thompson for “*Comparing pathways of functional response of top predators to seasonality of upwelling in the California Current*”, and Chan Joo Jang for “*Variability of mixed layer depth and its relation with chlorophyll concentration in the North Pacific Ocean*”. See the list of awards at the end of this Session Summaries report).

List of papers

Oral presentations

Hans O. Pörtner (Invited)

Oxygen and capacity limited thermal tolerance (OCLT): Linking climate to ecosystem change

Julie E. Keister, Emanuele Di Lorenzo, Sanae Chiba, Vincent Combes, Cheryl A. Morgan and William T. Peterson

Climate-related changes in ocean transport control zooplankton biogeography around the North Pacific basin

Yury Zuenko, Ludmila Chernovanova, Alexander Vdovin and Elena I. Ustinova

Saffron cod fluctuations in the Japan Sea: An evidence of match/mismatch hypothesis

William R. Crawford and James R. Irvine

Climate variability and ecosystem response in Pacific Canadian coastal waters

Kazuaki Tadokoro, Yuji Okazaki, Tsuneo Ono and Hiroya Sugisaki (Invited)

Geographical comparison of the decadal-scale variations in marine ecosystems in the North Pacific Ocean

Ken Drinkwater, Glen Harrison, Erica Head, Padmini Dalpadado, Jim Carscadden and George Lilly

Comparison of the ecosystem responses to climate forcing and fishing between the Labrador Sea and the Norwegian/Barents seas

Jürgen Alheit, Michele Casini, Wulff Greve, Thomas Pohlmann, Anne Sell, Ralf Vorberg and Carola Wagner

Climate variability drives anchovies and sardines into North and Baltic Seas

Joachim P. Gröger, Gordon H. Kruse and Norbert Rohlf

Climate cycles and population dynamics of North Sea herring

Anne B. Hollowed, Steven Barbeaux, Ned Cokelet, Stan Kotwicki, Patrick Ressler and Christopher Wilson

Effects of climate change on pelagic ocean habitats and their potential role in structuring Bering Sea and Gulf of Alaska ecosystems

Shin-ichi Ito, Takeshi Okunishi, Atsushi Kawabata, Hiroshi Kubota, Akinori Takasuka, Taketo Hashioka, Hiroshi Sumata and Yasuhiro Yamanaka (Invited)

Multi-trophic level ecosystem modeling for understanding the mechanism of small pelagic fish species alternation associated with climate regime shifts

Richard D. Brodeur, James J. Ruzicka and John H. Steele

Investigating alternate trophic pathways through gelatinous zooplankton, krill, and planktivorous fishes in an upwelling ecosystem using end-to-end models

William J. Sydeman, Jarrod A. Santora, Sarah Ann Thompson, Kyra L. Mills, John C. Field, Brian K. Wells, Baldo Marinovic and Bryan A. Black

Numerical responses of krill predators to variation in krill abundance and spatial organization

Seokjin Yoon, Hiroya Abe and Michio J. Kishi

Variance estimation of the growth and food sources of the Manila clam by global warming in a subarctic lagoon, Japan

Harald Loeng

Impacts of climate change on the Arctic Ocean and adjacent seas

Franz J. Mueter (Invited)

Long-term forecasts of walleye pollock dynamics in the eastern Bering Sea based on estimated responses of recruitment and growth to climate variability

Oleg Bulatov

Climate fluctuations and walleye pollock biomass dynamics

Bryan A. Black, Isaac D. Schroeder, William J. Sydeman, Steven J. Bograd and Brian K. Wells

Winter and summer upwelling modes and their biological relevance in the California Current Ecosystem

Masahide Kaeriyama, Hideaki Kudo, Hideki Kaeriyama and Katherine W. Myers

Spacio-temporal changes in the feeding pattern of Pacific salmon, *Oncorhynchus* spp., in the North Pacific Ocean ecosystems during 1958–2009

Melissa A. Haltuch and André E. Punt

On the promises and pitfalls of including decadal-scale climate forcing of recruitment in demersal fish stock assessment

Yongjun Tian, Hideaki Kidokoro and Tsuneo Goto

Long-term changes in the condition factor of small pelagic fishes in the Japan Sea and the impact of the late 1980s regime shift

Poster Presentations

Vanessa R. von Biela, Christian E. Zimmerman, Thomas E. Helser, Bryan Black and David C. Douglas

Terrestrial and marine correlates to black rockfish (*Sebastes melanops*) growth in the California and Alaska Coastal Currents

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Michael A. Litzow, Franz J. Mueter and Dan Urban

Can rising variance predict sudden shifts in populations and ecosystems? A test using Alaskan crustacean data

Elena A. Shtraikhert, Sergey P. Zakharkov and Tatyana N. Gordeychuk

Inter-annual variability of the spring chlorophyll *a* concentration maximum in the Peter-the-Great Bay (Sea of Japan) in 1998-2010

Se-Jong Ju, Chang-Rae Lee and Ah-Ra Ko

Latitudinal variation of lipid contents and compositions in copepods, *Euchaeta* and *Pleuromamma* spp., from the Northwest Pacific Ocean: Its implication in feeding ecology

James J. Ruzicka, Thomas C. Wainwright, Richard D. Brodeur, Jeannette Zamon, Elizabeth Daly, Cheryl A. Morgan and Robert L. Emmett

Interannual variability in the Northern California Current food web structure: Inferring trophic pressures upon juvenile salmon

Suam Kim, Sangwook Yeh, Chung-Il Lee, Sukyung Kang, Hyunwoo Kang, Jin-Hee Yoon, Jung Jin Kim and Sinjae Yoo

Forecasting practice on the common squid (*Todarodes pacificus*) population responding to climate/oceanographic changes

Sarah Ann Thompson, William J. Sydeman, Jarrod A. Santora, Robert M. Suryan, Bryan A. Black, William T. Peterson and John Calambokidis

Comparing pathways of functional response of top predators to seasonality of upwelling in the California Current

Jun Shoji, Syun-ichi Toshito, Ken-ichiro Mizuno and Yasuhiro Kamimura

Possible effects of global warming on fish early life stages: Shift in spawning season and latitudinal distribution can alter growth of juvenile fishes through the changes in daytime length

Chan Joo Jang and Sinjae Yoo

Variability of mixed layer depth and its relation with chlorophyll concentration in the North Pacific Ocean

Ken-ichiro Mizuno, Yasuhiro Kamimura and Jun Shoji

Effect of temperature on growth of black rockfish *Sebastes cheni* juveniles in seagrass and macroalgae beds

Hee Dong Jeong, Sang-Woo Kim, Yong Kyu Choi, Jeong Min Shim and Kee Young Kwon

A striking difference of coastal SST related to climate change in the eastern coast of Korea

Jackie R. King, Vera N. Agostini, Chris J. Harvey, Gordon A. McFarlane, Michael G. Foreman, James E. Overland, Nicholas A. Bond and Kerim Y. Aydin

Climate forcing and the California Current ecosystem

Ann E. Edwards and Shannon Fitzgerald

Predicting resilience to ecosystem change in a far-ranging, pelagic, generalist forager

Oleg N. Katugin, Konstantin A. Karyakin and Alexander A. Nikitin

Contrasting distribution patterns of the common squid (*Todarodes pacificus*) in Peter the Great Bay (Japan/East Sea) in 2008 and 2009

Mikhail A. Zuev and Oleg N. Katugin

Distribution patterns of the gonatid squids (Gonatidae, Oegopsina) in the northern Sea of Okhotsk in 1990-2008

MEQ Topic Session (S9)

Conceptual and numerical models of HAB dynamics

Co-conveners: *William Cochlan (U.S.A.) and Shigeru Itakura (Japan)*

Background

Each PICES member country has conceptual models of harmful algal bloom dynamics that link the physics, chemistry and biological aspects of bloom development and decay. The biology gives us information on ecosystem structure but also describes elements contributing to success of a particular species. The chemistry focuses on nutrient dynamics, ratios and preferences among species. Physical processes detail cell and nutrient delivery to the coast. While conceptual models are descriptions of HAB dynamics without numbers, numerical models include rate estimates. In theory, each of these would be supported with the same physical, chemical and ecological foundation, overlain with the unique considerations of different water types and second order ecosystem structure. However, these models vary widely between species and among countries. There have been no comprehensive intercomparisons among these conceptual and numerical models to identify their

similarities and differences. The focus of this session was to seek commonalities among models and to identify the unique second order aspects needed to describe the distribution and dynamics of HAB in different PICES regions.

Summary of Presentations

This session was held on Wednesday, October 27, 2010 and consisted of 8 oral presentations, including 3 invited talks. The session started with the first invited speaker, Wolfgang Fennel, presenting his paper on the construction of models with reference to HABs. The points touched upon were that:

- Not everything can be modeled, but ask the right questions; one has to deal with a certain amount of mathematics and computing;
- New modelers are encouraged to start with simple box models and MATLAB software;
- HAB modeling can be done as continuous distributions or as individual particles;
- State variables as a concentration of individuals/volume (number and a unit); process rates are the rate of change of state variables such as T, O₂, and S; dynamics are rates of change over time; the interface would be growth rates, mortality rates, vital function, or toxicity;
- Example models are the Gulf of Maine Model (Anderson *et al.*, 2000; McGillicuddy *et al.*, 2003) and Baltic Sea Model (Koyonen, 2001; Neumann *et al.*, 2002);
- Truncation issues remain, as upper and lower trophic levels; spatial dimensions such as advection and diffusion; linkage of physics to biology;
- Stacked box models; each box with its own equations with parameters spanning the boundary (inputs and outputs);
- Baltic Sea 3D model showing algal bloom modeling and comparison to specific results to what occurred (satellite chlorophyll).

The second invited speaker, Ted Smayda, discussed modeling HABs and the need for a conceptual template that is harmonious with empirical evidence. Points included:

- C, S, and R-strategists for dinoflagellates;
- Hierarchy and niche growth including cellular, population, and community growth as different things needs to be considered;
- Other problems needing examination: PvsE (carbon dumping and irradiance problem), allometric influence on growth rates, and the paradox of high Ks values;
- Smayda, 1997 and Smayda, 1996 (growth rates for many organisms under natural light, photo period and temperatures);
- Cell quota (volume) may be more important than actual cell concentration in some cases (Perez-Ruzala *et al.*, 2002);
- About a 22 year “wavelength” in Diatom:Dinoflagellate ratio;
- “Insect swarm ecology” may be similar to dinoflagellate blooms and probably share common attributes.

Jenny Lane spoke on the development of toxigenic *Pseudo-nitzschia* bloom models in Monterey Bay, California, at a single monitoring site in a model domain. Points included:

- upwelling events and extreme river discharge correlate with intensity of blooms;
- Predictor variables, found in Lane *et al.*, 2009;
- Chlorophyll-*a* anomaly only predicts blooms well about 56% of the time;
- SPATT bags and resin is picking up DA adequately and generally mirrors toxin content in mussels.

Her presentation won a Best Oral Presentation award for an MEQ-sponsored Topic Session (see list at the end of the Session Summaries report).

Shigeru Itakura discussed the different seeding strategies and bloom dynamics in enclosed embayments for *Chattonella* and diatom blooms. Points included:

- *Chattonella* and diatom blooms do not occur concurrently in Ariake Bay, Japan;

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- Flushing of the bay is important for diatom concentration: no or reduced flushing (low tidal cycles) will increase diatom concentrations; high tidal events flush water well from the bay and keep diatom concentrations low;
- *Chattonella* germination temperature is about 20°C; light does not seem to be an important factor for germination (Ariake Bay is a shallow mud flat);
- Diatom germination from the resting stage is more reliant on light intensities and can germinate within hours, given the right conditions.

Don Anderson talked about the Gulf of Maine model for predicting *Alexandrium* blooms.

- Good predictions for years leading up to 2010 using the models and the previous years cyst survey maps;
- 2010 not a good predictive year; physical water qualities were different due to intrusion of a water mass not previously considered that altered predicted conditions.

Jack Rensel discussed *Heterosigma* blooms and fish killing incidents in the Salish Sea and the development of a conceptual model to predict *Heterosigma* blooms.

- Link between low sockeye salmon returns following a year with high *Heterosigma* blooms;
- Possible effect of *Heterosigma* blooms killing/weakening outmigrant salmon, reducing their success of return;
- Several ecotypes of *Heterosigma* being found currently;
- Initiation sites include English Bay and southern Strait of Georgia.

Angelica Peña discussed the use of a bio-physical ROMS model developed to study factors influencing phytoplankton bloom dynamics.

- Two nutrient sources are found for the area: outflow from Juan de Fuca Strait (river runoff; possible anthropogenic sources) and upwelling;
- Nutrient sources have different signatures, concentration of nutrients and ratios.

List of papers

Oral presentations

Wolfgang Fennel (Invited)

Construction of models with reference to HABs

Theodore J. Smayda (Invited)

Modeling harmful algal blooms: The need for a conceptual template harmonious with empirical evidence

Jenny Q. Lane, Peter T. Raimondi and Raphael M. Kudela

The development of toxigenic *Pseudo-nitzschia* bloom models in Monterey Bay, California, and their application at a single monitoring site within the model domain

Shigeru Itakura, Ichiro Imai, Satoshi Nagai and Mineo Yamaguchi

Chattonella (antiqua/marina) versus diatoms - Different seeding strategies and their bloom dynamics in enclosed embayments

Tamiji Yamamoto and Ryoko Sakai (Invited)

Numerical modeling of the slow-growing, motile harmful alga *Gymnodinium catenatum* in Inokushi Bay, a small inlet in southern Japan

Donald M. Anderson, Dennis J. McGillicuddy, Jr., Bruce A. Keafer and Ruoying He

Bloom dynamics of the red tide dinoflagellate *Alexandrium fundyense* in the Gulf of Maine: A synthesis and progress towards a forecasting capability

J.E. Jack Rensel

Modeling fish-killing blooms of *Heterosigma akashiwo* in the Salish Sea

Angelica Peña and Michael G. Foreman

Phytoplankton bloom development in the Juan de Fuca Eddy: Insights from a simple biophysical model

MEQ/FIS Topic Session (S11)*Identifying vulnerable marine ecosystems in the North Pacific*Co-sponsored by: *the North Pacific Fisheries Management Council*Co-Convenors: *R. Ian Perry (Canada) and Chang-Ik Zhang (Korea)*Background

The Food and Agriculture Organization (FAO) and the Convention on Biological Diversity (CBD) have been encouraging the sustainable use of marine living resources by the identification of vulnerable marine ecosystems (VMEs) and ecologically and biologically significant areas (EBSAs), in particular but not exclusively in international waters, and have developed criteria. The broad purpose for identifying such areas is to prevent significant adverse impacts and to protect the marine biodiversity and services that these ecosystems provide.

To achieve these objectives, researchers and managers must be able to identify areas where VMEs are known, or are likely, to occur. Outstanding questions related to VME identification include what characteristics should be used to classify these systems, how can current information on VMEs and EBSAs be consolidated, and how can models which predict the locations of such areas be developed and tested. PICES member countries are beginning to identify VMEs that meet a variety of biological and socio-economic objectives. However, no comprehensive comparison of the different methods or assessment of their performance against established ecological, social and economic objectives exists to provide guidance on the appropriate tools to be used. This session brought together researchers and managers engaged in ecosystem-based management to address two objectives: (1) to compare current approaches and datasets used to identify Vulnerable Marine Ecosystems/Ecologically and Biologically Sensitive Areas by different member countries in order to develop a list of appropriate tools and (2) to explore how the criteria for these areas (such as defined in the FAO Guidelines FIEP/R881 and CBD Resolution UNEP/CBD/COP/DEC/IX/20) can be used to identify VME/EBSA-type areas in the high-seas of the North Pacific Ocean. Both benthic/demersal and pelagic systems were considered, as they may have different characteristics. Presentations and methods developed for shelf and coastal waters were included because they could provide guidance and case studies for open ocean situations. This review of international experiences with applying approaches and data to identify VMEs and EBSAs helped to contribute to the international discussion and evaluation of these issues, and to the application of measures to protect these significant regions.

Summary of Presentations

The majority of the presentations in this session focused on the issues of approaches, tools, and data sets available to identify Vulnerable Marine Ecosystems (VMEs) and Ecologically and Biologically Sensitive Areas (EBSAs) in the North Pacific. Kim *et al.* noted that the term VME is subject to variable interpretation, potentially referring to populations of particular vulnerable taxa, entire benthic assemblages or communities, ecosystems and associated processes. Criteria for identifying VMEs include uniqueness or rarity of species or habitats, their functional significance, fragility, and structural complexity as well as life histories that limit the probability of recovery. Gregr *et al.* concluded that the EBSA concept represents a parsimonious and encompassing marine classification approach that is applicable to shelf and high seas ecosystems. They also recognized that physical properties are often used as proxies for (poorly sampled or poorly known) biological distributions, and that remotely-sensed data which are available at high temporal frequency can be used to identify dynamic boundaries that are significant for biological distributions and therefore of VMEs and EBSAs.

Three papers (Suryan *et al.*, Santora *et al.*, and Jahncke *et al.*) explored the use of remotely-sensed data to identify locations of persistent high biological activity in the California Current System. Suryan *et al.* used

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time series of remotely-sensed chlorophyll data and marine bird distributions to identify pelagic “hot spots” of biological activity. They related these locations to persistent upwelling fronts (often related to bathymetric features), in which *persistence* of the feature over time provided stronger correlations with marine bird densities than did the instantaneous concentration of chlorophyll. Santora *et al.* linked seabird and large whale distributions with locations of elevated krill abundances (krill “hot spots”), and found these were often not directly associated with the locations of strong upwelling centres but did depend on the productivity generated from these centres. Jahneke *et al.* used seabird distributions as high trophic level integrators to identify EBSAs in the California Current System, and found they generally matched the locations of existing U.S. National Marine Sanctuaries, although some EBSAs were not covered by marine reserves. Jamieson, using the example of EBSAs in British Columbia, recognised that identifying EBSAs is the first marine spatial planning step to developing a network of functional Marine Protected Areas. Ishida *et al.* described the integration of protected areas with different fishing activities in the Tosa Bay region of Japan to protect and sustain key fish populations, following the Japanese concept that people and fishing activities can be sustainable aspects of marine ecosystems along with species persistence.

Finney *et al.* described the development of models to predict distributions of vulnerable benthic species, such as corals, on the B.C. continental shelf, and thereby to determine potential habitats on a probabilistic basis. Kim *et al.* described a Korean approach to identifying VMEs on oceanic seamounts, by requiring all Korean vessels fishing in such areas to report their catches of VME-indicator organisms such as corals, sponges, and other benthos. These data are being used to assess the locations and cumulative impacts of fishing on these vulnerable taxa. Hayashibara *et al.* discussed the need for research to confirm that areas with corals identified from fishing activities are in fact high-density and significant ecosystems, but they also recommended that such areas should be protected initially until detailed studies can be conducted (*i.e.* taking a precautionary approach). Parker *et al.* described the approach adopted by CCAMLR to manage impacts of fishing to VMEs in the Southern Ocean. They have determined that:

- 23 taxa (phyla to species) qualified as vulnerable to longline gear;
- most data on distribution and impacts comes from the fishery itself;
- impact assessments integrate fishing threats and biological impacts;
- recovery models suggest the long-term impacts are low, and that recovery can occur relatively quickly especially if areas are closed when detected; and
- there is the need to investigate the effects of other ecological constraints on this system.

Overall, the session met its objectives, although it was noted that the majority of work is currently being conducted on the identification of VMEs and EBSAs in the North Pacific, with less research to date on the responses of these areas to disturbance by fishing and the potential recovery times.

List of papers

Oral presentations

Edward J. Gregr, Andrea Rambeau and R. Ian Perry

Identifying ecologically and biologically sensitive areas in the eastern North Pacific

Doo-Nam Kim, Jae-Bong Lee, Kyu-Jin Seok and Dong Woo Lee

Investigating Vulnerable Marine Ecosystems (VMEs) from Korean distant-water fisheries

Steven J. Parker and David A. Bowden

Criteria to select benthic invertebrate taxa to monitor potential impacts to vulnerable marine ecosystems: Lessons from the Southern Ocean

Glen Jamieson

Moving from EBSAs to a protected area network: Framework considerations and progress challenges in Canada’s Pacific waters

Jessica L. Finney, Isabelle M. Côté, Randall M. Peterman and Edward J. Gregr

Using the overlap of predicted cold-water coral habitat and bottom-contact fisheries to identify vulnerable marine ecosystems in British Columbia, Canada

Takeshi Hayashibara, Mai Miyamoto and Takashi Yanagimoto (Invited)

Investigation of the cold-water corals in the Emperor Seamount Area by Fisheries Agency of Japan

Yukimasa Ishida, Kazuaki Tadokoro, Akihiko Yatsu and Mitsutaku Makino

Japanese-type marine protected areas (MPAs) and their contributions to biodiversity and fisheries in Tosa Bay, southern Japan

Robert M. Suryan, Jarrod A. Santora and William J. Sydeman

Biological “hotspots” of the California Current revealed by satellite imagery: Temporal and spatial variability and implications for biodiversity conservation

Jarrold A. Santora, William J. Sydeman, John Field, Robert M. Suryan and Stephen Ralston

“Hot zones” of krill in the California Current: Application to marine spatial management?

Jaime Jahncke, Nadav Nur, Lance Morgan and Astrid Scholz

Identifying vulnerable marine ecosystems in the California Current System

MEQ/FUTURE Topic Session (S12)

Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function

Co-Sponsored by: *IMBER*

Co-Convenors: *Blake Feist (U.S.A.), Hiroshi Kawai (Japan), Olga Lukyanova (Russia), Steven Rumrill (U.S.A.) and Thomas Therriault (Canada)*

Background

The North Pacific marine environment has provided a diverse and valuable series of ecosystem services to coastal communities for many thousands of years. Ocean and land-based anthropogenic activities are now widely recognized to have a strong influence on ecological processes throughout the North Pacific marine ecosystem. Anthropogenic influences such as commercial fishing, aquaculture, pollution, and urbanization are particularly strong in coastal waters where they impose a wide variety of multiple stressors that can impact fundamental ecosystem functions, critical processes, and marine biodiversity. Changes in the physical and biological environment perturb native communities, often resulting in disruption of species interactions and trophic relationships that can negatively impact productivity and diminish ecosystem resilience. In addition, large scale processes such as regime shifts, ocean oscillations, and climate variability can alter near-shore processes. For example, introduced species can negatively impact native communities, and commercial shipping and recreational activities can be a powerful vector for changes in the geographic distribution of marine and estuarine species. Similarly, changing ocean conditions have facilitated the continued pole-ward range expansion of a number of marine organisms, often with unknown impacts on the ecosystems they are moving into. Recent range expansion (*e.g.*, Humboldt squid) and population eruptions (*e.g.*, jellyfish) on both sides of the Pacific have had negative consequences for native flora and fauna.

Application of an ecosystem-based approach to coastal management would provide a template to better understand multiple stressors in coastal systems. Continuing to study and manage these stressors independently as single problems must be replaced by examining multiple stressors within the context of the ecosystems they are altering. Further, global climate change is expected to have clear consequences with respect to future species introductions, establishment, and range expansion. Ignoring complex interactions will only hinder management efforts. Thus, integrating non-indigenous species invasions with existing anthropogenic stressors will facilitate a holistic approach to addressing the challenges facing our coastal marine ecosystems.

Summary of Presentations

This session explored the characterization, understanding, and forecasting of the influence of multiple anthropogenic stressors in North Pacific coastal ecosystems. For example, how do non-indigenous species interact with other anthropogenic stressors? The presentations dealt with a high-level overview of stressors in

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various North Pacific ecosystems (*e.g.*, overharvesting, urbanization, habitat alteration and loss, mariculture, HABs, pollution, non-indigenous species, *etc.*) and the types of impacts that have been observed, especially those linked to changes in biodiversity and productivity (*e.g.*, extinctions, species interactions, trophic cascades).

List of papers

Oral Presentations

John J. Stachowicz (Invited)

Changing biodiversity and the functioning of coastal marine ecosystems

Steven S. Rumrill, Alicia R. Helms and Adam S. DeMarzo

Potential influence of multiple anthropogenic stressors on restoration and recovery of native Olympia oysters (*Ostrea lurida*) in the Coos Bay estuary, Oregon, USA

Olga N. Lukyanova, Sergei A. Cherkashin and Mikhail V. Simokon

Multiple stressors impact on the ecosystem of Peter the Great Bay (Japan/East Sea)

L.I. Bendell

Influence of near bottom mariculture structures on intertidal diversity

Thomas A. Okey, Andrew Day, Laura A. Loucks, Jennifer Spencer and Kathryn Wallace (Invited)

An application of Integrated Ecosystem Assessment in the marine areas of the West Coast of Vancouver Island to support integrated planning and management

Jameal F. Samhuri, Cameron H. Ainsworth, D. Shallin Busch, William L. Cheung and Thomas A. Okey

The importance of community interactions for predicting climate change impacts

D. Shallin Busch, Cameron H. Ainsworth, Jameal F. Samhuri, William L. Cheung, John Dunne and Thomas A. Okey

Evaluating uncertainty in estimates of how climate change may impact Northeast Pacific marine ecosystems

R. Ian Perry, Diane Masson, David L. Mackas and Gisele Magnusson

Developing ecosystem-based management in a human-dominated marine system: The Strait of Georgia, Canada

Lingbo Li, Tony Pitcher and Robert Devlin

Investigating potential ecological impacts of growth-hormone transgenic coho salmon using a marine ecosystem model

Toshiyuki Yamaguchi, Yuu Ohshiro, Masashi Kiuchi, Michio Otani, Ikuo Ueda and Hiroshi Kawai (Invited)

The introduction of the Titan Barnacle, *Megabalanus coccopoma* (Darwin, 1854) (Cirripedia: Balanomorpha) to Japan

Vasily I. Radashevsky

World wide dispersal of mudworm *Boccardia proboscidea* Hartman, 1940 (Annelida, Spionidae)

Shang Chen, Tao Xia, Guoying Du, Huiyang Wang, Li Wang and Dachuan Ren

Quantification of influence of *Spartina* spp. invasion on coastal wetland ecosystem services: Yancheng case study, China

Thomas W. Therriault, Claudio DiBacco, Leif-Matthias Herborg and Graham E. Gillespie

The importance of scale for predicting impacts of stressors in nearshore environments: An example using European green crab (*Carcinus maenas*) invasions in British Columbia

Peter S. Ross, Donna Cullon, Andrea Buckman and John K.B. Ford

Climate change may exacerbate pollution impacts in marine mammals of the North Pacific Ocean

Burke Hales, Jesse Vance, Sue Cudd, Mariona Segura, Wiley Evans and Alan Trimble

Changing carbonate chemistry and the future of oysters in the eastern North Pacific boundary system

Tatiana Yu. Orlova, Inna V. Stonik, O.G. Schevchenko and Vladimir I. Ponomarev

Long-term changes in phytoplankton communities in Amursky Bay (the north-western part of the East/Japan Sea) under eutrophic conditions

Elizabeth Logerwell, Mary Baker and Amy Merten

Natural resource damage assessment in Arctic waters

Xianshi Jin, Xiujuan Shan, Xiansen Li, Jun Wang, Yi Cui and Tao Zuo

Long-term variations of ecosystem structure in the Laizhou Bay, China

Vjacheslav. S. Labay

Variability of macrobenthos structure in coastal waters of northern Sakhalin Island (Okhotsk Sea) around oil- and gas extracting objects

Tatiana V. Morozova, Tatiana Yu. Orlova, Boris A. Burov, Alexander Yu. Lazaryuk, Sergey P. Zakharkov and Vladimir I. Ponomarev

Dinoflagellate cysts as indicators of eutrophication in the Amursky Bay, Sea of Japan (East Sea)

Poster Presentations

Vjacheslav. S. Labay

Malacostraca (Crustacea) – A new species in coastal waters of Aniva Bay (Okhotsk Sea, Sakhalin Island)

Takeo Kurihara, Hideki Takami, Takeharu Kosuge, Susumu Chiba, Masatsugu Iseda and Takenori Sasaki

Area-specific temporal changes of species composition and species-specific range shifts in rocky-shore molluscs associated with a warming Kuroshio Current

Ferdinand A. Mkrtchyan, Vladimir F. Krapivin, V.I. Kovalev, V.V. Klimov

An adaptive system to identify pollutants on the water surface

Alexandra S. Kondakova and Andrey P. Chernyaev

Anthropogenic hormone substances in coastal waters of Peter the Great Bay (Japan/East Sea)

Andrey P. Chernyaev and Anna S. Vazhova

Oil pollution in Nakhodka Bay (Japan/East Sea)

Yasuhiro Kamimura and Jun Shoji

Effects of environmental conditions on growth-selective survival of juvenile black rockfish *Sebastes cheni* in a vegetated habitat in the central Seto Inland Sea, Japan

Yulia V. Koudryashova, Tatiana L. Chizhova, Evgeniya E. Solodova and Nina N. Belcheva

Age-specific oxidative stress response to cadmium in the scallop *Mizuhopecten yessoensis*

Alexander Sevastyanov, Anastasia Chernova and Tatyana Lishavskaya

Results of long-term pollution monitoring in Peter the Great Bay (Sea of Japan)

Takuma Morita, Yuji Iwamoto and Jun Shoji

Significance of estuarine habitat as nursery for yellowfin sea bream *Acanthopagrus latus*: Comparison of feeding, growth and possible predators for larvae and juveniles in two habitats around Ohta River estuary northern Hiroshima Bay, Japan

Young Shil Kang, Won-Chan Lee, Sok Jin Hong and Dong-Wook Kim

Seasonal and spatial variability in the zooplankton community in Masan Bay, Korea

Jung-Hoon Kang, Oh Youn Kwon, Kyoungsoo Shin and Man Chang

Distribution of potentially risky heterotrophic *Noctiluca scintillans* and port specific capacity based on port baseline surveys in Korea

Guo Ying Du, Shang Chen, Tao Xia, Dachuan Ren, Li Wang and Min Wang

Valuation of ecological capital in coastal area of Shandong province, China

Ik Kyo Chung, Jung Hyun Oak, Sang-Rae Lee and Jeong Ha Kim

Estimation of the seaweed biomass by the extensive field survey

Hee Won Park, Jae Bong Lee, You Jung Kwon, Chang Ik Zhang and Sung Il Lee

Estimating optimum size of stock enhancement in marine ranching ecosystem

Sangjin Lee and Mark Walton

Threats to marine and coastal biodiversity in the NOWPAP region

POC/BIO/MONITOR/FUTURE Topic Session (S13)

Comparing the two major gyres of the subarctic North Pacific - Seasonal and interannual variability and its predictability

Co-Convenors: *James Christian (Canada), Emanuele Di Lorenzo (U.S.A.), Shin-ichi Ito (Japan), David L. Mackas (Canada), Vyacheslav B. Lobanov (Russia) and Atsushi Tsuda (Japan)*

Background

The subarctic North Pacific contains two major gyres; the western subarctic gyre and the Alaskan gyre. Both gyres are mainly driven by the subarctic wind field and are expected to be synchronized with each other. However, the real responses are not so simple. For example, the western subarctic gyre shows large seasonal variability in the western boundary current (Oyashio), while the Alaskan stream does not show large seasonal variability. In addition to these physical characteristics, chemical and biological characteristics are different. For example, iron supply is larger in the western subarctic gyre because the distance from the terrestrial

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sources is closer than in the Alaskan gyre. This, in turn, affects the duration, composition, and magnitudes of phytoplankton and zooplankton production. Therefore, ecosystems also differ between in the two gyres. To achieve better understanding of the mechanisms of the subarctic response to atmospheric forcing, comparisons of the responses of the two gyres are essential. Although severe winter conditions have limited observational activity in the two gyres, recent progress in observational networks, including satellites, drifters and Argo floats, have improved our understandings of the two gyres. Such progress enables better comparison of the two gyres, which was enhanced by discussions in this session.

Summary of Presentations

About 50 persons attended and seven presentations were made. An invited talk by Hiroshio Kawamura (co-authored with Osamu Isoguchi) reviewed seasonal-to-interannual variability of the Oyashio transport, as indexed by several methods. Large seasonal variability is controlled by barotropic response to wind stress curl associated with intensity and location of the westerlies, while interannual variability is controlled by barotropic and baroclinic responses. The second paper by Howard Freeland showed a test case of volume, heat and salt conservation estimates made using Argo floats data. He derived vertical upwelling velocity as 8.9×10^{-7} m/s in the Alaskan Gyre, which is larger than some previous estimates. Sachihiko Itoh compared characteristics of cyclonic and anti-cyclonic eddies in the two gyres and found similarity between cold-core anticyclonic eddies in the western subarctic gyre and low salinity-core anticyclonic eddies in the Alaskan gyre. The invited talk by Joaquim Goes showed a technique to estimate nitrate concentration from satellite-derived sea-surface temperature and Chl-*a* concentrations. Seasonal changes of the nitrate can then be used to estimate annual “new” primary production, and to examine their spatial and interannual differences. Results showed a strong basin-scale response to the ENSO. Rui Saito showed excellent east–west comparison of individual size and abundance of zooplankton based on *Oshoro-maru* survey line data. He found a larger body size of copepods and hydrozoans in the western subarctic gyre. An invited talk by Sanae Chiba reviewed climate impact on lower trophic level ecosystems and its predictability in the two gyres. Both phenology and productivity show strong low frequency variability in both gyres that is strongly linked to temperature and stratification variability indexed by PDO. Many of the plankton responses show opposite temporal phase in the two gyres, as expected by the east–west dipole pattern of the PDO. In the final paper, Hiroaki Saito discussed between-species differences in the vertical distribution and life history timing of dominant *Neocalanus* copepods, and used a modelling approach to investigate the advective trajectories of copepods spawned in various parts of the subarctic Pacific. Transport speeds are high and trajectories very long in the western gyre and especially in the Kamchatka, Oyashio and KOE regions. He estimated fractional exchange of populations between various subregions, and showed that the seasonal and interannual variability observed at any single site is strongly influenced by the mixture of upstream source populations.

Taken together, the papers showed that in comparison to the Alaska Gyre, the Western Subarctic Gyre can be characterized as one of cooler temperature, higher nutrients, richer in iron, higher primary production, larger-size phytoplankton, larger-sized zooplankton. Those differences are caused by the interaction between differences in upstream conditions, wind-stress distribution, interaction between subtropical gyre, and distance from terrestrial iron source. However, the knowledge on seasonal and interannual variability remains limited and enhancement of *in situ* observations are expected. Additionally, comparable approaches are essential to improve our comprehensive understandings, and to predict future responses to global warming.

At the end of the session, the convenors expressed their regret and surprise that relatively few papers (7 orals and 3 posters) were submitted to the session. However, the quality of the papers was high. Continuing efforts towards the progress of comparative studies in the subarctic gyres were encouraged.

List of papers

Oral Presentations

Osamu Isoguchi and Hiroshi Kawamura (Invited)

Seasonal to interannual variations of the western boundary current of the subarctic North Pacific using altimeter data

Howard Freeland

Heat and salt conservation in the N.E. Pacific

Sachihiko Itoh, Ichiro Yasuda and Hiromichi Ueno

Warm and cold-core anticyclonic eddies in the western subarctic North Pacific

Joaquim I. Goes, Helga do R. Gomes, Kosei Sasaoka and Toshiro Saino (Invited)

The role of the Aleutian Low Pressure System in regulating phytoplankton biomass, primary production and export production across the subarctic Pacific Ocean basin

Rui Saito, Atsushi Yamaguchi, Ichiro Imai, Sei-Ichi Saitoh and Kenshi Kuma

East-west comparison of the zooplankton community in the Subarctic Pacific during the summers of 2003-2006

Sanae Chiba (Invited)

An overview of ecosystem state variability in the subarctic North Pacific: East-west synchrony and contrast

Hiroaki Saito, Atsushi Tsuda, Hiroaki Tatebe

West meets East: Inter-gyre transportation of *Neocalanus* copepods

Poster Presentations

Shin-ichi Ito, Yugo Shimizu, Shigeho Kakehi, Taku Wagawa, Akira Kusaka and Masatoshi Sato

Seasonal variation of the Oyashio transport compared with the Alaskan Stream

Yuichiro Kumamoto, Akihiko Murata, Shinya Kouketsu, Michio Aoyama, Shuichi Watanabe and Masao Fukasawa

A comparison of dissolved oxygen concentration in intermediate layer between the western and eastern subarctic gyres of the North Pacific from 1985 to 2007

Yugo Shimizu, Taku Wagawa, Shin-ichi Ito, Shigeho Kakehi, Akira Kusaka and Masatoshi Sato

Velocity structure and transport of Oyashio measured by vessel-mounted acoustic Doppler current profiler along repeat hydrographic section A-line

POC/MEQ/FUTURE Topic Session (S14)

Marine renewable energy development in coastal and estuarine environments around the North Pacific

Co-Convenors: *George Boehlert (U.S.A.), Michael Foreman (Canada), Glen Jamieson (Canada) and Kuh Kim (Korea)*

Background

This was the first session at a PICES Annual Meeting dealing with the topic of marine renewable energy. Projects under active development throughout the world are typically designed to directly extract energy from waves, tides, currents, wind, osmotic, or thermal gradients or indirectly from biomass energy. These novel technologies will require new emplacements, moorings, or other structures in marine and estuarine environments with attendant intrusions upon the environment, including acoustic signals, changes to mixing, and electromagnetic fields. Marine renewable energy sources are able to provide clean energy, but their effects on the physical and biological environment are not well understood and should thus be of interest to PICES member countries.

Summary of Presentations

Papers were presented by authors from four PICES member countries (Canada, Japan, Korea, and United States) and by invited speaker, Henry Jeffrey from the University of Edinburgh, UK, who spoke on “*Ocean energy: A European perspective*”. As co-author of the UK Roadmap for Ocean Renewable Energy and a principal in the SuperGen project, he shared a great deal of experience on the European experience. His talk was followed by three national/regional talks; Tokio Wada (with co-author Ken Takagi) discussed “*Status and perspectives of the utilization of marine renewable energy in Japan.*” Keyyong Hong (with co-authors Seung-Ho Shin and Seok-Won Hong) discussed “*Current status and future perspectives of marine renewable energy development in Korea*” George Boehlert (with co-author Philip Malte) presented on “*Wave and tidal energy*”

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research in the Pacific Northwest: The Northwest National Marine Renewable Energy Center".

After the break, invited speaker, Brian Polagye, discussed the outcomes of an international workshop held in Seattle in March, 2010 in his talk "*Environmental effects of tidal energy development*". The proceedings of this workshop will be available soon as a NOAA Technical Memorandum. The final paper by Michael Foreman (with co-authors Dario Stucchi, Kyle Garver and Thomas Grime) discussed "*A circulation model for the Discovery Islands, Canada: The first step in assessing tidal energy potential and impacts*". Discussion for an additional 30 minutes led by the convenors explored several questions.

The session was not particularly well attended, with approximately 35 participants at the start and 15 at the end. Only one paper was not presented, as Yong Jun Cho was not at the meeting. The acoustics in the very large room were quite poor, and would have benefited from portable microphones and also lowering of the screen in the very high-ceilinged room.

List of papers

Oral Presentations

Henry Jeffrey (Invited)

Ocean energy: A European perspective

Tokio Wada and Ken Takagi

Status and perspectives of the utilization of marine renewable energy in Japan

Keyyong Hong, Seung-Ho Shin and Seok-Won Hong

Current status and future perspectives of marine renewable energy development in Korea

George W. Boehlert and Philip C. Malte

Wave and tidal energy research in the Pacific Northwest: The Northwest National Marine Renewable Energy Center

Brian Polagye (Invited)

Environmental effects of tidal energy development

Yong Jun Cho, Min Kyun Kim

On the likelihood of Power-Breaker as wave energy extractor and its hydraulic characteristics

Michael Foreman, Dario Stucchi, Kyle Garver and Thomas Grime

A circulation model for the Discovery Islands, Canada: The first step in assessing tidal energy potential and impacts

MONITOR Topic Session (S15)

Development and use of ocean observing and forecasting systems in coastal and marine management

Co-Sponsored by: *ICES*

Co-Convenors : *Jonathan Hare (U.S.A.), Vyacheslav B. Lobanov (Russia), David L. Mackas (Canada), Phillip R. Mundy (U.S.A.), Youngjae Ro (KOREA) and Hiroya Sugisaki (Japan)*

This session was developed to advance the objectives of the PICES Technical Committee on Monitoring, the PICES FUTURE program (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems) and the ICES-GOOS Steering Group. These groups have terms of reference related to the coordination of Global Ocean Observing Systems, the development and evaluation of forecasting systems, and their application to ocean management. The session focused on examples where ocean observations and forecasts have been used in PICES and ICES products.

Methodological advances and issues were also presented to promote the development of observing and forecasting capabilities. In addition, the session served as a forum to bring ocean observing, ecological forecasting and resource management communities together to better link observing and forecasting efforts with the need to provide scientific advice for marine and coastal resource management.

Summary of Presentations

The session had a total of 19 oral and 8 poster presentations from all 6 PICES member countries and 2 from Ireland and Malaysia. Unfortunately, there were few presentations on ICES issues in spite of this session being jointly sponsored with ICES. Glenn Nolan, the invited speaker, provided an overview of the hydrographic studies across the North Atlantic, and Jon Hare, one of the convenors, presented results from the Northeast U.S. CPR program. This information will be very helpful for collaboration between ICES and PICES in the future. Sue Moore (substituting for Drs. Gillian Lichota and John Calder) made a presentation on the monitoring activities by the Pacific Arctic Group as a part of activities of SAON (Sustaining Arctic Observing Networks; John Calder is SAON's the new *ex-officio* member of MONITOR). The importance of information exchange between the Arctic and sub-Arctic was made clear by this presentation.

The afternoon session began with an invited presentation by Dr. Sonia Batten who described the current status of CPR under the title of "*The Continuous Plankton Recorder - A lengthy history and a global future*". She provided an excellent report on the CPR status as well as the utilization of records in estimating the ecosystem status in Arctic waters. Next, U.S. observation history of salmon returns in relation to California current conditions was given by Dr. Bill Peterson. Physical oceanographer, Dr. David Foley, gave a very interesting talk about the Chinook salmon habitat along the California coast based on the statistical analysis of salmon return data along with physical conditions. This talk was a very refreshing and exceptional one. Lastly, Dr. Réka Domokos talked about the acoustic investigation of bigeye tuna at Cross Seamount. In this session, three talks were related with fishes and their return and/or survival story.

The concluding session began with an invited presentation by Jonathan Hare who shared the experience accumulated during 50 years of continuous plankton recorder (CPR) and expendable bathythermograph (XBT) observations from ship-of-opportunity platforms over the northwest continental shelf of the Atlantic Ocean. The observations document biological responses of plankton abundance, community structure and phenology within the context of physical observations that document the effects of climate change. Although the observations have increased fishery managers' understanding of ecosystem structure, the only operational management application to date is a right whale calving model. Even so, the calving model demonstrates that the ship-of-opportunity approach makes available a wealth of observations on which both ocean science and management communities could base operational management applications.

The use of satellite-derived oceanographic observations to guide management of a fish stock assessment survey was described by Carrie Holt in the next talk. The objective is to develop models that focus survey effort for the target species, Pacific hake (*Merluccius productus*), so that survey managers can maximize the benefit from the available ship time. Improved performance of models of fish distribution was achieved by incorporation of a measure of frontal activity, SST gradient. Dong-Jim Kang reported on the development of a new instrument and mooring for gathering and transmitting real-time continuous vertical profiles of hydrographic, chemical and ecological variables at depth. Using the same principle as the Argo drifter, the instrument autonomously collects observations by alternately rising and sinking about a mooring, and the components of the mooring send the data to the surface for distribution over a satellite communications system. Sei-Ichi Saitoh described an operational application of satellite remote sensing and marine-GIS to development of sustainable marine fisheries and their management. The integrated coastal fisheries information system defines a potential coastal fishing zone for squid by combining satellite and buoy observations with 4-D VAR data assimilation, ecosystem modeling, and marine-GIS spatial modeling. Dani Evenson addressed the development and application of an experimental forecast model for migratory timing of salmon using retrospective analysis of satellite, surface weather and NCEP reanalysis model data. The application of the experimental model in 2010 produced accurate timing forecasts 2 weeks in advance of the 2010 fishing season, so the project will proceed to deploy an operational product for fishery managers in 2011. The final talk of the session was by David Welch who described an application of the POST acoustic telemetry array toward the solution of a complex salmon fishery management problem. The application of the POST array permits the location of marine mortality to be more precisely defined, which promises to allow objective examination by policy makers of the relative importance of salmon farms as sources of mortality for wild salmon juveniles.

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The Best Poster award for a topic session/workshop sponsored by MONITOR was received by Dr. Hisashi Yamaguchi for the presentation titled “*Variation of satellite chlorophyll-a in the East China Sea based on local satellite algorithm with reduced influence from suspended sediment*” (see list at the end of the Session Summaries report)

List of papers

Oral Presentations

Glenn Nolan, Eugene Colbourne and Hedinn Valdimarsson (Invited)

The ICES Working Group on Oceanic Hydrography (WGOH): Building on over 100 years of North Atlantic observations

Molly McCammon, Carl Schoch and Darcy Dugan

Alaska Ocean Observing System: Lessons learned in developing an end-to-end observing system

Vyacheslav B. Lobanov

North-East Asian Regional Global Ocean Observing System: The story of success and current requirements for coastal and marine management

Kwang-Soon Park, Dong-Young Lee, Ki-Cheon Jun, Sang-Ik Kim, Jae-II Kwon and Jung-Woon Choi

Introduction of Korea operational oceanographic system (KOOS)

Toshio Suga (Invited)

Profiling floats as tools for biogeochemical and biological monitoring

Gillian B. Lichota and John A. Calder (presented by **Sue Moore**)

Monitoring Pacific Arctic ecosystem change through development of a Distributed Biological Observatory (DBO)

Yoichi Ishikawa, Toshiyuki Awaji, Teiji In and Sei-Ichi Saitoh

Development of coastal data assimilation system for environmental monitoring/forecasting

Jerome Fiechter, Gregoire Broquet, Andrew M. Moore and Hernan G. Arango

A data assimilative, coupled physical-biological model for the Coastal Gulf of Alaska

Yasumasa Miyazawa, Toru Miyama, Sergey M. Varlamov, Xinyu Guo and Takuji Waseda

Application of the Ensemble Kalman Filter to the Kuroshio variations around the Kii Peninsula

Sonia Batten (Invited)

The Continuous Plankton Recorder - A lengthy history and a global future

William Peterson, Edmundo Casillas, Jay Peterson, Cheryl A. Morgan and Jennifer Fisher

Forecasting returns of coho and Chinook salmon in the northern California Current: A role for long term observations

David G. Foley

Identification and monitoring of Chinook salmon habitat along the California coast

Réka Domokos

Acoustic investigation of bigeye tuna at Cross Seamount

Jonathan A. Hare, Jack A. Jossi and Joseph M. Kane

Fifty years of ship-of-opportunity observations on the northeast U.S. continental shelf: Results and management applications

Carrie A. Holt, Ashleen Benson, Brigitte Dorner, Melissa A. Haltuch, Megan O'Connor and Mary Thiess

Forecasting Pacific hake distribution at fine spatial scales using satellite-derived oceanographic data

Dong-Jin Kang, Kyung-Ryul Kim, Kyung-II Chang and Ki Wan Kim

E-RAP (EAST-1 Real-time Automatic Profiler): Its development and application

Sei-Ichi Saitoh, Toru Hirawake, I Nyoman Radiarta, Tomonori Isada, Robinson Mugo, Fumihiko Takahashi, Ichiro Imai,

Yasuhiro Sakurai, Michio J. Kishi, Masaaki Wada, Toshiyuki Awaji and Yoichi Ishikawa

New challenge of integrated coastal fisheries information system in southern Hokkaido, Japan

Phillip R. Mundy and Dani F. Evenson

Use of ocean observations to develop forecasts in support of fishery management operations

David W. Welch

Applications of coastal ocean acoustic telemetry arrays for marine fisheries: Making research cost-effective and policy relevant

Poster Presentations

Megan O'Connor, Melissa A. Haltuch, Carrie A. Holt, Brigitte Dorner, Ashleen Benson and Mary Thiess

Forecasting the north-south distribution of Pacific hake using coastal upwelling indices and oceanographic model outputs

Hisashi Yamaguchi, Young Beak Son, Eko Siswanto, Joji Ishizaka, Sinjae Yoo, Yu-Hwan Ahn, Sang-Woo Kim, Junwu Tang, Hiroshi Kawamura and Yoko Kiyomoto

Variation of satellite chlorophyll *a* in the East China Sea based on local satellite algorithm with reduced influence from suspended sediment

Tadafumi Ichikawa and Hiroya Sugisaki

Long term variations of abundance and size composition of copepod communities off southern Japan using bench-top Video Plankton Recorder system (B-VPR)

Huade Zhao, Xuemei Xu, Minghao Li and Juying Wang

The partial pressure of carbon dioxide and air-sea fluxes in the northern Yellow Sea of China

Hikomichi Igarashi, Nozomi Sugiura, Shuhei Masuda, Takahiro Toyoda, Yoshihisa Hiyoshi, Yuji Sasaki, Mitsuo Sakai, Taro Ichii, Takushi Kindaichi, Jun-ya Tanaka, Masaharu Oomizu, Yoichi Ishikawa and Toshiyuki Awaji

Improved approach for the identification and prediction of neon flying squid abundance and distribution in northwestern North Pacific using an integrated 4D-VAR data assimilation system

Vadim Burago, Georgiy Moiseenko and Igor Shevchenko

Modeling spatial distribution of the ocean chlorophyll *a* concentration from remote sensing data

Xiang Pu, Huiwang Gao, Zhe Liu and Yunjun Yu

Simulation of non-point source nutrient flux and its impact on water quality of coastal ocean: A case study on Jiaozhou Bay in China

Howard Freeland

Argo: A decade of success, what have we learned and what comes next?

BIO Paper Session

Convenor: *Michael Dagg (U.S.A.)*

Background

This session continued the tradition of providing oral and poster presentations on all aspects of Biological Oceanography in the North Pacific and its marginal seas that were not covered in the more specific BIO Topic Sessions (S2, S3, S4, S6, S8, and S13). Papers on marine birds and mammals were especially encouraged this year.

Summary of presentations

There were 18 oral and 14 poster presentations for this session, once again indicating its popularity as an outlet for a diverse set of papers oriented towards issues in Biological Oceanography that are not specifically addressed by focused Topic Sessions. Oral presentations were given by scientists from all PICES member countries. The initial set of talks, before morning coffee, focused on euphausiids with presentations from Korea (Ju *et al.*), U.S.A. (Shaw *et al.*, and Batchelder and Lindsay) and China (Du *et al.*). It was good to see these important but understudied organisms receiving more attention. It should be noted that the presentation by Du *et al.* titled "Feeding rates of adult *Euphausia pacifica* on natural particle assemblages in the coastal upwelling zone off Oregon, USA." received the BIO award for Best Oral presentation by an early career scientist for a BIO-sponsored Topic Session/Workshop. The euphausiid papers were followed by excellent contributions about other components of the pelagic food web, including phytoplankton, zooplankton, fish, birds and mammals, and the benthic environment was also represented by the presentation of Dolganova. The highly successful poster session featured a wide range of topics, including the recipient of the BIO Best Poster award by Dumbauld and Chapman titled "Can an introduced parasitic bopyrid Isopod *Orthione griffensis* cause extinction of mud shrimp *Upogebia pugettensis* populations in U.S. west coast estuaries?" The BIO-P session was well attended throughout the day, indicating broad interest from the PICES community. (See the list of awards at the end of this Session Summaries report).

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List of papers

Oral presentations

Se-J. Ju, H.S. Kim, W.S. Kim, D.H. Kang and A.R. Ko

Understanding the role of the Yellow Sea Bottom Cold Water Mass ($\leq 10^{\circ}\text{C}$) on the survival strategy of *Euphausia pacifica* throughout the hot summer in the Yellow Sea

C. Tracy Shaw, Leah R. Feinberg, Hongsheng Bi and William T. Peterson

Cohort data for the euphausiid *Euphausia pacifica* based on biweekly sampling off Newport, OR, USA

Xiuning Du, William T. Peterson and C. Tracy Shaw

Feeding rates of adult *Euphausia pacifica* on natural particle assemblages in the coastal upwelling zone off Oregon, USA

Harold P. Batchelder and Brie J. Lindsey

On adding a stage-structured model of krill to NEMURO

Kenji Tsuchiya, Yoshiki Tomoko, Hideo Miyaguchi, Kenichi Mori, Tomohiko Kikuchi and Tatsuki Toda

Typhoon-driven variations in productivity and species composition of phytoplankton in Sagami Bay, Japan

Atsushi Yamaguchi, Yurika Hanamiya, Hikaru Watanabe and Hiroto Murase

Macrozooplankton diel vertical migration and carbon flux in the summer, western North Pacific Ocean

Bridget E. Ferriss and Timothy E. Essington

Regional patterns in mercury concentrations of yellowfin and bigeye tuna in the Pacific Ocean

Anastasia S. Dolganova

The current condition of *Polychaeta* of the northwestern shelf of Bering Sea

Angelica Peña and Diane Masson

Modelling plankton dynamics in the Straits of Georgia and Juan de Fuca

Meredith L. Elliott, Jaime Jahncke, Moira Galbraith and David L. Mackas

Copepod assemblages as indicators of ocean conditions in Central California

Hidefumi Fujioka, Atsushi Tsuda and Ryuji J. Machida

A molecular method for species identification of early life stages of *Neocalanus plumchrus* and *Neocalanus flemingeri* using Real-Time PCR

Tomoko Yoshiki, Tsuneo Ono, Akio Shimizu and Tatsuki Toda

Egg development time and hatching success of deep sea spawning calanoid copepods, genus *Neocalanus*

Todd W. Miller, Richard D. Brodeur, Koji Omori, Robert L. Emmett and Hideki Hamaoka

A stable isotope trophic assessment of upper trophic level nekton in the Northern California Current ecosystem

Chiyuki Sassa and Youichi Tsukamoto

Interannual comparison of diet of larval jack mackerel *Trachurus japonicus* in the southern East China Sea during 2002-2005

Ah-Ra Ko, Dae-Yeon Moon, Seok-Gwan Choi, Kyung-Hoon Shin and Se-Jong Ju

Lipid metabolism of minke whale and pacific white-sided dolphin in Korean waters and implications for feeding ecology

Olga Yu. Tyurneva, Yuri M. Yakovlev, Vladimir V. Vertyankin, Glenn Gailey, Olga Sychenko and Judy E. Muir

Discovering a new feeding area for calf-cow pairs of Western Gray Whales on the south-east shelf of Kamchatka in 2009 and their utilization of different feeding regions within one season

Hector D. Douglas III, Alan M. Springer, Suzanne Budge and Lacey Aucoin

Fatty acid and stable isotope analyses reveal consumption patterns of planktivorous auklets and variability in ecosystem productivity

George L. Hunt, Jr., Stephani Zador and James Ianelli

Declines of northern fur seals at the Pribilof Islands: Forage fish depletion, competition with adult pollock and arrowtooth flounder, or fishing activity?

Poster Presentations

Alexander V. Zavolokin (presented by V. Kulik)

Forage base of Pacific salmon (*Oncorhynchus* spp.) in the Northwest Pacific Ocean in 2004-2009

Ludmila S. Belan and Tatyana A. Belan (presented by A. Chernova)

Composition and distribution pattern of macrozoobenthos on the continental shelf of the Okhotsk Sea near NE Sakhalin Island

Brett R. Dumbauld and John W. Chapman

Can an introduced parasitic bopyrid Isopod *Orthione griffenis* cause extinction of mud shrimp *Upogebia pugettensis* populations in U.S. west coast estuaries?

Sarat C. Tripathy, Joji Ishizaka, Tatsuya Shibata, Eko Siswanto and Yoshihisa Mino

Evaluation of Vertically Generalized Production Model (VGPM) in Ariake Bay, Southwestern Japan

Evgeniya E. Vekhova, Michael I. Kusaykin and Konstantin V. Kiselev

The phytoplankton contribution to the diet: A comparison of two mussels (Mollusca: Bivalvia) from different biotopes of the Sea of Japan

Katsumi Takayama, Tatsuro Watanabe, Hideyuki Kawamura and Iori Tanaka

Reproducibility of chlorophyll *a* and nutrient variability in the Japan Sea by the three-dimensional ecosystem-circulation model

Hyun Woo Kim, Yong-Rock An, Tae-Geon Park, Zang Geun Kim, Dae-Yeon Moon and Seok-Gwan Choi

Validity of a photo-identification method for spotted seals in the Baekryongdo, Korea

Yuji Okazaki, Kazuaki Tadokoro and Yugo Shimizu

The vertical distribution of krill in the Oyashio and mixed water regions, western North Pacific

Tae-Geon Park, Yong-Rock An, Zang-Geun Kim, Seok-Gwan Choi and Dae-Yeon Moon

Distribution of the spotted seal, *Phoca largha*, along the coast of Baekryeongdo in 2006 - 2008

Shin-ichi Ito, Hiroshi Kuroda, Takahiko Kameda, Takeshi Okunishi, Enrique N. Curchitser, Kate Hedstrom and Jerome Fiechter

A test of a coupled physical and lower-trophic-ecosystem model NEMUROMS in the North Pacific

Xiu-ning Du and Guang-xing Liu

Phytoplankton community structure and its relation to hydrographic conditions in the North Yellow Sea in autumn, 2007

Youngju Lee, Joong Ki Choi

Phytoplankton dynamics and primary production of the Yellow Sea in winter and summer

Brie J. Lindsey and Harold P. Batchelder

Potential spawning behaviors of *Euphausia pacifica* in the upwelling region of the Oregon coast: A 2-D modeling exploration

Natalia M. Aminina, Irina A. Kadnikova, Yeon-Kye Kim and Ho-Dong Yoon

Comparison of UV-absorbing and antioxidant activity of seaweed extracts

FIS Paper Session

Co-Convenors: *Gordon H. Kruse (U.S.A.) and Mikhail Stepanenko (Russia)*

Background

Papers addressing general topics in fishery science and fisheries oceanography in the North Pacific and its marginal seas are invited, except those covered by Topic Sessions S5, S6, S7, S8, S10 and S11.

Summary of presentations

The FIS Contributed Paper Session included 19 oral presentations and 30 poster presentations. Many of the poster presentations were originally proposed as oral presentations, but 19 talks were the maximum that could be accommodated for oral presentation during the two half-day sessions allotted for the FIS Contributed Paper Session. Presentations covered a wide range of invertebrates (*e.g.*, caridean shrimps, snow crab, common squid) and both pelagic (*e.g.*, Pacific herring, northern anchovy, Pacific salmon) and demersal (*e.g.*, walleye pollock, greenlings, Pacific cod) fish species. The first session began with three papers on genomics and genetics, including an overview on adaptive and behavioural responses to climate change and other genetic studies that focused on Atlantic cod and Pacific herring. Other oral presentations addressed a very broad diversity of fishery science topics. Specific research included studies of growth, geographic, depth and seasonal distributions, processes operating during early life history that regulate year-class success, population dynamics related to environmental factors including climate change, and ecosystem approaches including modelling. Poster presentations address an even wider diversity of fishery science topics. Additional topics covered in posters included fish abundance estimation, reproductive biology, stock-recruitment relationships, bioenergetics and over-wintering mortality, ecology of fished species including predator-prey relationships, assessments of fisheries and fishing effects, effects of oceanography on fish distributions, use of remote

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sensing technology, and management strategy evaluations that include ecosystem effects. The FIS Contributed Paper Session was very successful based on the number of oral presentations and posters, diversity of species and topics, high quality of the presentations, and the level of attendance by PICES members during these two half-day sessions.

List of papers

Oral presentations

Jennifer L. Nielsen

Adaptive and behavioral responses to a changing climate: A genomic perspective

Stewart Johnson, Marije Booman, Sophie Hubert, Brent Higgins, Tudor Borza, Jennifer Kimball, Cynthia Stone, Gary Simpson, Marlies Rise, Charles Feng, Tiago Hori, Jennifer Hall, Edward A. Trippel, Sharen Bowman and Matthew L. Rise

Atlantic Cod Genomics: Development of tools, resources and applications

Anna V. Dakus

The use of molecular techniques for population genetic analysis of the Pacific herring (*Clupea pallasii*) in the northwestern Pacific

Angela M. Johnson, Lorenzo Ciannelli and W. Waldo Wakefield

Effects of hypoxia on the juvenile demersal fish community structure in nearshore Central Oregon waters

Motomitsu Takahashi, David M. Checkley, Jr., Marisa N.C. Litz, Richard D. Brodeur and William T. Peterson

Responses in growth rate of larval northern anchovy to anomalous upwelling in 2005 in the northern California Current

Vladlena V. Gertseva, Jason M. Cope and Sean E. Matson

Growth variability of the splitnose rockfish (*Sebastes diploproa*) in the Northeast Pacific Ocean: Pattern revisited

Hye-Min Park, Jung Nyun Kim, Hae Won Lee, Byeong Gyu Hong, Jin Ho Bae, Hyeong Gi Kim and Chul-Woong Oh

Vertical distribution and reproductive aspects of caridean shrimps in the deep-water of the East Sea, Korea

Tetsuichiro Funamoto, Satoshi Honda, Yuho T. Yamashita, Masayuki Chimura and Kazushi Miyashita

Distribution of walleye pollock (*Theragra chalcogramma*) larvae around Funka Bay, Japan: Relationships with environmental factors

Kerim Aydin and Troy Buckley

An analysis of 30 years of seasonal and geographic variability in marine food webs through fish food habits and stable isotope analyses

Jennifer L. Boldt, Thomas W. Therriault, Marc Trudel, Tyler Zubkowski and Jake Schweigert

Recruitment strength indices for northern British Columbia stocks of Pacific herring

Akihiko Yatsu

A two-stanza outbreak hypothesis for the Pacific stock of Japanese sardine during the 1970s

Jung Jin Kim, William T Stockhausen, Yang-Ki Cho, Chang Sin Kim and Suam Kim

Inter-annual variability in larval dispersion of common squid *Todarodes pacificus* during the 2000s

Akira Okuno, Tatsuro Watanabe, Katsumi Takayama, Naoto Honda, Koji Kakinoki and Osamu Katoh

Numerical simulation of the larval transport of snow crab *Chionoecetes opilio* in the Japan Sea

Elizabeth A. Daly and Richard D. Brodeur

Shifting trophic utilization by juvenile Chinook salmon in coastal marine waters: An interdecadal perspective with implications for climate change

Beverly Agler and Greg Ruggerone

Growth of the Bristol Bay and Yukon River, Alaska, chum salmon in relation to climatic factors and inter-specific competition

Bernard A. Megrey, Jason S. Link, Thomas J. Miller, Tim Essington, R. Ian Perry, Alida Bundy, Ken F. Drinkwater and Erlend Moksness

Can production models be used as a tool to examine factors that influence productivity of marine systems?

Louis W. Botsford, Matthew D. Holland, J. Wilson White and Alan Hastings

Population dynamic effects of fishing and climate change on upper trophic levels in the northeast Pacific

Shang Chen, Dachuan Ren, Dong Wang, Jingmei Li, Tao Xia and Guoying Du

Marine ecological capital assessment: Concepts and frameworks

James R. Irvine, Kim D. Hyatt, Janelle Curtis and Ray Lauzier

Science-based ecosystem approaches under Canada's Wild Salmon Policy

Poster Presentations

Michio J. Kishi, Kenta Awa and Takeshi Terui

Ecosystem approach for management of chum salmon coupled with NEMURO

Sang-Rae Lee, Tae Keun Rho, Jung Hyun Oak, Tongsup Lee, Jin Ae Lee and Ik Kyo Chung

Metagenomic approach to plankton species diversity of the East Sea of Korea

Thomas C. Kline, Jr.

Estimating over-winter mortality of age-0 Pacific herring based on loss of energy content and implications for recruitment

Yu-Chun Huang and Wen-Bin Huang

Maturation of female Pacific saury *Cololabis saira* (Brevoort) in the northwestern Pacific from the Taiwanese fishery catch

Takaomi Kaneko, Takashi Yamakawa and Ichiro Aoki

Formularization and internalization of the future external diseconomies produced by present fishing activities

Thomas C. Wainwright and Laurie A. Weitkamp

Climate effects and Oregon coast coho salmon: A multi-ecosystem approach

Hideaki Kudo, Akihiro Etoh and Masahide Kaeriyama

Attempt to estimate spawning escapement of chum salmon, *Oncorhynchus keta*, using aerial census by radio-controlled helicopter

You Jung Kwon, Doo-Hae An, Keith Bigelow and Dae-Yeon Moon

Effects of fishery factors on catch rate of bigeye tuna, *Thunnus obsesus* and yellowfin tuna, *Thunnus albacare* in the Korean tuna longline fishery

Hyeok Chan Kwon, Chang Ik Zhang and You Jung Kwon

Estimation of population parameters for filefish (*Stephanolepis cirrhifer*) in the Japan/East Sea of Korea

Hiroshige Tanaka, Seiji Ohshimo and Chiyuki Sassa

Trophic relationships of small pelagic fish in the East China Sea and Sea of Japan: A stable isotope approach

Yuichiro Kogura, James E. Seeb, Noriko Azuma, Hideaki Kudo, Syuiti Abe and Masahide Kaeriyama

Genetic population structure of lacustrine sockeye salmon, *Oncorhynchus nerka*, in Japan

Alexei M. Orlov, Vadim F. Savinikh and Eugeny F. Kulish

Pacific sleeper shark in the North Pacific: New data on distribution and size composition

Kevin Thompson

Factors affecting the diets of groundfish in the Gulf of Alaska

Elizabeth Logerwell, Kimberly Rand and Tom Weingartner

Arctic cod (*Boreogadus saida*) and snow crab (*Chionoecetes opilio*) distributions relative to oceanography in the Alaskan Beaufort Sea, August, 2008

Ryuji Yukami, Mari Yoda, Seiji Ohshimo and Hiroshige Tanaka

Stock size fluctuations in chub and spotted mackerel in the East China Sea and Sea of Japan from 1973 to 2008

Hector D. Douglas III, Alan M. Springer, Suzanne Budge, Igor Ermakov and Werner Gellermann

Discriminating variation in consumption patterns and carotenoid content of juvenile Pacific Salmon with fatty acid analysis and Raman spectroscopy

Ji-Hyeon Kim, Jung Nyun Kim, Tack-Yoon Oh, Jin Ho Bae, Hyeong Gi Kim and Chul-Woong Oh

Age, growth and reproductive biology of Filefish *Tamnaconus modestus* in the Southern Sea of Korea

Sukgeun Jung and Il Su Choi

Estimating abundance of Pacific cod (*Gadus macrocephalus*) by applying a mark-recapture method during the spawning season in Jinhae Bay, Korea

Heui Chun An, Bong Seong Bae, Kyoung Hoon Lee, Chang Doo Park and Chae Sung Lee

Evaluation of LED fishing lamps for jigging and angling boats

Jae Bong Lee, Soo Jeong Lee, Jong Hee Lee, Young Jae Shin, Yeong Min Choi, Dong Woo Lee and Chang Ik Zhang

Seasonal variations in the composition of fisheries resources in the coastal ecosystem of Youngil Bay, Korea

Jong Hee Lee, Jae Bong Lee and Chang Ik Zhang

Forecasting variations of fishery and ecosystem risk indices for large purse seine and twopaired trawl fisheries in Korean waters using IFRAME

Graham E. Gillespie, Antan C. Phillips and Lindsay C. Orr

Population dynamics and biological characteristics of the invasive European green crab, *Carcinus maenas*, in British Columbia, Canada

Tatiana Tunon and Gottfried Pestal

Authorship patterns in 30 years of DFO research documents: Is applied fisheries research like other science?

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Gottfried Pestal and Tatiana Tunon

Visualizing a complex spawner-recruit model for sockeye salmon

Jung Hyun Lim and Chang Ik Zhang

Estimation of population ecological characteristics of Thomas's rapa whelk, *Rapana venosa*, along the west coast of Korea

Hee Won Park and Chang Ik Zhang

Study on the ecological characteristics of *Mugil cephalus* in waters south of Korea

Soo Jeong Lee, Hyeok Chan Kwon, Sang Cheol Yoon, Yeong Min Choi and Chang Ik Zhang

Age and growth of *Gomphina veneriformis* along the east coast of Korea

Jae Bong Lee, Young Jae Shin, Jong Hee Lee, Yeong Min Choi, Jae Seong Lee, Dong Woo Lee and Inja Yeon

Spatial biomass distribution of *Corbicula japonica* in the Seomjin River of southern Korea

Hyun Jeong Lim, Kwang Jae Park, Sang Ho Baik, Tae Seek Lee, In Kwon Jang, Hyun Sob Han and Phillip R. Mundy

Recovery of the productivity of shellfish aquaculture in the Western Sea of Korea after the *Hebei Spirit* oil spill

Theresa A'mar

Incorporating ecosystem forcing through predation into a management strategy evaluation for the Gulf of Alaska walleye pollock (*Theragra chalcogramma*) fishery

POC Paper Session

Co-Convenors: *Michael Foreman (Canada) and Ichiro Yasuda (Japan)*

Background

Papers were invited on all aspects of physical and biogeochemical oceanography and climate in the North Pacific and its marginal seas, except those covered by Topic Sessions S8, S13 and S14.

Summary of presentations

The session consisted of 18 oral presentations and 6 posters covering a wide range of physical and biogeochemical oceanographic research. Unfortunately two scheduled oral presenters (Qiao and Ishchenko) were unable to attend the meeting and their slots could not be filled in time. Kyung-Il Chang, Ichiro Yasuda, Nicholas Bond, and Mike Foreman chaired sub-sessions over the 1-day presentation period. The morning portion included interesting talks related to: (1) water characteristics in the Yellow and Japan-East Seas (Ro), (2) projected climate changes to upper ocean stratification (Capotondi), (3) CO₂ air-sea fluxes in the western Arctic Ocean (Chen), (5) sea level and ocean colour features in the Northeast Pacific as revealed by satellite imagery (Crawford), (6) a warming signal in the upper layers of the East/Japan Sea (Na), (6) low frequency sea-level variability in the Japan/East Sea (Trusenкова), and (7) numerical simulations of winter mixed layer south of Japan (Kuroda).

The early afternoon session largely focused on Arctic and sub-Arctic Seas. Stabeno compared recent cold (2007–2010) and warm (2001–2005) periods on the eastern Bering Shelf, Bond described factors controlling the extent of Bering Sea ice in spring, Ustinova described extreme winter events in the Okhotsk and Bering Seas, Trusenкова described her multivariate analysis of winds over the Japan/East Sea using scatterometer data, and Gao described changes in the Arctic carbon sink from 1999 to 2008. In the final sub-session, Chang described anomalous upwelling features off the east coast of Korea, Ladd described the Pribiloff Eddy in the eastern Bering Sea, Ladychenko described eddies in the northwestern Japan/East Sea, Nieto described the affects of mesoscale structures in the California Current on the distribution and survival of fish, Ueno described observations of the Kenai Eddy in the Alaskan Stream, and Liu described tide-induced Lagrangian eddies in Jiaozhou Bay.

The Best Presentation award in a sponsored POC-sponsored session was given to early career scientist, Hiroshi Kuroda, for his talk “*A numerical study on the winter mixed layer on the shelf-slope region south of Japan*” in this Contributed Paper Session. (See the list of awards at the end of this Session Summaries report).

List of papers

Oral presentations

Young Jae Ro

Linking tropical oceanic conditions to water characteristics in the subtropical western Pacific marginal seas

Antonietta Capotondi, Michael Alexander, James Scott, Enrique Curchitser and Nicholas Bond

Climate change in upper-ocean stratification as inferred from the IPCC AR4 models

Liqi Chen, Zhongyong Gao and Weijun Cai

Precision evaluation of air–sea fluxes of CO₂ in the western Arctic Ocean under rapid sea ice shrinking and its implication to global climate change

William R. Crawford

Features of the northeast Pacific Ocean

Hanna Na, Kwang-Yul Kim, Kyung-Il Chang, Kuh Kim and Shoshiro Minobe

Warming signal in the upper layers of the East/Japan Sea

Olga Trusenkova and Dmitry D. Kaplunenko

Low frequency variability of sea level in the Japan/East Sea estimated from AVISO satellite altimetry

Hiroshi Kuroda, Takashi Setou, Yuichi Hirota, Manabu Shimizu and Kazuhiro Aoki

A numerical study on the winter mixed layer on the shelf-slope region south of Japan

Phyllis J. Stabeno, Nicholas A. Bond and Jeffrey M. Napp

Eastern Bering Sea shelf: Comparison between a cold period (2007–2010) and a warm period (2001–2005)

Nicholas A. Bond, Phyllis J. Stabeno, Albert J. Hermann and Muyin Wang

What controls the extent of ice in the Bering Sea in spring?

Elena I. Ustinova and Yury D. Sorokin

Winter extreme events in the thermal state of the Okhotsk and Bering Seas

Olga Trusenkova

Multivariate analysis of wind stress and curl over the Japan/East Sea based on satellite scatterometry data

Zhongyong Gao, Liqi Chen and Heng Sun

Developments of the Arctic carbon sink from 1999 to 2008

Jae-Hyung Park and Kyung-Il Chang

Characteristics of anomalous coastal upwelling detected off the east coast of Korea in summer 2007

Carol Ladd, Phyllis J. Stabeno and Julia O’Hern

The Pribilof Eddy in the eastern Bering Sea

Svetlana Y. Ladychenko, Vyacheslav B. Lobanov and Dmitry D. Kaplunenko

Evolution and hydrographic structure of mesoscale eddies formed in the northwestern Japan Sea

Karen Nieto, Sam McClatchie and Edward D. Weber

How does mesoscale oceanic structure in the California Current System affect the distribution and ultimately the survival of larval fish?

Hirofumi Ueno, Hiroji Onishi, Sachihiko Itoh, Ichiro Yasuda, Yutaka Hiroe, Toshio Suga and Eitarou Oka

Observations of a Kenai eddy along the Alaskan Stream south of the Aleutian Islands

Guangliang Liu, Zhe Liu, Huiwang Gao and Shizuo Feng

Simulation of the Lagrangian tide-induced residual current in Jiaozhou Bay, North China

Poster Presentations

Zhongyong Gao, Liqi Chen and Heng Sun

CO₂ system in the Bering Sea

Talgat R. Kilmatov, Elena V. Dmitrieva and Olga I. Trinko

The indirect estimation of the climatic trend of kinetic energy production in the North Pacific

Zhongyong Gao, Liqi Chen and Heng Sun

Summertime CO₂ system distribution and air–sea CO₂ fluxes in the Bering Sea

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Yugo Shimizu, Lynne D. Talley, Shin-ichi Ito, Shigeho Kakehi and Taku Wagawa

Spreading pattern and transport of the Okhotsk Sea Intermediate Water to the northwest Pacific revealed by profiling floats with optode and hydrographic observations

V.V. Moroz

Peculiarities in intermediate water characteristics in the Komandor–Kamchatka area

Tae-Hoon Kim and Guebuem Kim

Basin-scale low N:P ratios and DOC export in the East/Japan Sea

TCODE Topic Session (E-Poster)

Monitoring and Ocean Observing Systems

Convenor: *Toru Suzuki (Japan)*

Background

Integrated Ocean Observing Systems have recently received significant attention for monitoring and reporting the status of coastal, continental shelf and even deep ocean ecosystems. Ocean Observing Systems enhance our ability to collect, deliver, and use ocean information, and they deliver the data and information needed to increase understanding of our oceans and coasts, so decision makers can take actions to improve safety, enhance the economy, and protect the environment. Ocean Observing System information is also used to initialize numerical ecosystem models. Contributions to this session demonstrated the application of ocean observing systems that support the FUTURE goals of improved understanding, status reports, outlooks and forecasts through the use of electronic display systems, including interactive web sites and animations.

Summary of presentations

Igor Shevchenko demonstrated PICES TCODE geospatial portal using GeoNetwork, which is open source software based on international and open standards for services and protocols including web-based interactive map viewer, on the PICES rented server. The geospatial portal stored the PICES digital document library and metadata collected under the PICES Metadata Federation and TINRO-Centre provides a great contribution to maintain the server.

Tony Koslow showed the California Cooperative Oceanic Fisheries Investigations (CalCOFI) which is developing on the web-based information-management system known as DataZoo. The DataZoo information environment aggregates 2- or 3-dimensional physical and biological data, enhancing data access and contributing to the coherence and quality of the long-term CalCOFI data. DataZoo includes datasets ranging from species level counts and hydrographic profiles to biogeochemical measurements and core CalCOFI data sets as well as data from California Current Ecosystem Long-Term Ecological Research Program and others partner programs.

Richard Dewey demonstrated the VENUS (Victoria Experimental Network Under the Sea) coastal observing system with real time data displays and user controlled interactive experimental systems including CTD measurement, time series of dissolved oxygen, turbidity, ADCP currents, echo-sounder images of fish and zooplankton. He also demonstrated the access to the on-line data archive and real time signals through the Internet from Saanich Inlet and the Strait of Georgia, Canada. The mobile assets such as Gliders, AUVs, water columns profilers, and geospatial mapping of marine conditions will be supported in future.

These systems can access to remote databases through the Internet and visualize data interactively by using recent information and communication technologies, and are expected to develop along with improvement of information and communication technologies.

List of papers

Poster Presentations

Igor Burago, Bernard A. Megrey, Georgiy Moiseenko, Olga Vasik, Tatiana Semenova and Igor Shevchenko

Using the PICES rented server

Karen Baker, Edward D. Weber and J. Anthony Koslow

CalCOFI information management and data delivery

Richard Dewey and Verena Tunncliffe

VENUS: Real time ecosystem monitoring from a coastal observing system

BIO Workshop (W1)

Marine ecosystem model inter-comparisons (III)

Co-convenors: *Harold P. Batchelder (USA), Shin-ichi Ito (Japan), Guimei Liu (China) and Yvette Spitz (U.S.A.)*

Background

The objective of the Marine Ecosystem Model Inter-comparison Project (MEMIP) was to compare the performance of various lower trophic level marine ecosystem simulation models at predicting the abundance and distribution of coastal zooplankton functional groups. Models with high performance were used to examine the future state of the marine ecosystem to global climate change. This workshop built upon the discussions and planning accomplished at the successful workshop held at PICES-2009. The workshop was a technical, hands-on, one with focus on parameterizing, executing and calibrating three test bed versions of a biogeochemical lower trophic level (LTL) marine ecosystem models. At each test bed it was planned to run 3 to 6 ecosystem models. Specific ecosystem models (*i.e.*, NPZD, NEMURO and CoSINE) were executed. Some models were tuned to run in a specific region and others were applied to areas different from where they were calibrated. Model skill assessment was evaluated. The models were used to identify important mechanisms that control secondary production, zooplankton biomass and variability, as well as bounding the levels of uncertainty in model predictions by calculating ensemble statistics. Eventually, comparisons at multiple locations will provide information on the spatial-temporal robustness of particular model structures and parameterizations. The products of the comparison will contribute to FUTURE by estimating the uncertainty and the limits of forecasting.

Summary of Workshop

Eighteen scientists from all 6 PICES member countries, plus Norway, participated in the 3rd MEMIP workshop that was held Saturday–Sunday, October 23–24, 2010. After reviewing the current status of MEMIP and describing the general goals and objectives, we heard an interesting invited talk by Guimei Liu of China on a nowcast/forecast model in the South China Sea. Hal Batchelder and Shin-ichi Ito described the datasets that are available and the data that have been prepared and place on the “orion” server at the Alaska Fisheries Science Center. Following a question regarding the continued availability of “orion”, which was provided by Bern Megrey, Batchelder agreed to contact the appropriate people at AFSC to determine if it would be possible to continue MEMIP use of “orion” for another two years. Jeff Napp was contacted and indicated that he would approve such use following a written request from the MEMIP group. Batchelder agreed to prepare a request shortly, following the conclusion of PICES-2010. In addition, we will request an additional user account be established for a new active member of MEMIP, Jerome Fiechter of the U.S.A.

Our original goal was to have at least one, and hopefully two, regional 2D models configured to provide a well-defined and consistent physical test bed for the testing of multiple ecosystem models. Toward that end, Dr. Yvette Spitz configured a domain for the Newport, Oregon line prior to the meeting, and was expected to

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have a domain configured for the Seward (GAK) line shortly following the meeting. We had agreed at the MEMIP-2009 workshop to freeze the ROMS code based on a November 2009 version. However, two participants during the workshop (Peña and Fiechter) indicated that the biological codes in ROMS were extensively reconfigured in summer 2010. This was the first major reorganization of the biological codes in ROMS in more than 5 years. The changes were significant and would simplify the addition of new models, thus the MEMIP team agreed to update to the most recent version. The adoption of this will greatly simplify the addition of new ecological models. More importantly, the new version has a more accurate advection-diffusion code for biological tracers. We retrieved the new ROMS code from the ROMS repository and installed it on "orion". Thanks to the concerted work of Peña and Spitz during the workshop, test codes were successfully compiled and run. Unfortunately, it was not possible to recode the Spitz model of the Newport system (our working testbed) into the new version during the workshop.

During the final two hours of the workshop, the group held a broad-ranging discussion of MEMIP's future directions (short- and long-term), products and deliverables, and a timeline for completing the outlined tasks. The group agreed that MEMIP should focus on activities that will advance the main deliverables of the project, namely:

- Parameterize, execute (and optionally calibrate) multiple ecosystem models (3–6) in each of three test bed regions;
- Quantitative skill assessment;
- Identify mechanisms that are important controls on the level and variability of secondary production (= zooplankton biomass) at each test bed site;
- Bound the levels of uncertainty in model predictions by calculating ensemble statistics.

We believe the above list is in priority order (highest to lowest), mostly because the activities logically proceed from the first to the last.

Given the desire of the MEMIP to conclude the project's activities by PICES-2012, we felt that it would be best to continue with the planned 2D comparisons of the A-Line, GAK and Newport Lines. We agreed that we should attempt multiple simulations to generate ensembles of outputs using different ecosystem models, parameter values and different forcing years. A timeline was established so that all of the model simulations will be completed before the PICES-2011 ASC in Khabarovsk, Russia. A 1.5-day workshop immediately preceding the PICES-2011 ASC was proposed. The focus of this 4th MEMIP workshop will be quantitative model-model and model-data analysis and comparison of the results of the simulations.

List of papers

Oral presentations

Guimei Liu, Hui Wang and Fei Chai (Invited)

Developing Nowcast/Forecast Ecosystem Model in the South China Sea

Harold Batchelder

Data types and availability for the CCS (Newport) and GOA (Seward) test bed locations

Shin-ichi Ito

Data types and availability for Western Subarctic (A-Line) test bed location

Harold Batchelder (with input from all)

Test beds, Ecosystem Models Available, Computer Platforms for MEMIP

Yvette Spitz

Demonstration: How to merge/modify an ecological model into ROMS/Compiling Example

Small group activity

Whet your modeling appetite before lunch; identify biological models to implement

Implement new ecosystem models into ROMS and run existing codes

Meet in plenary to discuss problems/troubleshoot

Continue implementation of models

Yvette Spitz

Demonstration: Running a model; an example from the Oregon Shelf; BC's, IC's, surface forcing

Continue implementation of models/run models if ready/debugging

More debugging

More debugging, and hopefully some successful model runs

Debugging, debugging, debugging...

Workshop Convenors

Progress Review, Timetable, Next steps include post-simulation analyses, Action Item Identification

FIS Workshop (W2)

Beyond Lagrangian: Modeling migratory fish behavior in Global Circulation Models

Co-Convenors: *Enrique Curchitser (U.S.A.), Shin-Ichi Ito (Japan) Michio Kishi (Japan) and Skip McKinnell (PICES)*

Background

The advent of high resolution coupled atmosphere–ocean circulation models and the creation of repositories of high resolution 4-D ocean hindcasts and future scenarios, as well as advances in modeling of higher trophic levels and the constantly increasing computer power, has made it possible to add virtual fish to these models. The ability to study virtual fish in a virtual ocean has a potential to elucidate past phenomena and potentially, to predict future behavior. Recent developments in satellite data availability, in data assimilating physical models, and in tagging technologies for fishes, all increase the chance to improve our understanding of fish migration mechanism. However, fish behavior is complex. It is a consequence of genes, the physical, chemical and biological environment and their interaction, and perhaps even from learned behavior. This makes the modeling of fish behaviors very complex, and suggests that a team approach to model building might be desirable. The purpose of this workshop was to understand the current state of development in modeling fish behaviour. Presentations discussed the successes (and failures) in modeling migratory fish behavior. Presentations related to data availability to evaluate fish behavior models and laboratory experimental approaches to investigate fish behavior were also welcomed. Based on the results and opinions expressed at the workshop, the convenors discussed the desirability of establishing a group that will focus its attention on developing and advancing the state of fish behavioral modeling.

Summary of Workshop

The workshop ended much better than it began. In his introduction, Skip McKinnell told the 25 participants that the invited speaker was unable to fly to Portland. This news was complemented by a second withdrawal, caused by a corrupted file on a memory stick. However, with a quick rearrangement of the schedule and some welcome volunteer presenters from an enthusiastic audience, the topic came to life. In the end, it was the last group to leave the venue that afternoon.

Prof. James Anderson from the University of Washington began with a talk that focused on micro-scale turbulent influences on salmon migration. He described how fish use rheotaxis, chemotaxis, and geomagnetotaxis during migration and how the relative amounts of each vary according to developmental stage. Brian Burke, also from the University of Washington, considered three issues of concern when modeling animal migration: the choice of temporal and spatial scales in the model, responses to local stimuli, and model validation. He concluded that the correct choice of scale is important, that migration needs more than responses to local factors, and that model validation needs to consider the nature of the observations. Chloe Bracis, the third speaker from the University of Washington, was interested in determining whether salmon can return to their home river from widely distributed locations in the ocean by imprinting the magnetic field imprinted as juveniles. Migration simulations using the inclination and intensity of the magnetic field gave favourable results when compared with arrival timing at two Snake River hatcheries where the stocks have very different run timing. Steven Teo described how new technologies are being used to follow

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the migrations of large pelagic fishes such as sharks and tunas. The data from these observational systems will provide critical observations for model validation.

Michio Kishi of Hokkaido University presented the results of a modeling study of Japanese chum salmon migration and growth that he had undertaken with colleagues. Migration directions were based on a vector sum of best growth direction and advection direction. Model results were compared with observed mean size at age in two years of different oceanic conditions. Migration based on an SST rule resulted in meridional migration but not zonal migration. John Payne, of the Pacific Ocean Shelf Tracking Project (POST) introduced the kinds of observational data that POST is providing and raised some interesting questions about the assumptions needed to model these data.

In the discussion that followed, participants found two important missing pieces of information to model fish migrations. One is prey density distributions and the other is vertical distribution of fishes. For phytoplankton distribution, satellite images are available but for zooplankton, the data are limited. In the North Atlantic, the Continuous Plankton Recorder is used to collect information on the spatial distribution of zooplankton. But the data is restricted to the surface layer. For forage fishes, there is even less data than for zooplankton and the information about the vertical distribution of the target species is also limited. Much more systematic data, which includes ocean environments, prey, and target species distributions is needed to model fish behaviors. Additionally, improvements of zooplankton models are encouraged. Even if such a kind of systematic data is available, it is still difficult to define the mechanism of the fish behaviors. To define the happiness of target species with multiple parameters, data assimilation methods seems effective, but simplified laboratory experiments and endocrinological analysis are essential to elucidate the mechanisms.

The participants encouraged the convenors to pursue, within PICES, the scientific challenge of modeling animal behaviours in the ocean. However, the convenors noted an imbalance of North Americans over Asians at the workshop, so they felt that it was premature to discuss the formation of a migration modeling group. Instead, the workshop convenors chose to propose a topic session on migration modeling for PICES 2011 (Khabarovsk, Russia) to allow greater participation by Asian modelers and to gauge the overall interest in this relatively specialized, but important discipline. The topic session was later endorsed by Science Board.

List of papers

Oral Presentations

James Anderson

Seeking principles for modeling fish migratory behavior - A cross discipline approach

Dongwha Sohn, Lorenzo Ciannelli, Janet T. Duffy-Anderson and William T. Stockhausen (withdrawn)

Modeling the drift pathways of Greenland halibut (*Reinhardtius hippoglossoides*) from spawning to settling locations in the eastern Bering Sea using the Dispersal Model for Early Life Stages

Chloe Bracis

Successes and limitations modeling fish behavior with limited data

Brian J. Burke, James J. Anderson and Edmundo Casillas

Evaluating behavioral rules potentially used by migrating salmon

Steven L.H. Teo, Suzy Kohin, Heidi Dewar, David Wells and Candan Soykan

Movement patterns of pelagic sharks and tunas in the Northeast Pacific

MEQ Workshop and a Laboratory Demonstration (W3) and HAB-S Meeting
New technologies and methods in HAB detection: I. HAB species detection

Co-conveners: *Ichiro Imai (Japan) and Vera Trainer (U.S.A.)*

Background

We begin a series of workshops and lab demonstrations focusing on new technologies in harmful algal bloom (HAB) research and monitoring. The first workshop in this series included demonstrations of new methods in organism detection with concentrated information on HAB species. This workshop and integrated demonstrations included demonstrations and lectures describing equipment and methods from the following list: environmental sampling platform (ESP), FloCam, sandwich hybridization assay (SHA), qPCR, FISH, and *in situ* sensors including gliders. This series will continue in the future with demonstrations on automated nutrient samplers, modeling, remote sensing, and other techniques.

Summary of Workshop

There were 22 scientists in attendance: U.S.A. (14), Canada (1), Japan (4), Korea (1), and Russia (2)

Satoshi Nagai (FRA, Research Institute of Fisheries and Environment of Inland Seas, Japan) described recent developments in molecular diagnostic technology for HAB detection. With loop mediated isothermal amplification (LAMP), there is no need to denature double stranded DNA into single strands, and it is an isothermal reaction (one temperature throughout, 60–65°C).

Vladi Cherepakhin (Accuri Cytometers Inc., U.S.A.) described the use of Accuri Flow Cytometry. The flow cytometer weighs only 25 lbs and is highly portable (easily shipped). Power consumption is the same as a laptop computer. It uses negative pressure to pick up samples using peristaltic pumps using a proprietary method that avoids pulsing flow. Fluorometric detectors are arranged around the flow cell so there is no need for dichroic mirrors, and so no alignments, adjustments or calibrations are needed. It has a high dynamic range and a zoom feature included in the software for viewing data. An automatic sampler capable (add on) is capable of sampling from 24, 48, 96 well formats. (Performance validation (using beads) was provided.) Bacteria and viral detection can be used via nucleic acid stain, dye and side scatter. The documented upper size of core portion is 40 microns, but 70 micron particles have been used with no problems. The system is about \$40K complete. A sorting capability is being developed, but there is no certainty that it will be compatible with current units.

Ichiro Imai (Hokkaido University, Japan) described work on the detection of *Alexandrium tamarense* cysts with a real-time PCR. The toxic species in Japan are: *A. tamarense*, *A. catenella*, *Gymnodinium catenatum*, *A. minutum*, *A. tamarense*, and others. From 1993–2001 there has been an expansion of PSP events, especially in southern Japan. The first record of a PSP occurrence in Osaka occurred in 2002 with re-occurrences every year between 2006–2010. Accumulations of toxin have been found in Manila clams, Arch shell, brackish-water clams, and Japanese cockles. qPCR (quantitative PCR) using real-time PCR is species-specific quantification and has high sensitivity. The method is described in Kamikawa *et al.* 2007 in Harmful Algae Vol. 6. Calcaflour white staining is used for vegetative cells and primuline for cysts. The method involves sonicating, size fractioning, washing via centrifuge. Visually, *A. tamarense* and *A. catenella* have very similar cysts. In Osaka Bay, however, there was no detection of these species. There was good agreement between real-time PCR and primuline staining method as far as concentrations of cysts. They exist in a 10–27°C temperature range throughout the year, and no vegetative cells are seen at temperatures >15°C. Real-time PCR detected cysts at a low density (<10 cysts/gram wet weight sediment) and cysts were detected throughout the year even though germination begins in winter when water temperatures decrease below 15°C. Laboratory cultured cells and cysts were used to calibrate PCR product to numbers of cysts. The top 3 cm of sediment was used for analyses. It was noted that the cysts found below 1 cm of sediment have been shown to be much different (older, possibly more compromised) than the newer ones above 1 cm.

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Kate Hubbard (University of Washington, U.S.A.) is working on *Pseudo-nitzschia* populations and their molecular detection in Puget Sound. She used PCR primers for the ITS1 region where the length and sequence is specific to different species. Using the ARISA method, sequence lengths used were compared with Genbank and other clone libraries. Relative abundance was achievable with this method, but not absolute abundance. Twelve *Pseudo-nitzschia* species were detected, with populations from March being very different from populations taken in August. The August populations were also more diverse. In spring the most common species was *P. delicatissima* but in August, it was more diverse. In spring, *P. granii* was found in coastal and inland areas but it is considered to be a more oceanic species. Spring temperatures were more homogenous than in August because of downwelling. Again, in spring *P. delicatissima* and *P. granii* were found and in August *P. pungens*, *P. multiseriata*, *P. heimii* and *P. Americana* were found. The inland and coastal communities were more distinct in summer than in spring, and coastal populations were distinct from inland populations.

Mark Wells (University of Maine, U.S.A.) described Raman-based barcoding for identification of toxic marine pathogens and phytoplankton. There is a growing need for biosensors that are not species specific, are compact, robust, and have low power requirements. Nanotechnology can be used to detect bioanalytes and species can be detected through linkage to these bioanalytes or through direct sensing of the species themselves. The detection involves a vibrational spectroscopy method (Raman spectroscopy). Surface Enhanced Raman Scattering (SERS) is up to 15 times more sensitive than regular Raman.

Nick Adams (NOAA, U.S.A.) described the population structure of *Pseudo-nitzschia australis* and DA production in Washington State. He used microsatellite markers developed for *P. pungens* and *P. australis* to identify and differentiate individuals and to detect population parameters such as Hardy-Weinberg equilibrium. Most Pacific Northwest (PNW) isolates of *P. pungens* isolates are unique and all were unique from the North Sea isolates. All PNW isolates deviated from Hardy-Weinberg and had significant linkages (dis)-equilibrium. There were two populations present in PNW isolates analyzed via STRUCTURE, a software program (both Hardy-Weinberg and linkage (dis)-equilibrium were present). For *P. australis*, progress to date has involved 25 individuals only and all but 2 isolates were distinct, suggesting a single population. Twenty-five individuals include isolates from Washington and California only.

Jim Birch (MBARI, U.S.A.) discussed an Environmental Sampling Platform (ESP) and recent detection of marine microbes. ESP can preserve or lyse cells (with further processing). It can be used with SHA, qPCR, etc. The annual southern California bloom event at Newport Beach was studied using two ESPs and gliders. On April 20, a drop in water temperature was recorded on ESPs and by the end of April, *P. multiseriata* and some *P. australis* came into the assemblage (corresponding increase in DA detected as well). Cooler temperatures at the end of month correlated with phytoplankton growth and upwelling event. Development of a third generation ESP is underway and he is working to place it in a glider-type platform/vehicle instead of static location (buoy).

Bruno Soffientino (Wet Labs Inc., U.S.A.) noted that instruments for HAB detection are new to Wet Labs as they are an optics company by trade, making optical detectors for fluorescence, absorbance, scattering. They have wet chemistry applications such as phosphate, ammonium and other nutrient analysis, but there are separate units for each analysis. Gas *et al.* (2009) developed the ELISA method for whole cells of *A. minutum*. Bead use is problematic because of the need to keep the beads in suspension. A tangential flow filter that is easier on cells is being used, but the pre-filter size (10 microns) may be an issue in more turbid or high productivity areas. The service time is 3–6 months, but it is probably much less than that in turbid or high productivity areas.

List of papers

Oral presentations

Satoshi Nagai (Invited)

Recent developments in molecular diagnostic technology for HAB detection

Katie Flynn Bush, Juli Dyble Bressie, Chris Navas and Clare E. Rogers

A novel, portable flow cytometer facilitates algal population quantification in cultures and environmental samples

Ichiro Imai, Tomotaka Shiraishi, Ken-Ichiro Ishii, Keigo Yamamoto, Masaki Nakajima and Satoshi Nagai

Detection of *Alexandrium tamarense* (Dinophyceae) cysts in bottom sediments with real-time PCR assay: Cyst dynamics and occurrence of bloom in Osaka Bay, the Seto Inland Sea

Katherine Hubbard, Claire H. Ellis and E. Virginia Armbrust

Molecular detection and insights into differentiation of Eastern Pacific *Pseudo-nitzschia* communities from the open ocean to the Puget Sound estuary

Vera L. Trainer, Mark S. Strom, Qiuming Yu and Mark L. Wells

A proposal for raman-based barcoding for the identification of toxic marine pathogens and phytoplankton

Nicolaus G. Adams, Piper Schwenke and Vera L. Trainer

Population structure of *Pseudo-nitzschia australis* and its association to domoic acid production in the waters of Washington State

James Birch, Scott Jensen, Brent Roman, Doug Pargett, Christina Preston, Roman Marin, Cheri Everlove and Christopher Scholin

Remote detection of marine microbes, their genes and gene products using the Environmental Sample Processor (ESP)

Satoshi Nagai and Shigeru Itakura

Demo: Simple, rapid, specific and cost-effective method for identifying *Alexandrium tamarense* and *A. catenella* using "LAMP" method

Katie Flynn Bush

Demo: Flow Cytometry

Poster Presentations

Bich-Thuy L. Eberhart, Brian D. Bill, Nicolaus G. Adams, Soram Hong and Vera L. Trainer

Pseudo-nitzschia and cellular domoic acid levels along the coastline of the Pacific Northwest, USA: Summer 2009

Brian D. Bill, William P. Cochlan and Vera L. Trainer

Kinetics of nitrogen uptake and transient ammonium uptake response by the toxigenic diatom *Pseudo-nitzschia turgidula*

POC Workshop (W4)

PICES Working Group on Evaluations of Climate Change Projections (WG 20): Progress and FUTURE

Co-Convenors: *Michael G. Foreman (Canada) and Yasuhiro Yamanaka (Japan)*

Background

Presentations and discussions were carried out on: (1) progress related to the WG 20 Terms of Reference, (2) status of, and future work on, the final report, and (3) follow-up activities that conform to FUTURE objectives and needs.

Summary of Business Meeting and Discussions

After introductory formalities and Muyin Wang kindly agreeing to act as the rapporteur, Mike began the meeting began with a recap of the WG terms of reference (TORs) and his personal summary (Appendix 1) of activities addressing each one. It was generally felt that significant progress had been made with the IPCC GCM evaluations (#1), the development of regional climate models (RCMs) (#3), collaboration with other PICES groups like CFAME and WG25 (#2), and convening PICES and international workshops/sessions (#5).

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As WG20 completed its tenure at this PICES meeting, a primary discussion point was the structure and content of the final report. It was agreed that each of the WG member chapters should summarize work accomplished versus the TORs and be 10-20 pages long. With an expectation of contributions from all members, the following chapter outline was put forward:

- 1) Acknowledgments, Abbreviations & Acronyms, Executive Summary
- 2) Introduction: background, Terms of Reference, membership, outline
- 3) Wang, Overland, Bond: GCM downscaling procedures & examples
- 4) Di Lorenzo, Miller: regional climate modeling & covariability in North Pacific
- 5) Foreman & colleagues: RCM development for BC shelf waters
- 6) Christian: GCM carbon cycle development
- 7) Curchitser, Hermann: RCM development for the NE Pacific and Bering Sea & two-way coupling of this RCM into the NCAR GCM
- 8) Ustinova, Zuenko: evaluation of climatic variability in Far Eastern Seas
- 9) Navrotsky: interactions between climate and ecosystems
- 10) Yamanaka, Hasumi, & colleagues: ecosystem projections for the Kurorshio/Oyashio system
- 11) Jang, Pang, Yeh, Oh & colleagues: GCM projections of changes to mixed layer depth
- 12) Qiao, Wang, Wu & colleagues: Chinese contributions
- 13) Summary and recommendations

It was emphasized that the final report is considered “grey literature” and will not be formally reviewed. As such, individual chapters should only give highlights of work that is either planned for publication, or has already been published. For specific PICES formatting requirements authors were referred to http://www.pices.int/publications/scientific_reports. Rosalie Rutka from the PICES Secretariat will be the technical editor and although she prefers MS Word files, she will accept other formats (*e.g.*, LaTeX equations will be converted to MathType). Tables can either be in Word or Excel (no images of tables) and though the figures can be in any one of the common various formats (*e.g.*, eps, tiff, jpg), they should be good quality and use greyscale if colour is not necessary. Tables and figures can be put at the end of each chapter and Rosalie will fit them into the text later. Chapters should be sent to Mike by December 31, 2010, with earlier submissions preferred.

As PICES Science Board and Governing Council are particularly interested in the recommendations from this WG, Mike presented four possibilities (Appendix 2) that will hopefully be expanded and extended in the final report. Draft TORs for a new working group on “North Pacific Climate Variability and Change” that was proposed by Emanuele Di Lorenzo and Shoshiro Minobe were also presented and discussed along with the four recommendations. Several comments were made asking for clarification of terminology (*e.g.*, conceptual mechanistic model), time scales, and scope, and these were recorded so they could be passed on to Di Lorenzo and Minobe. Possible membership (*e.g.*, the need to bring in new people) was also discussed.

Hiroaki Saito, chair of the COVE Advisory Panel, gave a brief summary of the COVE meeting on October 22. COVE fully supports the proposed new “climate” working group and is proposing both another new working group on “Ecosystem Responses to Multiple Stressors” and a workshop on “Indicators of Status and Change within North Pacific Marine Ecosystems: a FUTURE workshop” to occur just before or after the Inter-session Science Board meeting in April.

Anne Hollowed gave a brief summary of recent activities of the ICES/PICES joint WG on Forecasting Climate Change Impacts on Fish and Shellfish. Though this WG ends in 2011, their high productivity has spawned discussion on how it will continue within each the ICES and PICES frameworks. Regardless of how the group is re-structured, there will be an ongoing need for IPCC GCM and RCM projections so Anne was supportive of WG20 recommendations on how that might be done.

No other business was discussed and the meeting was adjourned at about 5:00pm. Mike thanked all members for their contributions over the four year tenure of the working group.

Meeting Agenda

- 1) Welcome, introductions, opening remarks
- 2) Changes to, adoption of, agenda and appointment of rapporteur
- 3) Update on FUTURE & its Advisory Panels (Hiroaki Saito)
- 4) Review of WG Terms of Reference & summary of accomplishments
- 5) WG20 Final Report:
 - a. Organization, contents, formatting
 - b. Chapter assignments & deadlines
 - c. Recommendations for FUTURE
 - i. TOR for a new WG
- 6) Other business
- 7) Adoption of meeting report for presentation at POC committee meeting

Attendees

Mike Foreman (Canada)
 Jim Christian (Canada)
 Elena Ustinova (Russia)
 Enrique Curshitser (USA)
 Muyin Wang (USA)
 Art Miller (USA)

Observers

Kyung-Il Chang (Korea)
 Jae-Hyoung Park (Korea)
 Teresa A'mar (USA)
 Tim Lee (USA)

JungJin Kim (Korea)
 Hanna Na (Korea)
 Tom Royer (USA)
 Jae Hak Lee (Korea)
 Anne Hollowed (USA)
 Yury Zuenko (Russia)
 Chan Joo Jang (Korea)
 Sinjae Yoo (Korea)
 Dong-Jin Kang (Korea)
 Toshi Saino (Japan)
 Yuichiro Kumamoto (Japan)
 Hiroaki Saito (Japan)

Appendix 1: Summary of WG20 Activities versus Terms of Reference

- a. To analyze and evaluate climate change projections for the North Pacific and its marginal seas based on predictions from the latest global and regional models submitted to the Inter-governmental Panel on Climate Change (IPCC) for their 4th assessment report
 - Several Wang/Overland/Bond publications evaluating global climate models (GCMs) & their projections in North Pacific & Arctic
 - Di Lorenzo, Miller & colleagues: NPGO analyses of IPCC model results
 - Hasumi & colleagues continued analyses & improvements to Japanese GCM (MIROC)
 - Yamanaka & colleagues continued analyses of ecosystem models coupled to Japanese GCM
 - Qiao & colleagues studied GCM improvements by addition of surface waves
 - Ustinova & colleagues evaluated climate variability in Far Eastern seas
 - Jang & colleagues studied GCM projected mixed layer depth changes in North Pacific
 - Foreman & colleagues evaluated GCM winds off BC
- b. To facilitate analyses of climate effects on marine ecosystems and ecosystem feedbacks to climate by, for example computing an ensemble of the IPCC model projections for the North Pacific and making these projections available to other PICES groups such as CFAME
 - Worked with CFAME
 - Joint workshops at PICES annual meetings & April 2008 workshop in Hawaii
 - Contributed to final report & co-authored publication

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- Working with WG25 – ICES/PICES WGCCIFS
 - Foreman, Yamanaka are WG25 members
 - Co-convened downscaling session at, & members participated in, Sendai symposium
 - Manuscripts submitted to ICES J Mar Sci
- Yamanaka & colleagues continued development & analyses of ecosystem model coupled to Japanese GCM
- c. To facilitate the development of higher-resolution regional ocean and coupled atmosphere-ocean models that are forced by, and take their boundary conditions from, IPCC global or regional models
 - RCMs developed, or under development, for
 - California shelf (Auad, Miller, Di Lorenzo)
 - NE Pacific & Bering Sea – fully coupled to NCAR GCM (Curchitser et al.)
 - BC shelf (Foreman et al.)
 - Washington-Oregon shelf (Bond, Hermann, Curchitser)
 - Kuroshio region (Kurogi, Hasumi, Tanaka)
 - Curchitser participated in RCM workshop in September
 - Japanese have 0.25° resolution GCM
- d. To facilitate the development of local and regional data sets (*e.g.*, SST, river flow, sea ice cover) incorporating information from climate model projections as well as observations and historical re-analyses
 - Augmenting a data set of buoy wind measurements off the BC coast by filling gaps over the last decade with values from a NASA archive & analysing 50 year time series for trends in magnitude or timing
 - Argo float data freely available (Freeland has given several summaries at POC meetings)
 - See recommendation #3
- e. To ensure effective two-way communication with CLIVAR
 - CLIVAR representatives gave presentations at several WG20 annual meetings
 - Close relationship with ESSAS (Wang, Curchitser)
- f. To convene workshops/sessions to evaluate and compare results
 - Annual workshops at all PICES meetings, 3 jointly with CFAME
 - Participated in CFAME workshop, Honolulu, April 2008
 - Co-convened downscaling session at “Effects of Climate Change in the World’s Oceans”, Gijón, May 2008
 - Co-convened downscaling session at “Climate Change Effects on Fish and Fisheries”, Sendai, April 2010
- g. To publish a final report summarizing results.
 - Proceeding

Appendix 2: Draft Recommendations for the Final Report

- 1) Continue evaluating IPCC GCM (and RCM) results:
 - a. Jim Overland, Muyin Wang, Chan Joo Jang (and others?) plan evaluations of new AR5 outputs when they are available (winter 2010-11?)
 - b. WG25 (Forecasting Climate Change Impacts on Fish and Shellfish) will be interested in these forecasts
 - c. The RCM community is hoping to have a chapter in AR5
 - d. Besides continuing Japanese GCM/ecosystem model studies (Yamanaka and colleagues), several North Pacific RCMs are under development that are being, or could be, coupled to ecosystem models (*e.g.*, Curchitser, Hermann, Rose *et al.*)

- e. This activity may not warrant a new WG but the work should be part of COVE and/or SOFE
- 2) Continue analyses of North Pacific inter-annual to inter-decadal variability. This would be an extension of the PICES 2009 workshop convened by Di Lorenzo and Minobe.
 - A new WG, under POC and with COVE's support, has been proposed (Appendix 3 has draft TORs)
 - IPCC-AR5 will include decadal predictions. Unlike GCM predictions that should only be evaluated statistically, these decadal predictions should be directly comparable with subsequent observations. An analysis of these predictions could be part of SOFE.
 - 3) Establish live-access servers or ftp sites to archive and provide easy access to results from RCMs, analogous to the PCMDI archive for IPCC GCM results.
 - This would address WG20 TOR #4, something that was not adequately accomplished during the tenure of that WG
 - It would also provide fisheries scientists (e.g., WG-FCCIFS) with climate change variables on much finer spatial scales than can be resolved with the GCMs.
 - This could be a possible activity for the COVE or SOFE Advisory Panels and the TCODE Committee.
 - 4) Provide and regularly update lists of links to GCM/RCM sites like NARCCAP (North American regional climate model results, <http://www.narccap.ucar.edu/>) and to relevant publications like the "Guide to Best Practices on the Use of Climate Models" (Overland *et al.*)

Appendix 3: Proposal for a new Working Group: "North Pacific Climate Variability and Change"

Motivation:

Need to develop essential mechanistic understandings of North Pacific climate variability & change that can better guide the formulation of process-based hypotheses underlying the links between ecosystem dynamics and physical climate.

Draft Terms of Reference:

1. Develop conceptual mechanistic models or frameworks of North Pacific climate variability & change that can be readily used by ecosystem scientists to explore hypotheses of the links between ecosystem dynamics and physical climate.
2. Summarize the current understanding of mechanisms of Pacific climate variability, and evaluate the strengths of the underlying hypotheses with supporting evidence.
3. Coordinate, in conjunction with ecosystem scientists, the development & implementation of process-based models to hindcast the variability of available long-term biological time series.
4. Provide improved metrics to test the dynamics of the IPCC models.
5. Understand and fill the gaps between what the physical models can currently produce and what ecosystem scientists suggest are important physical forcing factors required for predicting species and ecosystem responses to climate change.
6. Maintain linkages with, and summarize the results from National & International programs/projects such as CLIVAR, IMBER, US CAMEO, ESSAS, Japanese Hot Spot in the Climate System, POMAL, CREAMS EAST-I, POBEX, and others.
7. Convene workshops & sessions to evaluate and compare results
8. Publish a final report summarizing results.

Possible Co-Chairs: E. Di Lorenzo (U.S.A.), S. Minobe (Japan), M. Foreman (Canada)

Objectives

Present and discuss drafts of chapters for the final WG20 Report and finalize recommendations to PICES/FUTURE. The following list of possible chapters was put forward at the April WG20 meeting in Sendai, Japan:

- Introduction: Background and Terms of Reference
- Wang, Overland, Bond: GCM downscaling procedures & examples

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- Di Lorenzo, Miller: Regional climate modeling and covariability in North Pacific
- Foreman and colleagues: RCM development for BC shelf waters
- Christian: GCM carbon cycle development
- Curchitser, Hermann: RCM development for the NE Pacific and Bering Sea and two-way coupling of this RCM into the NCAR GCM
- Ustinova, Zuenko: Evaluation of climatic variability in Far Eastern Seas
- Navrotsky: interactions between climate and ecosystems
- Yamanaka, Hasumi, and colleagues: Ecosystem projections for the Kuorshio/Oyashio system
- Jang, Pang, Park, Yeh, and colleagues: GCM projections of changes to mixed layer depth
- Qiao, Wang, Wu and colleagues: Chinese contributions

Informal Agenda:

1. Review of WG20 Terms of Reference and what was accomplished
2. Discussion of proposed chapter topics and presentations of recent research that might be included
3. Updates on chapter assignments and setting of deadlines
4. Recommendations for follow-up work and/or groups within FUTURE Summary of Seoul Advisory Panel meeting, August 16-18
5. Adjournment to local pub/restaurant

POC/BIO Workshop (W5)

Carbon data synthesis (III)

Co-Convenors: *Masao Ishii (Japan) and Robert M. Key (U.S.A.)*

Background

This workshop will continue the implementation of the North Pacific carbon data synthesis. Investigators who submit data to the workshop will collectively review the progress of the QA/QC process, and discuss the degree of success of the techniques applied and whether different or additional approaches are necessary. This is a highly “hands-on” activity that will involve data originators who submit data to the synthesis, and investigators participating in the synthesis process, and will lead directly to value-added data products and collective publications.

Summary of presentations

Sixteen participants from four countries were in attendance. Masao Ishii reviewed the 2nd PACIFICA Data Synthesis Workshop and the objective of this 3rd carbon data synthesis workshop. This was followed by a review of our activities, the datasets we have collected, and the decisions we made in the 2nd workshop in June this year for the variables used in the crossover analysis and inversions. Dr. Ishii then outlined the progress to be made at the workshop in a 2nd level QC to examine each adjustment value, either additive or multiplicative, for salinity, DIC, TA, oxygen and nutrients for each cruise that has been suggested from crossover analysis, and filling in the adjustment table.

Invited speaker, Robert Key, gave a talk about the perspective on global data synthesis and commented on its future sustainable operation. Total sample counts of PACIFICA amounts to 132×10^3 and the total of GLODAP, CARINA and PACIFICA amounts to 931×10^3 . Assembly of high-quality calibrated open ocean data will continue to improve and expand for the foreseeable future with the addition of other parameters (*e.g.*, helium/tritium data). He and colleagues were also trying to assemble data from regions not covered in v1.1 (Arctic and marginal seas). He declared that data should be available to the public (<1 year post cruise) with *no*

restrictions as individual data and compiled products, but that there needed to be a site/manager (CDIAC?), sustainable operation *without* the need for major team efforts, ability to create custom data products, a standard method for each new cruise (immediate 1st QC, metadata collection, quick 2nd QC check, *etc.*), and regular product updates (as needed, annual?).

Toru Suzuki discussed the progress being made on PACIFICA data collection in 2009/2010 and its 2nd level QC. After the 2nd workshop in June 2010, data from two cruises in the equatorial Pacific conducted by KAIYO/JAMSTEC were revised. New data of CLIVAR Repeat Hydrography along P21E and P21W sections conducted by MIRAI/JAMSTEC in 2009 were added. They are to be opened by the end of this year. PACIFICA now includes datasets from total of 305 cruises; <http://pacific.pices.jp/table/>. These original datasets have been converted to the WHP Exchange Format. Suzuki reviewed the method of 2nd level QC that used Matlab runs for crossover analysis and inversions as well as the outlines of several runs that have been made on the demands of working groups. The results of Matlab runs have been uploaded to <http://pacific.pices.jp/offset/figs/>. (See http://pacific.pices.jp/offset/figs/00_README.txt for details.)

Michio Aoyama reported that a 2nd level QC of salinity data was completed and the adjustment was assigned for each cruise. Datasets from 16 cruises that showed extremely large offsets in the preliminary runs of crossover analyses were excluded in the 2nd level QC. Stations located in the Kuroshio and Kuroshio Extension (29.4°–36°N, 131°–150°E) were also excluded from the cross-over analysis. The crossover analysis and inversions were then made *without* correcting for the offsets from standard seawater used in each cruise and *without* selecting the core cruises (ver. 20101017). The suggested adjustment is consistent with the offset of standard seawater used in each cruise.

Tsuneo Ono informed participants that DIC observations along A-line in the Oyashio region off Hokkaido have been made by MRI and Hokkaido University until 2001 in the top 1500m of the water column. The observations were made by FRA after 2001 and samples from deeper layers are beginning to be taken. Large offsets that are seen in deep layers in some cruises are considered to be attributed *not* to the natural variability but to the analytical offsets.

Subgroup meetings

Carbon working group

- A total of 37 cruises were selected as core cruise. They include all CLIVAR Repeat Hydrography cruises (16 cruises), 18 cruises in a total of 37 WHP cruises, and 3 “good” cruises of repeat lines (137°E, 155°E).
- These core cruises for the 2nd QC are common for DIC and TA, but TA was not measured on 7 core cruises (6 for WHP, 1 for MRI-JMA).
- 18 core cruises in a total of 37 WHP cruises (reference cruises) are the ones that meet all the following requirements:
 - Cruises in which DIC has been measured,
 - CRM has been used for the QC of DIC measurements,
 - Cruises are long sections that have crossovers with other core cruises,
 - Suggested adjustments (or offset corrections) for DIC in the preliminary runs of crossover analyses, those of Lamb *et al.* (Deep-Sea Res. II, 2002), or GLODAP are within $\pm 4 \mu\text{mol kg}^{-1}$.
- 3 “good” cruises for repeat lines (137°E, 155°E) are the ones that used CRM in DIC analysis and have been suggested to be of good DIC quality in the preliminary runs of crossover analyses.
- No significant DIC offset among these core cruises was seen in inversion runs for core cruises in v.20101015. Among CLIVAR Repeat Hydrography cruises, TA also showed no significant offsets, but adjustments have been suggested for the same WHP cruises as had corrections applied in GLODAP.
- For core cruises, no significant difference in suggested adjustment was seen between the crossover analysis for $z > 2000\text{m}$ and that for $z > 1500\text{m}$.
- The carbon working group looked at the results of crossover analyses. For each cruise to which large adjustment was suggested for either DIC or TA, they looked at the offset(s) from the core cruise(s) and specified the adjustment. Basically, results from $>2000\text{m}$ were referred to, but those from $>1500\text{m}$ were

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referred to for cruises in which data from deeper layers (>2000m) are not available or sparse.

- What we should do for carbon 2nd level QC next is:
 - Repeat primary QC of “old” (before June 2001) Line-P data.
 - Generate additional crossovers for spatially restricted time series programs such as Line P and A-Line by reducing minimum number of common stations and, if necessary, expanding the search radius,
 - Manually apply offsets,
 - Rerun inversion with high weight for core cruises,
 - Toru Suzuki will post cruise data and Adjustment Table to the website.
 - Collect any outstanding metadata (cruise dates, ship, chief scientist, PI for each measurement, use of CRMs, scale and temperature for pH, nutrient standards, references to publications that used data from this cruise).

Oxygen and nutrients working group

- No core cruise has been selected for oxygen and nutrients (nitrate, phosphate, and silicic acid).
- The oxygen and nutrients working group looked at the results of inversions (v.2000m_20101017/) for each parameter for each cruise. They judged if the result of inversion could be adopted or other numerical value should be adopted for adjustment on the basis of number of crossovers and so on. For oxygen, those cruises with the suggested adjustments larger than 1% were examined. For nutrients, offsets from the cruises in which the reference material for analysis of nutrients in seawater (Aoyama *et al.*, 2010) were basically regarded as the adjustments. Inversion will be repeated with core cruises assigned.
- What we should do for oxygen-nutrients 2nd level QC next is:
 - Assign core cruises (basically the cruises in which nutrients reference material have been used),
 - Define user weight for time-series,
 - Revise crossover criteria so that more crossovers are available (*e.g.*, for Line P and A-Line),
 - Then re-examine the offset in each parameter in each cruise.

2nd level QC of CFCs (A. Murata)

Ken'ichi Sasaki is at sea; Akihiko Murata took his place and reported on the progress of 2nd level QC of CFCs.

- Ken'ichi Sasaki and John Bullister are working on the 2nd QC for the data from Japanese and US cruises, respectively.
- The method of 2nd QC of CFCs in PACIFICA is the same as in CARINA (Steinfeldt *et al.*, Earth Syst. Sci. Data, 2: 1–15, 2010). They looked at the relationships between pCFC-11 and pCFC-12, which should fall into the historical range of that in the atmosphere if these parameters have been properly measured. They also looked at the saturation levels of CFC-11 and CFC-12 in surface layers ($\pm 10\%$ of saturation).
- The adjustment was assigned in 5% intervals.
- It appeared that 1st level QC is yet needed for several Japanese cruises.

Discussion on the data products

- PACIFICA will not include datasets that have already been included in GLODAP and CARINA (*e.g.*, P6 by MIRAI/JAMSTEC in 2003 will not be included in PACIFICA since it has already been included in CARINA). PACIFICA will also not include the data from Hawaii Ocean Time-series.
- We will open the collection of original datasets from CDIAC and MIRC (need metadata), except datasets from Line-P and P21(2009), soon on the web.
- We will open the data products that have gone through the 2nd QC once it is finished.
- We will separate the database into 3 domains: Open Pacific, Arctic Mediterranean Sea (north of Aleutians) and marginal seas. However, no progress has been made on the data collection from marginal seas since PICES-2009.
- Toru Suzuki will prepare Adjustment Table on MIRC's website.
- We will communicate via the web and e-mail. At present, we have no plan for further data synthesis workshops.
- We will document the PACIFICA data collection and 2nd level QC, and submit to Earth System Science Data (Special section?). Potential papers are summary, salinity, carbon, oxygen, nutrients, and CFCs.

List of papers

Oral Presentations

Masao Ishii, Masahide Wakita, Akihiko Murata, Toru Suzuki, Alex Kozyr and Robert Key

Second-level quality control of PACIFICA synthesized database

Robert M. Key (Invited)

Expanding the ocean interior carbon data collection

Toru Suzuki

Review for the method of cross-over analyses and inversions for secondary QC of PACIFICA

Subgroup-1: Secondary QC of CO₂ parameters - 1

Subgroup-2: Secondary QC of oxygen and nutrients - 1

Subgroup-1: Secondary QC of CO₂ parameters - 2

Subgroup-2: Secondary QC of oxygen and nutrients - 2

Subgroup-1: Secondary QC of CO₂ parameters - 3

Subgroup-2: Secondary QC of oxygen and nutrients - 3

Subgroup-1: Secondary QC of CO₂ parameters - 4

Subgroup-2: Secondary QC of oxygen and nutrients - 4

Subgroup-1: Secondary QC of CO₂ parameters - 5

Subgroup-2: Secondary QC of oxygen and nutrients - 5

Michio Ishii

Report from sub-group - 1

T. Ono

Report from sub-group - 2

A. Murata

Secondary QC of data from Bering Sea

K. Sasaki

Secondary QC of CFCs

Discussion on the future plan: Opening of PACIFICA to the public

Discussion on the future plan: Scientific products

Best Presentations for Committee/Program-sponsored Topic Sessions or Workshops at PICES-2010

Science Board Best Oral Presentation

Shin-ichi Ito (Tohoku National Fisheries Research Institute, FRA, Japan) on “Projection of Pacific saury response to future climate change” co-authored with Takeshi Okunishi, Michio J. Kishi and Muyin Wang

Science Board Best Poster

Sayaka Matsumura (Graduate School of Environmental Sciences, Yokohama National University, Japan) on “Spatio-temporal changes in species diversity and assemblage structure of Euphausiids (Oyashio to Oyashio-Kuroshio Transition Region in the western north Pacific)” co-authored with Hiroya Sugisaki, Hiroaki Saito, Yuji Okazaki and Tomohiko Kikuchi

Best Oral Presentation by an early career scientist for the BIO-sponsored Contributed Paper Session

Xiuning Du (Hatfield Marine Science Center, U.S.A.) on “Feeding rates of adult *Euphausia pacifica* on natural particle assemblages in the coastal upwelling zone off Oregon, USA” co-authored with William T. Peterson and C. Tracy Shaw

Best Poster for the BIO-sponsored Contributed Paper Session

Brett R. Dumbauld (USDA-ARS, Hatfield Marine Science Center, U.S.A.) on “Can an introduced parasitic bopyrid Isopod *Orthione griffenis* cause extinction of mud shrimp *Upogebia pugettensis* populations in U.S. west coast estuaries?” co-authored with John W. Chapman

Best Oral Presentation by an early career scientist for the FIS-sponsored Contributed Paper Session

Hye-Min Park (Pukyung National University, Busan, Korea) on “Vertical distribution and reproductive aspects of caridean shrimps in the deep-water of the East Sea, Korea” co-authored with Jung Nyun Kim, Hae Won Lee, Byeong Gyu Hong, Jin Ho Bae, Hyeong Gi Kim and Chul-Woong Oh

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Best Poster for the FIS-sponsored Contributed Paper Session

Yuichiro Kogura (Graduate School of Fisheries Sciences, Hokkaido University, Japan) on “Genetic population structure of lacustrine sockeye salmon, *Oncorhynchus nerka*, in Japan” co-authored with James E. Seeb, Noriko Azuma, Hideaki Kudo, Syuiti Abe and Masahide Kaeriyama

Best Oral Presentation by an early career scientist for the MEQ-sponsored MEQ Topic Session on “Conceptual and numerical models of HAB dynamics” (S9)

Jenny Q. Lane (University of California Santa Cruz, Santa Cruz, U.S.A.) on “The development of toxigenic *Pseudo-nitzschia* bloom models in Monterey Bay, California, and their application at a single monitoring site within the model domain” co-authored with Peter T. Raimondi and Raphael M. Kudela

Best Poster for the MONITOR-sponsored Topic Session on “Development and use of ocean observing and forecasting systems in coastal and marine Management” (S15)

Hisashi Yamaguchi (Graduate School of Environmental Study, HyARC, Nagoya University, Japan) on “Variation of satellite chlorophyll *a* in the East China Sea based on local satellite algorithm with reduced influence from suspended sediment” co-authored with Young Beak Son, Eko Siswanto, Joji Ishizaka, Sinjae Yoo, Yu-Hwan Ahn, Sang-Woo Kim, Junwu Tang, Hiroshi Kawamura and Yoko Kiyomoto

Best Oral Presentation by an early career scientist for the POC-sponsored Contributed Paper Session

Hiroshi Kuroda (National Research Institute of Fisheries Science, Yokohama, Japan) on “A numerical study on the winter mixed layer on the shelf-slope region south of Japan” co-authored with Takashi Setou, Yuichi Hirota, Manabu Shimizu and Kazuhiro Aoki

Best Poster for the POC-sponsored Topic Session on “Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting”(S8)

Sarah Ann Thompson (Farallon Institute for Advanced Ecosystem Research, U.S.A.) on “Comparing pathways of functional response of top predators to seasonality of upwelling in the California Current” co-authored with William J. Sydeman, Jarrod A. Santora, Robert M. Suryan, Bryan A. Black, William T. Peterson and John Calambokidis

Best Poster for the POC-sponsored Topic Session on “Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting”(S8)

Chan Joo Jang (Korea Ocean Research and Development Institute, Ansan, Korea) on “Variability of mixed layer depth and its relation with chlorophyll concentration in the North Pacific Ocean” co-authored with Sinjae Yoo

Best Oral Presentation by an early career scientist for the FUTURE-sponsored Topic Session on “Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function”

D. Shalin Busch (NOAA Fisheries, Northwest Fisheries Science Center, Seattle, U.S.A.) on “Evaluating uncertainty in estimates of how climate change may impact Northeast Pacific marine ecosystems” co-authored with Cameron H. Ainsworth, Jameal F. Samhuri, William L. Cheung, John Dunne and Thomas A. Okey

LIST OF PICES ACRONYMS

AP-AICE	FUTURE Advisory Panel on <i>Anthropogenic Influences on Coastal Ecosystems</i> (Oct. 2009 –)
AP-COVE	FUTURE Advisory Panel on <i>Climate, Oceanographic Variability and Ecosystems</i> (Oct. 2009 –)
AP-CPR	Advisory Panel on <i>Continuous Plankton Recorder Program</i> (Oct. 1998 –)
AP-CREAMS	Advisory Panel for a <i>CREAMS/PICES Program in East Asian Marginal Seas</i> (Nov. 2005 –)
AP-IFEP	Advisory Panel on <i>Iron Fertilization Experiment</i> (Oct. 1998 – Oct. 2007)
AP-MBM	Advisory Panel on <i>Marine Birds and Mammals</i> (Oct. 1999 –)
AP-MIE	Advisory Panel on <i>Micronekton Sampling Inter-Calibration Experiment</i> (Oct. 2002 – Oct. 2009)
AP-NPDB	Advisory Panel on <i>North Pacific Data Buoy</i> (Oct. 2001 – Oct. 2006)
AP-SOFE	FUTURE Advisory Panel on <i>Status, Outlooks, Forecasts and Engagement</i> (Oct. 2009 –)
BIO	Biological Oceanography Committee
CCCC	Climate Change and Carrying Capacity Scientific Program (Oct. 1995 – Oct. 2009)
F&A	Finance and Administration Committee
FIS	Fishery Science Committee
FUTURE	Forecasting and Understanding Trends, Uncertainty and Responses of the North Pacific Ecosystem (Oct. 2009 –)
GC	Governing Council
IP-WT	FUTURE Implementation Plan Writing Team (Jun 2008 – Apr 2009)
MEQ	Marine Environmental Quality Committee
MONITOR	Formerly Task Team on Monitoring (Oct. 1997 – Oct. 2004), renamed to Technical Committee on Monitoring
NEMURO	North Pacific Ecosystem Model for Understanding Regional Oceanography
NEMURO.FISH	NEMURO for Including Saury and Herring
NEMURO.SAN	NEMURO for Sardine and Anchovy populations
NPESR	North Pacific Ecosystem Status Report (Oct. 2002 – Oct. 2004)
PICES	North Pacific Marine Science Organization
POC	Physical Oceanography and Climate Committee
SB	Science Board
S-CC	Section on <i>Carbon and Climate</i> (Oct. 2005 –)
S-HAB	Section on <i>Ecology of Harmful Algal Blooms in the North Pacific</i> (Oct. 2003 –)
SG-CB	Study Group on <i>PICES Capacity Building</i> (Oct. 2002 – Oct. 2003)
SG-COM	Study Group on <i>Communication</i> (Oct. 2007 – Oct. 2009)
SG-EBM	Study Group on <i>Ecosystem-based Management Science and its Application to the North Pacific</i> (Oct. 2003 – Oct. 2004)
SG-ESR	Study Group on <i>Ecosystem Status Reporting</i> (Oct. 2006 – Oct. 2007)
SG-FERRRS	Study Group on <i>Fisheries and Ecosystem Responses to Recent Regime Shifts</i> (Oct. 2003 – Oct. 2004)
SG-FISP	Study Group on <i>Future Integrative Scientific Program(s)</i> (May 2005 – Oct. 2009)
SG-GOOS	Study Group to develop a strategy for GOOS (Oct. 2006 – Oct. 2007)
SG-HD	Study Group on <i>Human Dimensions</i> (Oct. 2009 –)
SG-MAR	Study Group on <i>Marine Aquaculture and Ranching in the PICES Region</i> (Oct. 2006 – 2007)
SG-RAM	Study Group on <i>Restructuring of the PICES Annual Meeting</i> (Oct. 2008 - March 2009)
SG-RPFR	Study Group on <i>PICES Rules of Procedure and Financial Regulations</i> (Oct. 2004 – Oct. 2006)
SG-SC	Study Group on <i>Scientific Cooperation between PICES and Non-member Countries</i> (Oct. 2006 – Oct. 2007)
SG-SI	Study Group on <i>PICES Strategic Plan</i> (Oct. 2003 – Oct. 2004)

PICES Acronyms-2010

SG-SP	Joint P/ICES Study Group on <i>Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science</i> (Oct. 2009 –)
SG-USP	Study Group on <i>Updating the PICES Strategic Plan</i> (Oct. 2009 –)
SISG	Study Group on <i>PICES Strategic Plan</i> (Oct. 2003 – Oct. 2004)
SP-WT	FUTURE Science Plan Writing Team (Jan. 2007 – Apr. 2008)
TCODE	Technical Committee on Data Exchange
TT-MODEL	Conceptual / Theoretical and Modeling Studies Task Team (Oct. 1995 – Oct. 2009)
TT-CFAME	Climate Forcing and Marine Ecosystem Response Task Team (Oct. 2004 – Oct. 2009)
TT-BASS	Basin Studies Task Team (Oct. 1995 – Oct. 2004)
TT-MONITOR	MONITOR Task Team (Oct. 1997 – Oct. 2004)
TT-REX	Regional Experiments Task Team (Oct. 1996 – Oct. 2004)
TT-NEXT	NEMURO (North Pacific Ecosystem Model for Understanding Regional Oceanography) Experimental Plan Team Oct. 2002 – Oct. 2003)
WG 1	Working Group on <i>The Okhotsk Sea and Oyashio Region</i> (Oct. 1992 – Oct. 1993)
WG 2	Working Group on <i>Development of Common Assessment Methodology for Marine Pollution</i> (Oct.1992 – Oct. 1994)
WG 3	Working Group on <i>Dynamics of Small Pelagics in Coastal Ecosystems</i> (Oct.1992 – Oct. 1995)
WG 4	Working Group on <i>Data Collection and Quality Control</i> (Oct.1992 – Oct. 1994)
WG 5	Working Group on <i>The Bering Sea</i> (Oct.1992 – Oct. 1996)
WG 6	Working Group on <i>Subarctic Gyre</i> (Oct. 1992 – Oct. 1994)
WG 7	Working Group on <i>Modeling of the Subarctic North Pacific Circulation</i> (Oct. 1993 – Oct. 1995)
WG 8	Working Group on <i>Practical Assessment Methodology</i> (Oct. 1994 – Oct. 2000)
WG 9	Working Group on <i>Subarctic Pacific Monitoring</i> (Oct. 1994 – Oct. 1997)
WG 10	Working Group on <i>Circulation and Ventilation in the Japan/East Sea and its Adjacent Areas</i> (Oct. 1995 – Oct. 1999)
WG 11	Working Group on <i>Consumption of Marine Resources by Marine Birds and Mammals in the PICES Region</i> (Oct. 1995 – Oct. 1999)
WG 12	Working Group on <i>Crabs and Shrimps</i> (Oct. 1995 – Oct. 2001)
WG 13	Working Group on <i>Carbon Dioxide in the North Pacific</i> (Oct. 1997 – Oct. 2002)
WG 14	Working Group on <i>Effective Sampling of Micronekton to Estimate Ecosystem Carrying Capacity</i> (Oct. 1997 – Oct. 2004)
WG 15	Working Group on <i>Ecology of Harmful Algal Blooms (HABs) in the North Pacific</i> (Oct. 1999 – Oct. 2003)
WG 16	Working Group on <i>Climate Change, Shifts in Fish Production, and Fisheries Management</i> (Oct. 1999 – Oct. 2005)
WG 17	Working Group on <i>Biogeochemical Data Integration and Synthesis</i> (Oct. 2001 – Oct. 2005)
WG 18	Working Group on <i>Mariculture in the 21st Century – The Intersection between Ecology, Socio-Economics and Production</i> (Oct. 2003 – Oct. 2006)
WG 19	Working Group on <i>Ecosystem-based Management Science and its Application to the North Pacific</i> (Oct. 2004 – Oct. 2008)
WG 20	Working Group on <i>Evaluations of Climate Change Projections</i> (Oct. 2005 – Oct. 2010)
WG 21	Working Group on <i>Non-indigenous Aquatic Species</i> (Oct. 2005 –)
WG 22	Working Group on <i>Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean</i> (Oct. 2007 – Oct. 2010)
WG 23	Working Group on <i>Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim</i> (Oct. 2007 –)
WG 24	Working Group on <i>Environmental Interactions of Marine Aquaculture</i> (Oct. 2008 –)
WG-FCCIFS	Joint PICES/ICES on <i>Forecasting Climate Change Impacts on Fish and Shellfish</i> (Jan. 2009 –)
WG 26	Working Group on <i>Jellyfish blooms around the North Pacific Rim: Causes and Consequences</i> (Oct. 2010 –)

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