REPORT OF OPENING SESSION

AGENDA ITEM 1
Opening by the Chairman of PICES

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

AGENDA ITEM 2
Welcome addresses on behalf of the host country

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

AGENDA ITEM 3
Remarks by the Chairman of PICES

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

AGENDA ITEM 4
Wooster Award presentation ceremony

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

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

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

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

AGENDA ITEM 5
PICES Ocean Monitoring Service Award presentation ceremony

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

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

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

AGENDA ITEM 6
PICES "Year-in-Review" 2012

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

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

AGENDA ITEM 7
Closing remarks and announcements

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

OP Endnote 1

Opening Session agenda

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

OP Endnote 2

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

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

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

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

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

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

OP Endnote 3

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

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

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

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

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

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

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

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

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

OP Endnote 4

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

Distinguished delegates, guests, ladies and gentlemen:

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

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

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

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

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

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

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

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

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

OP Endnote 5

Science Board citation for the 2012 Wooster Award

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

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

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

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

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

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

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

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

OP Endnote 6

Science Board citation for the 2012 PICES Ocean Monitoring Service Award

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

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

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

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

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

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

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

OP Endnote 7

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

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

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

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

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

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

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