

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

ANNUAL REPORT

SEVENTEENTH MEETING
DALIAN, CHINA
OCTOBER 24–NOVEMBER 2, 2008

Secretariat / Publisher
North Pacific Marine Science Organization (PICES)
P.O. Box 6000,
9860 West Saanich Road,
Sidney, British Columbia,
Canada. V8L 4B2
E-mail: secretariat@pices.int
Home Page: www.pices.int

CONTENTS

☞

☞

Report of Opening Session	1
Report of Governing Council	17
Report of the Finance and Administration Committee	61
Reports of Science Board and Committees	
Science Board Inter-sessional Meeting	87
Science Board	98
Biological Oceanography Committee	111
Fishery Science Committee.....	123
Physical Oceanography and Climate Scientific Committee.....	136
Marine Environmental Quality Committee	145
Technical Committee on Data Exchange	156
Technical Committee on Monitoring	167
Report of the Climate Change and Carrying Capacity Scientific Program	
Implementation Panel on the CCCC Program	172
MODEL Task Team	177
Reports of Expert Groups	
Sections	
Section on <i>Ecology of Harmful Algal Blooms in the North Pacific</i>	181
Section on <i>Carbon and Climate</i>	187
Working Groups	
Working Group 19 on <i>Ecosystem-Based Management Science and its Application to the North Pacific</i>	191
Working Group 20 on <i>Evaluations of Climate Change Projections</i>	195
Working Group 21 on <i>Non-indigenous Aquatic Species</i>	201
Working Group 22 on <i>Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean</i>	208
Working Group 23 on <i>Comparative Ecology of Krill in Coastal and Oceanic Waters Around the Pacific Rim</i>	212
Advisory Panels	
Advisory Panel on <i>Continuous Plankton Recorder Survey in the North Pacific</i>	218
Advisory Panel for a <i>CREAMS/PICES Program in East Asian Marginal Seas</i>	220
Advisory Panel on <i>Marine Birds and Mammals</i>	224
Advisory Panel on <i>Micronekton Sampling Inter-Calibration Experiment</i>	230
Session Summaries	231
Participants	272
PICES Members	301
PICES Acronyms	321

REPORT OF OPENING SESSION

The Opening Session started at 09:00 hours on October 27, 2008. Dr. Tokio Wada, Chairman of PICES, welcomed delegates, observers and researchers to Dalian and formally declared that the PICES Seventeenth Annual Meeting was open. The session agenda is appended as *OP Endnote 1*.

Welcome address on behalf of the host country and the host city

Mr. Lianzeng Chen (Deputy Administrator, State Oceanic Administration, People's Republic of China) welcomed participants on behalf of the host country (*OP Endnote 2*), and Mr. Deren Xia (Mayor of Dalian) addressed the session on behalf of the host city (*OP Endnote 3*).

Remarks by representatives of Contracting Parties and the Chairman of PICES

Dr. Wada invited Dr. Laura Richards (Regional Director of Science, Pacific Region, Fisheries and Oceans Canada) to make a statement on behalf of the Canadian Government. Dr. Richards addressed the session and her remarks are appended to the report as *OP Endnote 4*.

Dr. Wada called upon Dr. Yukimasa Ishida (Director General, Tohoku National Fisheries Research Institute, Fisheries Research Agency, Japan) to speak on behalf of the Japanese Government. Dr. Ishida addressed the session and his remarks are appended to the report as *OP Endnote 5*.

Dr. Wada then asked Mr. Doan Jeong (Director of Marine Research and Development Division, Marine Policy Bureau, Ministry of Land, Transportation and Maritime Affairs, Republic of Korea) to make a statement on behalf of the Korean Government. Mr. Jeong addressed the session and his remarks are appended to the report as *OP Endnote 6*.

Dr. Wada invited Dr. Lev Bocharov (Director General, Pacific Scientific Research Fisheries Center, Federal Agency on Fisheries, Russian Federation) to speak on behalf of the Russian Government. Dr. Bocharov addressed the session and his remarks are appended to the report as *OP Endnote 7*.

Dr. Wada requested Dr. George Boehlert (Director, Hatfield Marine Science Center, Oregon State University, U.S.A.) to make a statement on behalf of the U.S. Government. Dr. Boehlert addressed the session and his remarks are appended to the report as *OP Endnote 8*.

Dr. Wada called upon Dr. Zhanhai Zhang (Director General, Department of International Cooperation, State Oceanic Administration, People's Republic of China) to speak on behalf of the Chinese Government. Dr. Zhang addressed the session and his remarks are appended to the report as *OP Endnote 9*.

Dr. Wada thanked Mr. Lianzeng Chen and Mr. Deren Xia and all the delegates for their remarks, and addressed the participants on behalf of PICES. His remarks are appended to the report as *OP Endnote 10*.

Wooster Award presentation ceremony

Dr. Wada and Dr. John Stein, PICES Science Board Chairman, conducted the 2008 Wooster Award presentation ceremony. Dr. Stein introduced the Wooster Award and announced that the 2008 Award was given to Dr. Charles B. Miller (Oregon State University, U.S.A.), a nationally and internationally distinguished biological oceanographer specializing in studies of zooplankton. He quoted the Science Board citation for the 2008 Wooster Award that is appended to the report as *OP Endnote 11*. (Reading of the citation was accompanied by a special slide show dedicated to Dr. Miller.)

OS-2008

Unfortunately, Prof. Warren Wooster was unable to join this ceremony, but he kindly sent a message to Dr. Miller. Dr. Wada read the tribute from Prof. Wooster:

It is a pleasure to acknowledge selection of Charlie Miller to receive the 2008 Wooster Award. His contributions to understanding of zooplankton ecology in the northern North Pacific tie in beautifully with studies of physical changes in the ecosystem. Eventually predictions of these physical changes will lead to predictions of ecosystem changes, with all sorts of applications to fisheries and other problems of PICES concern.

Monitoring the ecosystem with the Continuous Plankton Recorder (CPR) and studies in OECOS (Ocean Ecodynamics Comparison in the Subarctic Pacific), both of these involving Charlie Miller, are keys to understanding ecosystems of the region. This work has often made me wish I had chosen zooplankton ecology as the field in which to specialize – too late for me but not too late to appreciate the contributions of Charlie and his colleagues. Congratulations to him for his major contributions to PICES projects in this field.

Dr. Wada presented a commemorative plaque to Dr. Miller (a permanent plaque identifying Wooster Award recipients resides at the PICES Secretariat), who accepted the award with the thankful remarks. After the Annual Meeting, Dr. Miller sent the following note to the PICES Secretariat:

I have always been dubious of awards in science, because so many who deserve them are never recognized. I am still dubious, but getting the Wooster Award is very gratifying, and I thank PICES for it.

Receiving the Wooster Award at this time comes with some sadness because Warren Wooster died just as I was being honored in Dalian. Warren called many times with PICES tasks for me, and I always said “no”. I always ended up doing whatever he asked. That was one of Warren’s many gifts: he could turn “no” into “yes” with his magical powers. Forty-five years ago, he and Polly were very kind to the graduate students at Scripps, offering me and others the initial social outreach from the faculty to newcomers. It was a warm touch of humanity in a ferociously competitive place and never forgotten. Warren’s shift in interest from marine chemistry and physics to fisheries and ocean policy has been of great benefit to ICES, PICES, the University of Washington and every aspect of our concern for the ocean. We will miss him personally, but his lasting gifts to us will carry his spirit onward.

Very few work at science alone. I cannot thank everyone here who has pursued ocean ecology with me; I made a list of my more important associates and it came out around eighty! However, I have been especially fortunate in working down the years with Bruce Frost, John McGowan, Peter Wiebe, William Fager, Abe Fleminger, William Peterson, Martha Clemons, Harold Batchelder, Patricia Wheeler and Tim Cowles (in order of appearance in my life). Thanks to them and everyone studying life in the oceans. Keep going, there is much yet to be learned.

PICES Ocean Monitoring Service Award presentation ceremony

Drs. Wada and Stein also conducted the presentation ceremony for the PICES Ocean Monitoring Service Award (POMA). Dr. Stein introduced POMA and announced that the very first award was given to the training ship T/S *Oshoro-maru* of Hokkaido University, Japan. After he quoted the Science Board citation appended to the report as *OP Endnote 12* (reading of the citation was accompanied by a special slide show dedicated to T/S *Oshoro-maru*), Dr. Wada presented a commemorative plaque and a certificate to a representative of the recipient, Dr. Akihiko Hara (Dean, Graduate School of Fisheries Sciences, Hokkaido University), who accepted the award with remarks of appreciation.

PICES “Year-in-Review” 2008

Dr. Stein reviewed PICES’ scientific accomplishments since the Sixteenth Annual Meeting in Victoria, Canada. An article on the state of PICES science for 2008 will be published in the next issue of PICES Press in January 2009 (Vol. 17, No. 1).

After the closing remarks by Dr. Wada, Dr. McKinnell made announcements related to the logistics of the Annual Meeting. The session was adjourned at 10:40 a.m.

Keynote lecture

The 2008 keynote lecture entitled “*Wave-tide-circulation coupled model: To improve the forecasting ability for FUTURE*” was given by Dr. Fangli Qiao (First Institute of Oceanography, State Oceanic Administration, People’s Republic of China) as a part of the Science Board Symposium on “*Beyond observations to achieving, understanding and forecasting in a changing North Pacific: Forward to the FUTURE*”. The abstract of his presentation is appended to the report as *OP Endnote 13*.

OP Endnote 1

Opening Session agenda

1. Opening by the Chairman of PICES, Dr. Tokio Wada
2. Welcome addresses by representatives of the host country and host city
 - Mr. Lianzeng Chen (Deputy Administrator, State Oceanic Administration, People’s Republic of China)
 - Mr. Deren Xia (Mayor of Dalian)
3. Remarks by representatives of Contracting Parties
 - Dr. Laura Richards (Regional Director of Science, Pacific Region, Fisheries and Oceans, Canada)
 - Dr. Yukimasa Ishida (Director General, Tohoku National Fisheries Research Institute, Fisheries Research Agency, Japan)
 - Mr. Doan Jeong (Director of Marine Research and Development Division, Marine Policy Bureau, Ministry of Land, Transportation and Maritime Affairs, Republic of Korea)
 - Dr. Lev Bocharov (Director General, Pacific Scientific Research Fisheries Center, Federal Agency on Fisheries, Russian Federation)
 - Dr. George Boehlert (Director, Hatfield Marine Science Center, Oregon State University, U.S.A.)
 - Dr. Zhanhai Zhang (Director General, Department of International Cooperation, State Oceanic Administration, People’s Republic of China)
4. Remarks by the Chairman of PICES, Dr. Tokio Wada
5. 2008 PICES Wooster Award presentation ceremony
6. 2008 PICES Ocean Monitoring Service Award ceremony
7. *PICES “Year-in-Review” 2008* by the Chairman of Science Board, Dr. John Stein
8. Closing Remarks/Announcements

OP Endnote 2

Welcome address on behalf of the host country by Mr. Lianzeng Chen

Respected Mr. Chairman, distinguished Mayor Xia Deren, honourable guests, ladies and gentlemen: In this golden autumn, I am very pleased to witness the successful opening of the Seventeenth Annual Meeting of PICES in the beautiful coastal city of Dalian. Taking this opportunity, I would like to, on behalf of the State Oceanic Administration (SOA) and the Local Organizing Committee, extend our warmest welcome to the participants, and express our congratulations and sincere thanks for the great support from the Dalian government!

The ocean is a common asset shared by all humans; the responsibility and obligation to study, develop and protect the ocean is therefore shared by all nations. Only when international cooperation is strengthened and the efficient way to sustainable development is found can we humans be greeted with a prosperous future.

As one of the major developing countries, China is fully aware of its obligation and its role in international marine affairs. By participating actively in international, as well as regional marine cooperation, and performing our obligation seriously, China has been contributing to the development of international marine affairs.

As part of the world economy, the Chinese marine industry has now become a new factor of GDP growth and has been incorporated into the development of the world economy. The Chinese Government has attached a great importance to the activities of sea area use and marine environmental protection, and their management has been based on the related laws and regulation. With the preliminary establishment of a marine monitoring system and a disaster mitigation emergency response system, coastal areas enjoy the advantage of both economic and social development in return. Marine science and technology has already become an important pillar for the Chinese marine development and therefore has been listed into the “National Medium and Long Term Science and Technology Development Plan”, as well as the “National Development Plan for the Period of 2006–2010”.

It is our great pleasure to see that, as the most important intergovernmental scientific organization in the North Pacific area, since its foundation in 1992, PICES has always been devoting itself to promoting and coordinating marine research around the North Pacific, to advancing the knowledge of the areas concerning marine environment, global weather, climate change, living resources, ecosystem, as well as impacts from human activities, and to sharing scientific information. Together with the promotion of both position and influence, PICES has been enjoying an increasingly important role in recent years.

Distinguished guests, ladies and gentlemen, dear friends, the Chinese government attaches great importance to the relations with PICES and will continue to support PICES’ work. China also would like to show its willingness to work together with other Contracting Parties to improve the exchange and cooperation in scientific research in the North Pacific, for example, by conducting cooperative research in key fundamental and advanced scientific fields such as climate change, marine environmental protection and marine disaster prevention and mitigation, to improve the level of understanding of influences and the adaptation to climate change, and at the same time to provide technical evidence to governments and international communities for formulating a sustainable development strategy on climate change, by conducting cooperative research in the sustainable utilization of marine ecological resources, exploitation and utilization of marine renewable resources, technology on energy saving and emission reduction, to promote the conservation of marine ecological environment and sustainable utilization of marine resources, to provide technical support and service to solve the problems of global warming and energy crisis, and to contribute to the establishment of a marine ecological civilization and a harmonized living environment.

Finally, I wish the meeting great success, and all the participants good health. Have a pleasant stay in Dalian! Thank you all.

OP Endnote 3**Welcome address on behalf of the host city by Mr. Deren Xia**

Respected Mr. Chairman, distinguished Deputy Administrator of the State Oceanic Administration, Mr. Lianzeng Chen, ladies and gentlemen: On the occasion of the opening of the PICES Seventeenth Annual Meeting, I would like to, on behalf of the Dalian Municipal Government and its citizens, extend our warmest welcome to the Contracting Parties of the North Pacific Marine Science Organization and all the experts and friends here, and express our congratulations on the successful opening of the meeting!

On the east coast of Eurasia and the southern tip of the Liaodong Peninsula, Dalian is surrounded by the sea on three sides, and backed up by the vast Northeast Plain of China on the north. With a population of 6 million, it covers a land area of 12,500 square kilometers.

Dalian is an important port, trade, finance, industry and tourism city. The Dalian Port carries on trade and business with more than 300 ports in more than 160 countries and areas. It accounts for the majority of sea cargo and foreign trade container transportation in the whole northern area. The Dalian International Airport, the largest in Northeast China, offers flights to 133 domestic and international destinations, including 92 cities in 15 countries. It ranked the 4th in China in terms of international passenger volume in 2007.

Dalian, among the first batch of cities being opened to the outside world, is home to Northeast China's Economy and Technology Development Zone of national-level, the Hi-Tech Industrial Zone and the only Bonded Port Area in Northeast China. Foreign investors have set 12,900 enterprises, including 88 Fortune 500 companies who have invested in nearly 200 projects, with an actual utilized foreign capital of USD 30 billion.

As the conference and exhibition center of Northeast China, Dalian has held the World Chinese Insurance Convention, the APEC Summit, the 5th ASEM Economic Ministers' Meeting, and the WTO Small-scale Ministers' Meeting in recent years, and was the host of the annual meeting of Summer Davos 2007.

Dalian has been appraised with the Global 500 Award and Habitat Scroll of Honor Award by the UN, China's Model City of Environmental Protection, and is among the first batch of National Civilized Cities, as well. In 2007, Dalian won the honorary title of the Best Tourist City of China by both the World Tourism Organization of the UN and the National Tourism Administration.

On the theme of "*Beyond observations to achieving understanding and forecasting in a changing North Pacific: Forward to the FUTURE*", the PICES Seventeenth Annual Meeting holds 11 sessions, such as linking biology, chemistry, and physics in observational systems, species succession and long-term data set analysis, coastal upwelling processes and their ecological effects, *etc.*, which will further promote the common development of the North Pacific region.

The coast line of Dalian is 1906 kilometers long, and the sea area under the jurisdiction of Dalian is 23,000 hectares. The output value of aquaculture is 30% higher than that of the fishing industry, and the annual output values of the fishery reaches 17 billion yuan (RMB). The port logistics bring 60 billion RMB to GDP growth. The total revenue of tourism is 12.6 billion RMB, of which the sea-oriented tour program is the mainstay. So, the Dalian Municipal Government attaches great importance to the oceanic development and administration and conducts function zoning in marine areas. By sticking to the principle of "development with protection and protection benefits development", the Dalian Municipal Government makes rational use of oceanic resources. With respect to the waste water entering the sea, the environmental protection policies, such as the control of aggregated pollutants and discharge limits, should be executed strictly. Dalian has been a leader in avoiding global warming, saving energy and reducing carbon dioxide discharge in recent years. The city achieves the goals of energy conservation, coal conservation and emission reduction by implementing the central heating system and demolishing heating boilers that fail to conform to the standard of environmental protection facilities. Therefore, you can feel fresh air in our city as very few chimneys are here.

OS-2008

Dalian is well-known for the sea of which our citizens are proud. The inter-tidal zone and offshore sea areas are not only important resources, but are also places for citizens to enjoy the sea as well as the sea-routes leading to all over the world. We have made great efforts for about 2 years to successfully solve the problems caused by mariculture buoyant rafts, such as destroying the seashore scenery, bearing unfavorable influences on citizens who would like to appreciate the sea, as well as blocking the sea channel. We will strive to build Dalian into an ecological coastal city which is harmonious with the environment by deploying artificial reefs around the offshore zones in order to attract more marine creatures to inhabit here.

In the future, the latest research findings of PICES will be applied increasingly to the project of “blue sky, blue sea and green land”, and in response, the successful experience of Dalian in sea planning and administration will be exchanged and transferred to PICES. I believe the achievements of PICES, the stage combining the science and management of the sea, will further benefit the city and our citizens.

I sincerely hope that experts and friends from all over the world could tour around Dalian and enjoy the charm of this city when you finish the sessions of the meeting. Dalian will listen attentively to your wise and far-sighted ideas, and also contribute willingly to the development of PICES.

Finally, may the meeting succeed! Thank you.

OP Endnote 4

Remarks at the Opening Session by Dr. Laura Richards (Canada)

Mr. Chairman, distinguished guests and colleagues: On behalf of Canada and the Canadian delegation, I would like to thank the People’s Republic of China and the State Oceanic Administration for inviting us here to the beautiful coastal city of Dalian. We appreciate the hard work of the Local Organizing Committee and the PICES Secretariat in preparing for this meeting.

This has been an auspicious year for China as host to the 2008 Summer Olympic and Para-Olympic Games. Many Canadians were glued to their television sets, enjoying the wonderful games and ceremonies. We would like to congratulate China on your success.

This year has also been auspicious for marine science in Canada. We celebrated 100 years of science at St. Andrews Biological Station on Canada’s East Coast and the Pacific Biological Station at Nanaimo, on Canada’s West Coast. Unlike our host country of China, Canada is a young country with relatively few institutions that are 100 years old. As part of our celebration, we hosted several events, including the PICES Sixteenth Annual Meeting in Victoria last year, the American Fisheries Society meeting in Ottawa, in August 2008, and just last month, the ICES Annual Science Conference in Halifax. Our official 100th anniversary reception was held at the Pacific Biological Station earlier this month on October 1, bringing this year-long celebration to a close.

But to return to PICES, I would like to acknowledge another busy and successful year. Canada is particularly pleased to see the progress we have made in moving forward with FUTURE, our next major science program and its implementation plan, although we still have more work to do. FUTURE gives us the opportunity to ensure that PICES stays relevant by developing products that make our scientific knowledge available to decision makers and the broader community. We also have the opportunity to ensure that the science conducted within PICES is aligned with the current priorities and information needs of member countries. I encourage everyone to participate in the discussions about the FUTURE Implementation Plan which will take place this week. Let’s get it right so that PICES can continue to lead marine science in the North Pacific.

Thank you.

OP Endnote 5**Remarks at the Opening Session by Dr. Yukimasa Ishida (Japan)**

Mr. Chairman, distinguished delegates, ladies and gentlemen: On behalf of Japan and the Japanese delegation, I sincerely thank the Government of the People's Republic of China and the Local Organizing Committee for kindly hosting the PICES Seventeenth Annual Meeting here in Dalian. Also, I thank the PICES Secretariat for preparing for this meeting. I am sure that their excellent work will make this a fruitful meeting.

This year, Japan welcomed many international events. In July, the 34th Group of Eight Summit (G8) was held in Toyako, Hokkaido. The “*Environment and climate change*” was one of the major issues discussed by G8 leaders, including those from PICES member countries. In August, the PICES Summer School on “*Ecosystem-based management*” and the 4th PICES workshop on “*The Okhotsk Sea and adjacent areas*” were held in Hokkaido. The 5th World Fisheries Congress was held in Yokohama in October, just before this PICES Annual Meeting. Also recently, four Japanese scientists received the Nobel Prize, and one of them was a scientist who studied jellyfish in the United States. As such, the environment and ocean and fishery sciences were hot topics in Japan this year. The Government of Japan will continue to promote scientific research on these key issues, and I thank all of you for your cooperation now and in the future.

Japan is very pleased with the ongoing success of PICES activities, including the PICES project entitled “*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim,*” which is supported by a special Japanese Trust Fund. The goals of this project are to develop international systems to collect, exchange, and store relevant data on non-indigenous species in the North Pacific Ocean (and beyond), and to foster partnerships with non-PICES member countries and related international organizations. Japan hopes that these activities will contribute to the establishment of an information network 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 this Annual Meeting, an implementation plan for a new PICES integrated science program called FUTURE is scheduled to be discussed. This program is focused on marine environmental issues, especially in the coastal areas of each member country. Japan 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.

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 Dalian. Thank you very much.

OP Endnote 6**Remarks at the Opening Session by Mr. Doan Jeong (Republic of Korea)**

Honorable Dr. Tokio Wada (Chairman of PICES), Dr. Alexander Bychkov (Executive Secretary of PICES), Mr. Lianzeng Chen (Deputy Administrator of the State Oceanic Administration), Mr. Deren Xia (Mayor of Dalian), distinguished guests, ladies and gentlemen: First of all, on behalf of the Republic of Korea and the Korean delegation, I would like to extend my appreciation to the Government of the People's Republic of China for this wonderful arrangement of the Seventeenth Annual Meeting of PICES.

In recent years, we have witnessed too many abnormal events resulting from climate change, such as global warming or sea level rise. Rapid changes in the ocean and ecosystem could pose serious problems, especially in the North Pacific region. Now it is high time to make concerted efforts to respond to such climate change and to prevent another severe disaster. In this regard, I believe the theme of this year's PICES Annual Meeting, “*Beyond observations to achieving, understanding and forecasting in a changing North Pacific: Forward to the FUTURE*” is very timely and appropriate.

OS-2008

Ladies and gentlemen: Korea is always ready to take part in every issue of PICES, and cooperate with other member countries to accomplish the purposes of PICES. In this context, I am delighted to inform you that the Republic of Korea is to host the PICES Eighteenth Annual Meeting in 2009, under the theme of “*Understanding ecosystem dynamics, and pursuing ecosystem approaches to management.*” I hope to see all of you at the next Annual Meeting in Jeju, and also suggest that you to take the opportunity to enjoy the beautiful scenery of this southern island of Korea.

In addition, I would like to introduce to you the World Expo 2012 to be held in Yeosu, Korea, under the theme of “*The Living ocean and coast: Diversity of resources and sustainable activities*”. I am confident that the World Expo 2012 will raise common interests in the sustainable development of the ocean, and serve as valuable opportunities to strengthen cooperation among the North Pacific countries.

Lastly, I would like to extend my special thanks to all the staff of the PICES Secretariat and the Local Organizing Committee for their efforts and hard work to make this meeting a success. Thank you very much.

OP Endnote 7

Remarks at the Opening Session by Dr. Lev N. Bocharov (Russian Federation)

Dear Mr. Chairman, Dr. Tokio Wada, dear Mr. Lianzeng Chen, dear National Representatives, dear participants, ladies and gentlemen: First of all, I would like to thank our Chinese colleagues for the invitation to the beautiful city of Dalian. It is a perfect place for the Annual Meeting of PICES to be held! On behalf of the Russian delegation I would like to express my gratitude to the Local Organizing Committee and the PICES Secretariat for the great amount of work carried out to prepare for the meeting.

For the past 17 years since the moment the Organization was established, the scope of PICES activities has increased a lot. A large amount of work is being carried out between the Annual Meetings. Our relations with other international organizations and programs have greatly strengthened, and the cooperation with them is successfully developing. In the North Pacific region, one of our closest allies is the North Pacific Anadromous Fish Commission (NPAFC). In October 2007, the TINRO-Centre, on behalf of the Russian Federation Government, hosted the NPAFC Fifteenth Annual Meeting in Vladivostok. As an observer from the largest Organizations studying the Pacific Ocean, it was my honor to represent PICES at that meeting. A constantly increasing number of participants and observers from many organizations and programs, with an interest in the study and use of the world ocean, is a confirmation of growing interest in PICES around the world. Furthermore, the need to increasing the number of countries participating in PICES activities keeps getting stronger.

Once again, I would like to note that the Russian Federation has always paid great attention to the study of the world ocean, and PICES’ growing activities receive our regular support and are highly appreciated in our country. Further still, Russia stands for the development and perfection of PICES activities. We especially value the coordinating role of PICES in the realization of large integrative scientific programs, such as the Climate Change and Carrying Capacity (CCCC) Program and FUTURE.

Undoubtedly, lots of changes will occur in ocean science in general, and in fishery science in particular during the first half of this century. An ecosystem approach to the study of the ocean will be widely used for opening up new sea resources and developing mariculture by all the countries. PICES as a progressive scientific organization is ready to take a worthy place in this process.

To conclude my speech, I wish all the participants of the PICES Seventeenth Annual Meeting successful and fruitful work – a lot of problems have to be considered and a lot of important decisions have to be made. Thank you.

OP Endnote 8**Remarks at the Opening Session by Dr. George Boehlert (U.S.A.)**

The United States and its PICES delegation are very pleased to participate in the Seventeenth Annual Meeting of PICES here in Dalian. We are fortunate to be able to visit this beautiful port city in northern China, and congratulate the People's Republic of China on a very successful 2008 Olympic Games.

The challenges facing our climate, our oceans, and our marine ecosystems require scientific research that transcends the capability of any one nation to undertake. These challenges, indeed, transcend our national boundaries. Yet the impacts of changes to earth systems affect us all. In the North Pacific, PICES has stimulated the cooperation to help fill this need in ocean science. The reach of PICES goes even further by collaborating with ICES (International Council for the Exploration of the Sea), IOC (Inter-governmental Oceanographic Commission of UNESCO), and other organizations, in preparing and convening such events as the recent Gijón symposium on "*Effects of climate change on the world's oceans.*"

In addition to the valuable contributions by PICES scientific committees, working groups, and other collaboration, the scientific programs are timely and provide cutting-edge science. The new synthesis from the Climate Change and Carrying Capacity (CCCC) Program – "*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*" has recently been published. At this meeting, we will move forward with studying the implementation plan for FUTURE, a new PICES integrative science program, and address new scientific challenges.

At this Seventeenth Annual Meeting of PICES, we will see the full development plans for FUTURE, as well as other new initiatives. New approaches for exchange of scientific information through marine science libraries will be discussed. The Study Group on *Communications* will deliberate on how PICES may better communicate important scientific matters to managers and citizens alike. It is exciting for all of us to be part of the growth and evolution of PICES.

Finally, new uses of the marine environment continue to emerge. Offshore aquaculture is under development in many parts of the world ocean. Many nations are planning for development of renewable marine energy sources from waves, tides, or currents. Each of these new uses will require scientific study, and PICES will continue to serve as a forum to develop new scientific cooperation.

The U.S. delegation looks forward to this meeting and the advances it will bring. We thank the People's Republic of China, the city of Dalian, and the State Oceanic Administration for hosting this meeting and also look forward to learning more about Dalian.

OP Endnote 9**Remarks at the Opening Session by Dr. Zhanhai Zhang (People's Republic of China)**

Respected Mr. Chairman, Deputy Administrator Mr. Lianzeng Chen, Mayor Deren Xia, honourable guests, ladies and gentlemen: Autumn is the season of harvesting. The Seventeenth Annual Meeting of PICES is successfully opened in Dalian, which provides us a great opportunity to share new information and products, learn from each other and explore new cooperation fields. Please allow me, on behalf of the Department of International Cooperation of the State Oceanic Administration (SOA), and the Chinese delegation, to extend our warmest welcome to all the participants, and express our sincere thanks to the senior officials for your involvement!

Since its establishment in 1992, with the joint efforts from all the Contracting Parties, PICES has developed as an important inter-governmental marine scientific organization in the North Pacific, playing an vital role in the fields of enhancement of marine scientific research and improvement of coordination among the Contracting Parties. Meanwhile, PICES has also initiated large-scale international scientific programs, and implemented a

OS-2008

series of scientific activities accordingly. Through the implementation of these programs and activities, the research capacity of the Contracting Parties has been enhanced in basic marine science, ocean and climate change, marine ecological environment conservation and sustainable use of marine resources. The relationships among the Contracting Parties have been strengthened, and achievement has been made to help people to understand the ocean, utilize the ocean and save the ocean.

In 2005, PICES initiated a new program named “*Forecasting and Understanding Trends and Responses of North Pacific Marine Ecosystems*” (FUTURE). As an integrative large-scale scientific program, FUTURE aims to help understand how marine ecosystems in the North Pacific respond to climate change and human activities, to forecast ecosystem status based on a contemporary understanding of how nature functions, and to communicate new insights to its members, governments, stakeholders and the public. I believe, with the collective support and efforts from relevant governments, research institutions and scientists, we will make great progress on this program.

Since its involvement in PICES, China has put a lot of emphasis on, and took very active part in PICES activities, and at the same time, shouldered the responsibility and made contributions to the development together with other Contracting Parties. 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 utilization of the marine ecosystem.

I am very glad that the Seventeenth Annual Meeting of PICES is held in Dalian, with more than 400 scientists from the U.S., Russia, Canada, Japan, Korea, China, as well as other non-PICES member countries. The theme of the meeting is “*Beyond observation to achieving understanding and forecasting in a changing North Pacific: Forward to the FUTURE*”. In the forthcoming week, all the scientists will share information and new scientific output in the following sub-topics: species succession and long-term data set analysis pertaining to harmful algal blooms, ecosystem-based fisheries management, mariculture technology and husbandry for alternate and developing culture species, coastal upwelling processes and their ecological effects, marine system forecast models, consequences of non-indigenous species introductions, and connecting the human and natural dimension of marine ecosystems and marine management in the PICES context, *etc.*

We hope that the meeting would be a wonderful gathering for people to share new products in marine scientific research, marine technology and ocean management, and a free platform for people to explore new fields, generate new ideas, formulate new proposals and implement new projects. We also hope that all the participants could open a dialogue to contribute to further development of marine scientific research and sustainable development of an economic society in the North Pacific.

Finally, I wish the meeting great success! I wish all of you a pleasant stay in Dalian! Thank you.

OP Endnote 10

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

Mr. Lianzeng Chen, Mr. Deren Xia, distinguished delegates, guests, ladies and gentlemen: Welcome to the Seventeenth Annual Meeting of PICES. On behalf of the entire PICES community, I would like to express our hearty thanks to the Government of the People’s Republic of China, to the Dalian Municipal Government, and to the Local Organizing Committee for their hospitality and hard work in organizing this Annual Meeting.

Since 2004, PICES has been developing a new integrative scientific program called FUTURE, an acronym for “*Forecasting and Understanding of Trends, Uncertainty and Responses of North Pacific Marine Ecosystems*”. Its Science Plan was adopted by the Governing Council at the last Annual Meeting in Victoria, Canada. We

will discuss the Implementation Plan at this Annual Meeting, with a view toward initiating the program from next year.

As you know, FUTURE is a successor to the PICES-GLOBEC Climate Change and Carrying Capacity (CCCC) Program, our first integrative science program. The understanding of responses of North Pacific marine ecosystems to climate change is still a key issue of FUTURE. Therefore, its success will depend on the scientific legacies of the CCCC Program. On the other hand, FUTURE has some new aspects. It will evaluate the human dimensions of ecosystem dynamics, and it will improve the communication of scientific results to policymakers and stakeholders. These are based on the requests from the Contracting Parties and a necessity of PICES itself. From this point of view, we could say that FUTURE is the first PICES-oriented integrative science program.

At the beginning of October, this year's recipients of the Nobel Prize for physics and chemistry were announced. Their prize-winning results were achieved more than 40 years ago, when they were early career scientists. The successive studies for several decades by many other scientists evaluated the validity of those findings. This clearly shows that scientific breakthroughs can be achieved by the flexible thinking of young scientists. The succession of scientific legacy through passing generations is important for scientific seeds to blossom out into fruitful results. I sincerely hope that many young scientists will join in the implementation of FUTURE and open the frontiers of North Pacific marine science.

At this Annual Meeting, we have many interesting sessions under its overall theme, "*Beyond observations to achieving understanding and forecasting in changing North Pacific: Forward to the FUTURE*". Various environmental issues, including ecosystem-based aquaculture technique, are appropriate topics to be discussed in this meeting held in China, a leading country of studies in ocean environment and aquaculture science in the world.

This Annual Meeting will also be a turning point in the administration of PICES. Since the Fifteenth Annual Meeting, we have been discussing ways to collaborate with non-member countries and other organizations. Now, it is nearing the time to make some decision.

In recognition of the recent severe financial and economic situation, we must find a way to adjust our activities to fit within what can be allowed by the financial condition of all our Contracting Parties and the Organization. The Annual Meeting is also not an exception. At this Annual Meeting, I am hoping to discuss the restructuring of PICES Annual Meetings to lessen the financial burden on Contracting Parties and PICES.

Finally, I expect that this meeting will achieve many fruitful results not only in science, but also in administration, and will be a memorable one in the history of PICES. Thank you very much.

OP Endnote 11

Science Board citation for 2008 Wooster Award

In 2000, PICES established an award in honor of Dr. Warren S. Wooster, the principal founder and first Chairman of PICES, and world renowned researcher and statesman in the area of climate variability and fisheries production. The award is to be given annually to an individual who has made significant scientific contributions to North Pacific marine science; has achieved sustained excellence in research, teaching, administration or a combination of these in the area of the North Pacific; has worked to integrate the various disciplines of the marine sciences; and preferably someone who is, or has been, active in PICES.

Prior recipients of the Wooster Award were Michael Mullin (2001), Yutaka Nagata (2002), William Pearcy (2003), Paul LeBlond (2004), Daniel Ware (2005), Makoto Kashiwai (2006) and Kenneth Denman (2007). Today, it gives me great pleasure to announce that the Wooster Award for 2008 is given to Dr. Charles Miller, a nationally and internationally distinguished biological oceanographer specializing in studies of zooplankton.

Dr. Charles Miller, Charlie to most of his colleagues, grew up far from the ocean, in Minnesota, and did his undergraduate studies at Carleton College in Northfield, Minnesota, where he graduated with a stellar academic record. Charlie did not follow his father into medicine; instead, his interests tended to marine biology and biological oceanography, stimulated perhaps by a summer course taught by Joel Hedgepeth at a marine station. Charlie enrolled in a Ph.D. program at Scripps Institution of Oceanography, where he was a student of John McGowan. At Scripps, Charlie was exposed to the multidisciplinary ecosystem work of the CalCOFI program. Other influential mentors while at Scripps were Abe Fleminger, Ed Fager, and Reuben Lasker.

After receiving his Ph.D., Charlie spent a year in New Zealand as a National Science Foundation (NSF) fellow. In 1970, Charlie obtained an Assistant Professor position at Oregon State University (OSU) and landed in an office that he continues to occupy daily as an emeritus professor of Oceanography. His early career at OSU was marked by research on the early life history of plankton and fish in the Oregon coastal upwelling region; this work was collaborative with OSU faculty members Bill Percy (the 2003 Wooster Award recipient) and Jeff Gonor, and provided research opportunities and training for postdocs and technicians like Sally Richardson and Bill Peterson and training for several students. Key papers that came out of this work included descriptions of zooplankton community structure off Oregon and recognition of the strong seasonality in zooplankton species composition caused by north–south reversals of currents.

To understand the ecology of marine zooplankton, Charlie believes there is no substitute for observing their morphology, behavior and ecology. His observations of zooplankton led to descriptions of how copepod teeth were formed using silica, and how these patterns could inform development stage and the molting cycle of copepods. He also used more traditional incubation-based methods to quantify development rates and describe growth rules in copepods (work done collaboratively with his Ph.D. student, Ken Johnson). Also important are Charlie's studies of the phenology and life history of several dominant subarctic oceanic copepods and chaetognaths, done with several collaborators and students, and his investigations describing copepod sex determination and mating behavior.

Charlie and Bruce Frost of the University of Washington realized in the late 1970s that the Canadian Ocean Weathership program that had been ongoing at Station PAPA in the eastern subarctic Pacific was nearing an end, as the primary functions of weather data observations from the weathership were being replaced by satellite observations. With funding from the National Science Foundation and the cooperation of the Canadian Coast Guard and Institute of Ocean Sciences, Charlie initiated frequent (*ca.* weekly) net-plankton sampling at PAPA, that provided a one and one-half year time series of depth-stratified samples to 2000 meters. At the time, and perhaps to this day, that sample set is still the best long-term, vertically resolved time series for describing the population dynamics and phenology of oceanic Pacific zooplankton.

The results from the weathership sampling sowed the seeds for future big-program interdisciplinary ocean research to understand the spring–summertime dynamics of the planktonic ecosystem of the eastern subarctic Pacific. Project SUPER was a large, multidisciplinary group of scientists (including Pat Wheeler, Mike Dagg, Mike Landry, Suzanne Strom, Bruce Frost, Nick Welshmeyer, Hal Batchelder, Dave Mackas and the 2007 Wooster Award recipient, Ken Denman). The SUPER synthesis, which attributes the lack of spring blooms to both grazers and iron limitation, remains the right way to see the functioning of iron-limited HNLC systems. It was at this time that Charlie described and named *Neocalanus flemingeri*, and wrote the early papers about the life history of this important North Pacific copepod.

Charlie's research on zooplankton and pelagic ecology in the oceanic subarctic Pacific spans more than 40 years—beginning with graduate student cruises at Scripps in the summer of 1964, his sampling at Station PAPA in the early 1970s and later from the weatherships and during SUPER, and continuing with his intellectual leadership in the OECOS program. Charlie's research extends to the North Atlantic also, especially for *Calanus finmarchicus*, but that is a tale for another time. Charlie has published more than 60 scientific papers, half of these as senior author, and 9 of these as sole author. He also authored a widely used text book on biological oceanography.

Charlie has provided extensive service at national and international levels. Within the U.S., he has served on NSF review panels, the Exxon Valdez Oil Spill Scientific and Technical Advisory Committee, and for six years—two years as Chair—on the UNOLS Advisory Council. UNOLS is the organization that provides short- and long-term planning of the U.S. oceanographic research fleet.

Internationally, Charlie has contributed to ICES Working Groups and PICES activities. Since 2000, Charlie has chaired the PICES CPR Advisory Panel. Through his leadership, along with that of Sonia Batten, Dave Welch and others, PICES has established a North Pacific CPR survey. Charlie and Tom Ikeda organized the first OECOS (Oceanic Ecodynamics Comparison in the Subarctic Pacific) workshop, and Charlie continues as Co-Chair of OECOS.

Charlie has served on the editorial boards of *Limnology and Oceanography*, *Plankton Biology and Ecology* of the Plankton Society of Japan, and *Progress in Oceanography*. He served as Co-Editor-in-Chief of *Progress in Oceanography* from 2003–2006.

Charlie Miller mentored and advised (as major professor) ten Master's degree students and five Ph.D. students at Oregon State University, and served on the committees of countless other oceanography students. Charlie has, without doubt, positively influenced most biological oceanography students who have passed through Oregon State University in the past 30-plus years.

Honors bestowed upon Charlie include being a fellow of the American Association for the Advancement of Science, receiving the best presentation award at the 1997 ICES Annual Science Conference, and receiving the Excellence in Mentoring Award (2001) and Excellence in Teaching Award (2003) from the College of Oceanic and Atmospheric Sciences at Oregon State University. At the PICES co-sponsored Third International Zooplankton Production Symposium in Gijón, Spain in 2003, Charlie provided the closing remarks about exciting new developments and progress being achieved in the field of zooplankton ecology. He was chosen for this honor due to his expertise in the field, but perhaps also, to his longevity in the field.

Even though retired, Charlie is intellectually challenging to those around him and full of creative energy. For the past 5 to 10 years, Charlie has been socially proactive within his local community in Oregon. He has organized community forums to inform the general public about pressing social issues—including, but not limited to, forums on health care issues, global warming and associated social changes, energy alternatives to oil, and war and peace issues.

In summary, Charlie is a teacher, mentor and good citizen of planet Earth. Charlie's ability to identify big scientific issues, formulate plans and assemble scientific teams, and to carry the research through to synthesis and publication has clearly increased understanding of subarctic ecosystems and zooplankton phenology. He has contributed greatly to the goal of national and international cooperation and collaboration on North Pacific ocean research in general, and through PICES, specifically. He is extremely qualified for, and a worthy recipient of, the Warren Wooster Award of PICES, and we are pleased to honor him today with this award.

Please join me in a round of applause for Professor Charlie Miller, the 2008 recipient of the Warren Wooster Award.

OP Endnote 12

Science Board citation for 2008 PICES Ocean Monitoring Service Award

Significant advances in marine science are often based on ocean observations. Long-term observations are particularly important for detecting and understanding ecosystem change because major shifts in ecosystem structure and function occur over long temporal periods. It is widely recognized that these fundamental activities often lack the glamour and respect that typically accompanies other types of scientific achievement even though these other achievements rely on monitoring and observation. It is unfortunate that monitoring activities are often taken for granted and are frequently targeted for budget cuts when countries experience financial constraints or hardships.

With this in mind, PICES recently established a new award to recognize the sustained accomplishments of those engaged in monitoring data management, and communication. 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 and data management and communication.

In January of this year, PICES announced the award and solicited nominations for the very first POMA. The nominations were considered in April and the Science Board was unanimous in their decision. It is my pleasure to announce that the training ship T/S *Oshoro-maru* of Hokkaido University is the first recipient of the PICES Ocean Monitoring Service Award.

The first *Oshoro-maru* was built in 1909. The 31-meter wooden topsail schooner equipped with a 63 horsepower engine was modeled after those vessels used in the Gloucester cod fishery. It was named for a bay on Hokkaido, Japan. The bay, then an important fishing ground for Pacific herring, was the ship's first home port. In 1927, *Oshoro-maru I* was replaced by *Oshoro-maru II*, a 42-m steel barkentine with a 500 horsepower diesel engine. In 1955, the faculty of Hokkaido University greatly expanded their mission both geographically and thematically, adding meteorological observation, seawater analysis, plankton and larval fish collections, dredging and sea surface temperature measurement. In 1955, the ship made her first foreign port call during a North Pacific cruise to Seattle. This was the first visit by a Japanese government ship to the U.S. since the end of the World War II. One of the prominent scientific accomplishments of *Oshoro-maru II* was Professor Naoichi Inoue's "marine snow" research in 1952 conducted from the submersible "Kuroshio" for which *Oshoro maru II* served as the mother ship.

In 1962, *Oshoro-maru III*, a 67-m stern trawler with 2000 horsepower engine, was launched. She continued the important contributions made by the faculty of Hokkaido University by increasing monitoring activities in the North Pacific and the Bering Sea. This led to an increase in the degree of international collaboration. Since 1962, more than 100 scientists from outside of Japan have participated on her cruises.

Oshoro-maru IV, the current vessel, began her tenure in 1984. She is a 73-m stern trawler equipped with 3,200 horse power engine. She has 13 officers and 27 crew and the capacity for 6 researchers and 60 students. *Oshoro-maru II, III and IV* have made more than 90 port calls to nearly 20 ports on her North Pacific cruises, while primarily conducting research in the Bering Sea and North Pacific Ocean. The sampling includes physical, chemical and biological oceanography as well as fisheries. The data from the North Pacific cruises have been published annually since 1957 in the Faculty of Fisheries "*Data Record of Oceanographic Observations and Exploratory Fishing*" and are now available on a CD published by the Japan Oceanographic Data Center. Data from experimental fishing and other associated biological sampling are being organized in a new database that will soon be publicly available. This will contribute to our ability to understand the response of North Pacific marine ecosystems to climate change.

The observations made aboard *Oshoro-maru* have contributed to the rapid progress of marine scientific research in the region. The annual summer cruises since 1955 have allowed long-term ecosystem observations, and have advanced cooperative research among PICES countries. Through the T/S *Oshoro*

maru, members of the Faculty of Fisheries, Hokkaido University have actively promoted cooperative investigations among universities and research institutes of PICES countries, such as the University of Alaska, University of Washington, University of Hawaii, Oregon State University, University of British Columbia, NOAA – Alaska Fisheries Science Center, and Institute of Ocean Sciences of Fisheries and Oceans Canada, as examples. More than 250 scientific papers have been published using the data collected during *Oshoro-maru* cruises.

The almost 50 years of hydrographic, nutrient, zooplankton, and chlorophyll data of Hokkaido University are invaluable for addressing current scientific problems of the North Pacific Ocean. The Faculty of Fisheries showed great foresight in establishing their vessel as one of the principle sampling tools of the North Pacific Ocean. They have generously shared their ship time and observations with the international community and today we recognize and reward their accomplishments.

OP Endnote 13

“Wave-tide-circulation coupled model: To improve the forecasting ability for FUTURE”

Abstract of the keynote lecture by Dr. Fangli Qiao

(First Institute of Oceanography, State Oceanic Administration, People’s Republic of China)

As mixing is essentially an energy balance problem, surface waves should play a controlling role in the upper ocean as they are the most energetic motions. Unfortunately, in most ocean dynamics studies, wave motions have always been treated separately from the ocean circulation. So most ocean circulation models have overlooked the role of the surface waves, or just considered wave breaking effects. Consequently, these models have produced insufficient vertical mixing and this resulted in an under-prediction of the mixed layer depth and an over-prediction of the sea surface temperature, particularly during the summer season. As the ocean surface layer determines the lower boundary conditions of the atmosphere, this deficiency has severely limited the performance of the coupled ocean–atmospheric models and hence climate studies. To overcome this shortcoming, we have established a new theory on the wave-induced vertical mixing that will correct this systematic error due to insufficient mixing. This wave-induced vertical mixing is due to Stokes drift rather than wave breaking. Our studies indicate that the wave-induced mixing penetration depth can reach nearly 100m in high latitudes and about 30m in tropical areas. The new scheme has enabled the mixing layer to deepen, and shows an excellent agreement with observed climatologic data. Different OGCMs such as POM, ROMS and HIM show similar improvements, and this surface wave correction can alleviate the too-cold tongue in the tropical area of CCSM3 which is a common problem for all climate models without flux correction. In shallow coastal waters, tidal current-induced vertical mixing is very important for the formation of temperature fronts. So a wave-tide-circulation coupled model has been set up. This new generation ocean circulation model can improve the forecasting ability of temperature, salinity and currents.

REPORT OF GOVERNING COUNCIL

The Governing Council met from 9:00–18:00 hours on November 1, 2008, and from 9:00–14:30 hours on November 2, under the chairmanship of Dr. Tokio Wada. All Contracting Parties were represented at the two sessions (*GC Endnote 1*). At the first session, the Chairman welcomed attendees, introduced the provisional agenda circulated on September 17, and suggested the order in which to take up the various items. The agenda was adopted with the addition of the review of the procedure for preparing the Council report under Agenda Item 16 – Other Business (*GC Endnote 2*). The Executive Secretary requested each Contracting Party to examine its draft Delegation List and submit the final Delegation List prior to the second session. This report summarizes the treatment of each agenda item during the course of the two sessions.

AGENDA ITEM 3

Report on Administration

The Executive Secretary summarized the activities of the Organization and the Secretariat since the 2007 Annual Meeting. Council reviewed and adopted the report (*GC Endnote 3*).

AGENDA ITEM 4

Membership and observers from other countries

The Secretariat did not receive proposals from any country to accede to the PICES Convention.

The Chairman re-iterated that scientific cooperation with non-member countries and other international organizations is crucial for extending the activity of PICES, and has been an important subject of discussion in Council, especially because many of the issues addressed by PICES are not unique to the North Pacific. At the 2006 PICES Annual Meeting, a Study Group on *Scientific Cooperation between PICES and Non-member Countries* (SG-SC) was formed, under the direction of Council, to explore options on how scientific cooperation with non-member countries could be best achieved (Decision 06/A/6). The SG-SC report was adopted at the 2007 PICES Annual Meeting (Decision 07/A/4) and included in the 2007 PICES Annual Report. The Study Group was unanimously negative to the idea of amending the PICES Convention to expand the “area concerned”. One of the options for scientific cooperation within the current Convention offered by SG-SC was to establish an affiliate status system in PICES, similar to the arrangement implemented some time ago by ICES.

Following a request by Council at the 2007 inter-sessional meeting, a draft *Affiliate Member Policy* was developed and presented by the SG-SC Chairman, Dr. Laura Richards, at last year’s Annual Meeting (see 2007 *GC Endnote 6*). Council reviewed this document, but was unable to reach consensus on its adoption and agreed to continue discussion at the 2008 Annual Meeting. All Contracting Parties were requested to provide their views on the affiliate status system and comments on the draft policy to the Chairman and Executive Secretary prior to the meeting. The comments from the Japanese and U.S. delegations are appended as *GC Endnote 4*. Editorial changes suggested by the US delegation were included in the 2008 Council Background Briefing Book.

In Dalian, Council extensively discussed the comments provided by Japan and the United States, but again was unable to reach consensus on the adoption of the affiliate status system. Dr. Richards reported that the F&A Committee reviewed the PICES Rules of Procedures, and suggested possible changes in order to accommodate experts from non-member countries or other organizations to subsidiary bodies of Standing Committees (*ex-officio* membership). These proposed changes are not expected to have financial implications, except costs related to the distribution of PICES publications to these experts. Council agreed that this is a viable

GC-2008

alternative approach to the affiliate status system, and requested Dr. Richards to work with the Secretariat to prepare actual amendments for consideration at the next meeting of Council. Some Contracting Parties recommended extending *ex-officio* membership to Technical Committees.

AGENDA ITEM 5

Relations with relevant international and regional organizations/programs

The Executive Secretary provided a report on communication with the relevant international and national organizations and programs since last year's Annual Meeting (see *GC Endnote 3* for details). He also pointed out that more than 20 organizations and programs were present as observers at the PICES Annual Meeting this year (*GC Endnote 5*). In particular:

- Dr. Patricio Bernal (General Secretary of IOC) attended the Science Board meeting (October 26) and meetings of several expert groups, and shared his views on potential areas of collaboration between IOC and PICES. These areas, summarized in his letter sent to the PICES Secretariat on October 31, include: (1) joint efforts on developing understanding of the vulnerability of fisheries to climate variability and change as a potential input to the 5th IPCC Assessment Report; (2) cooperation in an information network on ocean acidification and a common database on natural iron; and (3) PICES involvement in the OceanObs'09 conference (<http://www.oceanobs09.net>).
- Dr. Adolf Kellermann (Head of ICES Science Programme) participated in the Science Board meeting (October 26) to present an update on the continuing science reform in ICES and to discuss joint activities of the two Organizations in 2009 and beyond.
- Dr. Manuel Barange (Executive Director of GLOBEC) attended the meeting of the Executive Committee of the CCCC Implementation Panel to (1) provide information on discussions within a GLOBEC-IMBER Transition Task Team on a way forward for international marine ecosystem science after the completion of GLOBEC, and (2) outline plans on the 3rd GLOBEC Open Science Meeting to be held in June 2009, in Victoria, Canada. He also liaised with the PICES Secretariat on logistics for this meeting.
- Representatives of several other programs and organizations (Argo, BEST, ESSAS, IMBER, IWC, NOWPAP, PAG, SOLAS, WCRP/CLIVAR) addressed PICES Standing Committees or their subsidiary bodies on potential areas of collaboration with PICES, and submitted specific proposals for joint activities (details can be found in the reports of Standing Committees).
- Some programs and organizations (Argo, BEST, ESSAS, IMBER, NOWPAP, PAG and SOLAS) had posters on display outlining their scientific objectives and highlighting recent activities.
- A brief presentation on the implementation of the Action Plan resulting from the 2007 PICES Publications Review was given by Mr. Brian Voss (IAMS LIC) at the meetings of the F&A Committee and Study Group on Communications (*F&A Endnote 6*). The plan, once completed, would allow a smooth transition to more on-line access for PICES publications.

Council reviewed the progress made in the integration and coordination of PICES activities with other international and regional scientific organizations and programs, and approved keeping the *Standing List of International and Regional Organizations and Programs*, and priorities for interaction in 2008–2009, as recommended by Science Board (Decision 08/S/8). This list is used, in part, to assist the Executive Secretary and Science Board in decisions regarding sending PICES representatives to meetings of other international organizations/programs.

AGENDA ITEM 6

Future integrative scientific program of PICES

The second integrative scientific program of PICES, FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems) will be the highest priority activity of the Organization for the next decade. At the 2007 PICES Annual Meeting, Council:

- approved in principle the Science Plan for FUTURE, subject to minor modifications to be completed by the end of 2007 (Decision 07/S/1);
- agreed that \$40,000 from the encumbered funds designated for high-priority projects be earmarked for the development of FUTURE (Decision 07/A/3(v));
- endorsed two activities proposed by Science Board for 2008: (1) a 2-day workshop to develop an Implementation Plan for FUTURE to be held in April 2008, in conjunction with an inter-sessional Science Board meeting (Decision 07/S/3), and (2) a 1-day Science Board Symposium on “*Beyond observations to achieving understanding and forecasting in a changing North Pacific: Forward to the FUTURE*”, to be convened at the 2008 PICES Annual Meeting (Decision 07/S/2).

At the second session of Council on November 2, Dr. John Stein (Science Board Chairman) reported on the progress made in the development of FUTURE. The following activities took place after the 2007 Annual Meeting:

- The FUTURE Science Plan was modified, taking into consideration comments from the 2007 Open Forum and recommendations by Science Board and Council, and its final version was posted on the PICES website in mid-February 2008.
- The FUTURE Implementation Plan workshop was held April 23–24, 2008, in Seattle, U.S.A. The goals of the workshop were to discuss: the organizing principles for implementing FUTURE, the framework for an organizational structure, potential membership and co-chairmanship for the Implementation Plan Writing Team (IP-WT), and a timeline for developing the Plan. Attendees of the workshop included practically all members of the Study Group on *Future Integrative Scientific Program(s)* (SG-FISP), Science Plan Writing Team (SP-WT) and Science Board, and several invitees. Some Council members participated in the workshop, which was valuable to the deliberations. A brief summary of the workshop was published in PICES Press in June 2008 (Vol. 16, No. 2).
- The IP-WT was established in May 2008, through the Council approval process, with the responsibility of drafting the Implementation Plan for FUTURE. This Team includes 21 scientists representing all Contracting Parties. Drs. James Overland (U.S.A.) and Hiroaki Saito (Japan) were appointed as IP-WT Co-Chairmen.
- The draft Implementation Plan was circulated to Council, Science Board and SG-FISP and posted on the PICES website on October 10, 2008.
- This draft was reviewed by Standing Committees and their subsidiary groups prior to, or at, the 2008 PICES Annual Meeting. An Open Forum was held at the Annual Meeting on October 30 to receive comments from the broader PICES community. A 1-day Science Board Symposium on “*Beyond observations to achieving understanding and forecasting in a changing North Pacific: Forward to the FUTURE*”, and several FUTURE-related Topic Sessions and workshop were also convened to assist in the development of the program.
- Science Board and some IP-WT members met to refine the scope and direction of the implementation of FUTURE. Discussions revolved around issues such as: (1) definition of clients; (2) the readiness to take on operational forecasts, and how to balance the work on developing forecasts; and (3) the need to improve our understanding of various issues from the physics to ecological interactions, and research to uncover the mechanisms in all of these areas which are essential for developing and improving forecasts that have reduced uncertainty. It was also pointed out that, compared with its predecessor, the CCCC Program, FUTURE has some new aspects which need to be explicitly reflected in the Implementation Plan: coastal processes and the associated anthropogenic forcings, the human dimension of ecosystem dynamics, and the communication of scientific results to policy makers and stakeholders.

Extensive discussion on the structure and implementation strategy for FUTURE took place after Dr. Stein’s presentation. While no formal decision was made by Council on the structure of FUTURE, some of the delegates suggested that a closer integration of FUTURE, Science Board, and Committees is desirable in the Implementation Plan. It was noted that this was also a major element of consideration when the Science Plan was being created, and that the intent was to facilitate better linkages between Standing Committees and the science program. Although the delegates had different ideas what a desirable degree of integration should be, they all agreed that the ownership of FUTURE belongs to Science Board, and that Science Board should serve as the Scientific Steering Committee for the Program. The Co-Chairmen of FUTURE must be on Science Board

GC-2008

to coordinate the implementation of the program with and among Standing Committees. It is important that these Committees be fully engaged with the program to ensure that all of the scientific capabilities within the Organization are contributing. Determining how the Committees and Science Board are to be involved in carrying out FUTURE should be a major consideration in developing the next draft of the Implementation Plan.

There were also comments on the scope of FUTURE, and that while this effort is only one segment of the science of PICES and should be focused, it is also our next major scientific program and should be structured to be appealing to all of the science elements within the Organization. Opinions were expressed 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.

Concerning the schedule, it was confirmed that the goal is to initiate the program in 2009. In the next draft(s) of the Implementation Plan to be developed by the spring of 2009, the focus should be on clearly defining the terms we are using, providing much more detail on the specific tasks, defining the structure of FUTURE and the responsibilities of the Standing Committees in delivering the tasks, and highlighting that there is a major component in FUTURE intended to improve our understanding of processes and mechanisms. There was a strong feeling that a phased approach in implementing FUTURE should be used, and that the Implementation Plan has to be re-visited in 3–5 years to review the progress and make needed adjustments.

Council approved a 2-day workshop to finalize the development of the Implementation Plan for FUTURE, to be convened in conjunction with inter-sessional meetings of Science Board and Council in April 2009, in Qingdao, China (Decision 08/S/2). A proposal to have an IP-WT meeting between November 2008 and April 2009 was considered, but consensus was not reached, and the decision was deferred to the IP-WT Co-Chairmen.

Dr. Richards suggested that sufficient funding is available in the budget for activities planned for 2009.

AGENDA ITEM 7

Capacity building activities and PICES Intern Program

Holding special conferences, schools on marine sciences and training courses for early career scientists, providing financial support for their participation in PICES Annual Meetings and symposia co-sponsored by the Organization, and the Intern Program are all essential components of PICES' strategy for capacity building (http://www.pices.int/about/capacity_strategy.pdf). The Executive Secretary reported on capacity building activities in 2008 and some plans for 2009.

Travel support for early career scientists

It is estimated that about \$38,000 from the Trust Fund will be spent in 2008 to support participation of early career scientists in the international symposium on "*Effects of climate change on the world's oceans*" (Gijón, Spain), and in the 2008 PICES Annual Meeting (Dalian, China). This amount includes about US\$12,500 provided by the Scientific Committee on Oceanic Research (SCOR) to cover travel of scientists from countries with "economies in transition" to these two meetings. Council expressed their thanks to SCOR for their continuing support. Following the revised guidelines for operating the Trust Fund adopted in 2006 (Decision 06/A/4(i)), the Executive Secretary provided a detailed report on applications received for support and their disposition at the F&A Committee meeting.

PICES schools on marine sciences

At the 2007 PICES Annual Meeting, Council supported a proposal to organize the second PICES Summer School on “*Ecosystem-based management and ecosystem approach*”. Fifty students and early career scientists from China, Japan, Korea, Russia and U.S.A. attended this school held August 23–26, 2008, at the Graduate School of Fisheries Sciences, Hokkaido University, Hakodate, Japan. The major funding for foreign participants was provided by several Japanese programs: Japan–China Students Exchange Program (support for 17 Chinese graduate and undergraduate students), Japan–Korea Core University Program (support for 6 Korean students), and Sustainability Governance Program of Hokkaido University (support for 3 Russian, 1 UK and 1 U.S. early career scientists and a foreign lecturer). Participation of Japanese students, early career scientists and lecturers was covered by scientific grants from the Japanese Society for the Promotion of Science. Funding from Japanese sources was coordinated by Dr. Yasunori Sakurai. PICES provided travel expenses for 1 foreign lecturer and 1 Russian early career scientist. The summary report of the school will be published in the next issue of PICES Press (January 2009, Vol. 17, No. 1).

The originally planned theme for the third PICES Summer School was “*Recent methods of investigating red-tide organisms and controlling red tides*”, but has been changed to “*Satellite oceanography*”. This school will be organized from August 25–28, 2009, in Seoul, Korea, and will coincide with the launch by Korea of the first geostationary ocean color satellite. In this course, principles and applications in three major areas (optical, infra-red and microwave) of satellite oceanography will be introduced to students and early career scientists who have little experience in the field (focus will be on Asian countries). In addition to lectures and seminars, hands-on training of image processing will be arranged. The major funding for the school will be provided by various Korean agencies. PICES is requested to support 1 foreign lecturer and 5 non-Korean students.

The first PICES Winter School on “*Field survey of sea ice area*” was being planned for late February or early March 2009, in Vladivostok, Russia. It is postponed and will proceed in 2010, if funding and logistical problems are resolved.

Workshops on ecological modeling

It was recommended that PICES partner with other organizations and programs to broaden applications of the NEMURO and NEMURO.FISH models developed by the CCCC MODEL Task Team. A 4-day training workshop on “*Simulation techniques for building multi-trophic level marine ecosystem models: Examples using NEMURO and NEMURO.FISH*” for Ph.D.-level Korean scientists was held January 29–February 1, 2008, at the National Fisheries Research and Development Institute (NFRDI) in Busan, Korea. Dr. Bernard A. Megrey (U.S.A.) delivered a series of lectures to 32 students from Pukyong National University, Seoul National University, NFRDI-Marine Environmental Lab-Pusan, NFRDI-South Sea Lab-Yeosu and NFRDI-Jeju Island. The workshop was co-sponsored by NFRDI, PICES and the U.S. National Marine Fisheries Service. Council commended these organizations and also Drs. Megrey and Jae Bong Lee (Korea), who coordinated the project, for their efforts.

Training HAB courses

A new area of capacity building for PICES is the enhancement of monitoring programs that may mitigate the expansion of harmful organisms and establish a free exchange of information on harmful algal blooms (HABs) in the Pacific Rim. Recent increases in HAB events have caused damage to fisheries and disturbance of ecosystems in the North Pacific and areas to the south. In order to minimize the impact and expansion of harmful organisms and lower their occurrence and damage to fisheries, a first step is building capacity in developing nations through focused training. In this effort, which is funded by the Ministry of Agriculture, Forestry and Fisheries of Japan, through the Fisheries Agency of Japan (see Agenda Item 10), PICES has partnered with the Intergovernmental Oceanographic Commission (IOC) to determine which countries have the greatest need and a strong interest in improving HAB monitoring and testing, and a commitment to sustainability. Site visits to labs in Vietnam and the Philippines, as well as participation in the 2nd Asian

GC-2008

GEOHAB (Global Ecology and Oceanography of Harmful Algal Blooms) conference in January 2008 (Nha Trang, Vietnam), and the 7th WESTPAC Scientific Symposium in May 2008 (Sabah, Malaysia), facilitated country selection. The initial training course will be from January 15–23, 2009, and will focus on assisting the Bureau of Fisheries and Aquatic Resources (BFAR), which is the agency that manages HAB events in the Philippines. The course will include: (1) training in methods for testing shellfish for paralytic shellfish poisoning (PSP) toxins; (2) review of phytoplankton identification, with specific focus on harmful species in the Philippines; and (3) introduction to on-line HAB databases. This project is being led by the Section on *Ecology of Harmful Algal Blooms in the North Pacific*.

PICES Intern Program

The PICES Intern Program, approved in 1999 (Decision 99/A/7) and commenced in 2000, aims at the professional development of marine scientists and managers from PICES Contracting Parties, and increasing the capacity of the PICES Secretariat to support the work of the Organization. From May 2000–October 2008, 9 scientists from three countries (3 from China, 4 from Korea and 2 from Russia) have worked as interns at the PICES Secretariat. The Executive Secretary reviewed the current positions of the former interns and their involvement in activities of the Organization. Two former PICES interns from the State Oceanic Administration, Gongke Tan (First Institute of Oceanography) and Chuanlin Huo (National Marine Environmental Monitoring Center), were the nucleus of the Local Organizing Committee for this year's Annual Meeting and contributed greatly to its success. Council noted that it is an indicator that the Intern Program is working effectively.

Council accepted changes in the background documentation for the Intern Program recommended by the F&A Committee to align the description of the program with current practice (Decision 08/A/6(i)). The changes are related to supervision (under the PICES Secretariat), start date of the internship (normally begins on or about February 1) and level of required education (university degree, with an M.Sc. or Ph.D. as an asset). The updated document can be found in this Annual Report (*F&A Endnote 7*) and on the PICES website (<http://www.pices.int/projects/intern.aspx>).

In July 2007, Mr. Key-Seok Choe (Project Management Team, Korea Ocean Research and Development Institute) was nominated and subsequently approved as the 2008 PICES intern. His originally-offered 8-month term started on February 1, 2008. At the 2007 PICES Annual Meeting, Korea announced a voluntary contribution of US\$10,000 to the Trust Fund in 2008, to allow this term to be extended to 12 months, assuming good performance by the intern. At the recommendation of the Executive Secretary, Mr. Choe's term will continue until January 31, 2009.

Earlier, Council agreed to postpone the deadline of nominations for the 2009 PICES internship until the beginning of the 2008 PICES Annual Meeting (Decision 07/A/6(ii)). In accordance with the guidelines for application and selection of interns, a member country that has had an intern in any year is eligible to have an intern in the following two years only if there are no applicants from other member countries. Therefore, it was expected that Russia will nominate an intern for the 2009 term. The Executive Secretary reported that in his letter of June 18, 2008, Dr. Lev Bocharov (Russian National Delegate) requested that Russia be allowed to nominate an intern for the 2010 term, and suggested that China nominate an intern for the 2009 term. This proposal was accepted by China. Council was informed that Mr. Yongling Zhu, Director of the Foreign Affairs Office, Second Institute of Oceanography, State Oceanic Administration) was nominated (September 8) and subsequently selected (October 28) as the 2009 PICES intern. At the recommendation of the F&A Committee, Mr. Zhu was offered a 12-month term to start as soon as possible after February 1, 2009.

Given that Mr. Zhu's term will continue until early 2010, Council extended the deadline of nominations for the 2010 PICES Internship until the Governing Council meeting at the 2009 PICES Annual Meeting (Decision 08/A/6(ii)).

Over the years, the Intern Program has been financed solely by voluntary contributions. The Executive Secretary reported that in 2008, the U.S. National Marine Fisheries Service (NMFS) and the Korea Ocean Research and Development Institute (KORDI) contributed US\$15,000 and US\$10,000, respectively, to the Trust Fund for the Program. It was also indicated that NMFS and Fisheries and Oceans Canada have been the most generous partners of this activity to date, providing from 2000–2008 approximately CDN\$150,000 and CDN\$71,500, respectively, for the Program. Council thanked both organizations and KORDI for their support of the Intern Program, and instructed the Executive Secretary to invite all Contracting Parties to make voluntary contributions to maintain the Program in 2009 and beyond (Decision 08/A/6(iii)).

Council confirmed that the stipend should be kept at the current level of \$2,000 per month. The nominating Contracting Party could consider supplementing this modest stipend, depending on the intern's personal circumstances (Decision 08/A/6(iv)).

It is estimated that at the end of *FY* 2008, the Organization will be holding about \$15,000 for the Intern Program. With the current stipend level, this amount is sufficient to maintain the Program for about 7 months in 2009. In the absence of voluntary contributions, the registration fee revenue from the Annual Meetings has to be used to finance the Program (Decisions 01/A/4(iv) and 04/A/5(iv)).

International scientist/student exchange

Even though there is a provision (clause 4(iii)) in the *PICES Trust Fund Guidelines* that allows usage of the resources in the Fund to support visits by scientists to laboratories for collaboration or training related to scientific projects sponsored by the Organization, the Secretariat did not receive any requests for support.

AGENDA ITEM 8

Schedule, structure and financing of future Annual Meetings

In 2007, Council accepted an invitation from Korea to host the 2009 PICES Annual Meeting from October 23–November 1, in Busan, with the National Fisheries Research and Development Institute (NFRDI) as the local organizer, and supported in principle the proposed theme of the meeting, “*Understanding ecosystem dynamics, pursuing ecosystem approaches to management*” (Decision 07/A/5(ii)). The theme description was finalized at the 2008 inter-sessional Science Board meeting (April 2008, Seattle, U.S.A.) and can be found in this Annual Report (*SB Endnote 4*). Brief information on the status of preparations for the meeting was provided by the Korean delegation. It was indicated that because of a restructuring within the Korean government, the local organizing committee will be now composed of the Ministry of Land, Transport and Maritime Affairs (MLTL), the Korea Ocean Research and Development Institute (KORDI) and NFRDI. The venue has also changed from Busan to Jeju. Council approved these changes and, at the recommendation of the F&A Committee, agreed to provide \$40,000 to Korea to partially cover costs for the meeting (Decision 08/A/5(i)).

Last year, the United States confirmed their willingness to host the PICES Annual Meeting in 2010, and this invitation was accepted by Council (Decision 07/A/5(iii)). Interest was indicated in exploring the opportunity of a joint ICES–PICES Annual Meeting, with shared science activities and separate business meetings (Decision 07/A/5(iii)). The U.S. delegation reported that though the idea of the joint meeting was supported by both organizations, it cannot be implemented this time. Council was also informed that dates and venue for the 2010 PICES Annual Meeting will be suggested by the end of 2008 (currently Portland, Honolulu and Seattle are under consideration). The proposed theme of the meeting, “*North Pacific ecosystems today, and challenges in understanding and forecasting change*” was supported in principle, and Science Board was instructed to finalize the theme description (see *SB Endnote 5* for the draft) by the 2009 inter-sessional Science Board meeting (Decision 08/A/5(ii)).

GC-2008

In keeping with the established 6-year rotation cycle (Decision 94/A/6), the Russian Federation was invited to explore the possibility of hosting the 2011 PICES Annual Meeting and inform the Secretariat on this matter by March 31, 2009 (Decision 08/A/5(iii)).

At the recommendation of Science Board (see *SB Agenda Item 14*), Council approved a new naming convention for future Annual Meetings that includes the name of the Organization and the year of the meeting (PICES-2009, PICES-2010, etc.). For consistency, a similar approach will be used for inter-sessional meetings of Science Board and Council (ISB-2009, IGC-2009).

Council confirmed that the practice of charging a registration fee for future PICES Annual Meetings should continue and, at the recommendation of the F&A Committee, accepted the same registration fee structure for 2009 as was maintained for 2004–2008 (Decision 08/A/5(iv)). Fees will be collected by the Secretariat and credited to the Working Capital Fund 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 04/A/5(iv)).

At last year's Annual Meeting, Council agreed that serious thought should be given to the restructuring of the Annual Meeting of the Organization. Following this discussion, Dr. Wada introduced a proposal to form a Study Group on *Restructuring of the PICES Annual Meeting* (SG-RAM) under the direction of Council. After careful consideration, Council approved this proposal (Decision 08/A/5(vi)). The rationale for this decision can be found in *GC Endnote 6*. The terms of reference and membership for SG-RAM are described in *GC Appendix B*. It is expected that initial recommendations from SG-RAM will be discussed at the next meeting of Council.

The practice of holding inter-sessional meetings of Science Board and Governing Council is only 6 years old, but these meetings have already become an integral part of PICES management, providing an essential opportunity for mid-term reviews of scientific activities and in-depth discussions on administrative issues of the Organization. At the 2005 PICES Annual Meeting (Vladivostok, Russia), Council expressed 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 should be evaluated each year. This approach was confirmed in the following years.

Council supported the request by Science Board for their inter-sessional meeting in 2009 to be convened in conjunction with a workshop to finalize the development of an Implementation Plan for FUTURE. Dr. Wada indicated that several important and urgent issues justify the holding of an inter-sessional Governing Council meeting in 2009. These include: (1) review and possible approval of the FUTURE Implementation Plan; (2) consideration of changes in the Rules of Procedure required to accommodate experts from non-member countries to PICES expert groups; (3) report of the Study Group on *Restructuring of the PICES Annual Meeting*; and (4) discussion on future collaboration with a new North Pacific fisheries management organization currently under consideration. After extensive discussion Council found that the agenda is substantive and approved this proposal. Council accepted with gratitude an offer from the State Oceanic Administration of China to host the FUTURE workshop and both inter-sessional meetings in Qingdao in April 2009 (Decision 08/A/5(vii)).

AGENDA ITEM 9

Improvement of participation in PICES activities

The Executive Secretary reported on the implementation of Council's decisions to target the improvement of the participation of scientists from Contracting Parties in the activities of the Standing Committees and their subsidiary bodies, and in the Annual Meetings of the Organization. He presented background graphic material for the last six Annual Meetings (2003–2008) to better assess problems existing in various countries. Council requested that these files be electronically circulated to all Contracting Parties and updated prior to the 2009

PICES Annual Meeting. Canada suggested adding to the background material information on the number of presentations given by participating scientists from each country as a measure of quality of their involvement. China and Korea informed Council on some measures they are taking to improve the inter-agency coordination for PICES activities and to review their national membership and make changes as appropriate.

AGENDA ITEM 10

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 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*” 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 anticipated duration of the project is 5 years (from April 1, 2007 to March 31, 2012).

The project has two distinct components, one on harmful algal blooms carried out by the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S), and the other on marine non-indigenous species conducted by the Working Group on *Non-indigenous Aquatic Species* (WG 21). Both these PICES expert groups are under the Marine Environmental Quality Committee (MEQ). The Chairman of MEQ, Dr. Glen Jamieson, serves as the Project Scientific Coordinator and has to report annually on the progress of the scientific implementation of the project. The Executive Secretary is responsible for the management of the fund and for reporting annually on its disposition to Governing Council and JFA, within 120 days after the close of each project year ending March 31.

The Japanese Trust Fund (voluntary contribution) was first announced at the April 2007 inter-sessional Governing Council meeting in Yokohama, Japan. The Executive Secretary informed Council that the required set of documents requesting funding for *Year 1* was sent to JFA on June 20, 2007, and funds (\$184,980) were transferred to a special (PICES/MAFF) bank account established by PICES on July 27, 2007. The progress report (summary of the activities carried out for the year, with an evaluation on the progress made, and a workplan for the following year) and the financial report for *Year 1* were submitted to JFA on July 19 and July 23, 2008, respectively. The notice on acceptance of both reports was received on July 30. The financial report is appended as *GC Endnote 7*. The scientific progress report prepared by Dr. Jamieson is included in the 2008 MEQ report.

The required set of documents requesting funding for *Year 2* was sent to JFA on April 3, 2008, and then again (following instructions from JFA) to the Consulate General of Japan in Vancouver (Canada) on June 2. Funds (\$161,466) were transferred to the PICES/MAFF bank account on July 17, 2008.

Japan stated that JFA is satisfied with the progress of the project. The United States suggested that some efforts will be made to involve U.S. government agencies in this activity. Council thanked Japan again for their generous contribution.

AGENDA ITEM 11

Report of Science Board

The Science Board met under the chairmanship of Dr. John E. Stein, who presented the report to Council on November 2. The full report can be found elsewhere in this Annual Report. Decisions on scientific issues (S-Decisions) are summarized in *GC Appendix A*, and terms of reference for new expert groups are included in *GC Appendix B*.

Several recommendations by Science Board were not supported:

GC-2008

- For the proposed Study Group on *Indicators of Human Well-Being*, it was suggested that the description and terms of reference should be better developed for consideration at the 2009 inter-sessional Council meeting. The important issue is to define the role of social science in PICES and how this expert group will fit into FUTURE.
- For the requested co-sponsorship of the ESSAS Open Science Meeting (OSM), the decision is deferred until the next Annual Meeting. Though close links and the importance of future collaboration with ESSAS were widely recognized, their OSM is not until 2011, and there may be more important issues to consider in the meantime.
- Travel support for a TCODE representative to attend the 2009 meeting of the ICES Working Group on Data and Information Management and the 2009 ICES Annual Science Conference was not approved.

In the presentation, special emphasis was placed on the workplan for the next version of the North Pacific Ecosystem Status Report (NPESR). After receiving the final report of the Study Group on *Ecosystem Status Reporting* (SG-ESR) at the 2007 PICES Annual Meeting, Science Board and Council approved the “incremental improvement” approach to the development of the next NPESR, which builds on the experiences of the 2004 pilot report on *Marine Ecosystems of the North Pacific*. This document reported on the status and trends in marine ecosystems of the North Pacific and its marginal seas, covering approximately the 5-year period from 1998–2002, and addressing system components from climate and hydrography to fish, birds and mammals. The new version will focus on the years from 2003–2008, and there will be modest revisions to the general organization of the report. To facilitate better comparisons among regions and a more comprehensive synthesis, greater top-down control of the report was suggested. Dr. Skip McKinnell (Deputy Executive Secretary) was endorsed as the Editor of NPESR, although it required some adjustment of his duties within the PICES Secretariat. At a later date, Dr. Michael Dagg (BIO Chairman) was added as a Co-Editor (his involvement in the project is supported by a separate grant of US\$15,700 from the North Pacific Research Board).

Currently three phases are envisioned in the preparation of the report:

- Phase 1 will consist of regional chapters, each written for a scientific audience. Lead Authors for each chapter have been identified and are in the process of putting their teams together. All regional chapters will follow a common framework provided by the Co-Editors and are planned to be completed by June 30, 2009. As the primary focus of the Lead Authors is regional/geographic, an Advisory Group has been established to provide disciplinary oversight of the report’s development. Some financial support for regional workshops or meetings is available.
- Phase 2 will be a synthesis and integration of all regions, also written for a scientific audience, to develop a status report on issues that cross the entire North Pacific basin, and to determine to what degree basin-wide climate and ocean indices are affecting all regions simultaneously. Regional chapters will provide important information for the synthesis and facilitate comparison among regions. The period from July 1–November 15, 2009, will allow Lead Authors and their teams to undertake regional inter-comparisons and synthesis studies in preparation for a synthesis workshop to be held in late 2009. Co-Editors, Lead Authors, members of the Advisory Group and additional scientific experts familiar with ocean-scale processes will participate in the synthesis workshop and prepare the synthesis chapter. The deadline for publishing the chapter is March 2010.
- Phase 3 will be a brochure summarizing the major findings of the regional chapters and the synthesis chapter. The target audience for this brochure is non-scientific and includes policy makers, managers, and other interested members of society.

Dr. McKinnell reported that Co-Editors, Lead Authors and Advisory Group members met in Dalian to discuss revisions to the structure of the report, the time period of interest for the new edition, tasks and responsibilities of Lead Authors and Advisors, and the timing and structure of the synthesis workshop. He also described discussions at the MONITOR meeting and revisions required in the terms of reference for this Committee to comply with the procedures accepted for the production of the NPESR.

The Executive Secretary indicated that after getting the remainder of the NPRB grant (\$53,100) and a voluntary contribution provided by Korea (\$40,500), PICES has sufficient funding (~\$212,000) designated for the preparation of the next NPESR.

AGENDA ITEM 12

Report and recommendations of the Finance and Administration Committee

The Finance and Administration (F&A) Committee met under the chairmanship of Dr. Laura Richards, who presented the report to Council on November 1. The full report is included elsewhere in this Annual Report. Some budgetary considerations can be found below. Decisions on financial and administrative issues (A-Decisions) are summarized in *GC Appendix A*.

12.1 Audited accounts for fiscal year 2007

At the recommendation of the F&A Committee, Council accepted the audited accounts of *FY 2007* (*F&A Endnote 3*, Decision 08/A/1(i)).

Council retained *Flader & Hale* as the external auditor for *FYs 2009–2011* (Decision 08/A/1(ii)).

12.2 Annual contributions

Council reviewed the payment schedule of annual fees to the Organization (*F&A Endnote 4*), and noted that all Contracting Parties met their financial obligations for *FY 2008*, except the United States. The United States indicated that the arrears payment of \$8,525 for 2008 would be made in conjunction with the 2009 annual contribution.

Even though only the Japanese contribution arrived prior to the due date (January 1, 2008), the timeliness of payment from other Contracting Parties is either stable or improved. China and Korea's progress is especially notable, with the time of the payment moving up one quarter in 2008.

Council instructed the Executive Secretary to send a letter to Contracting Parties commending them for their performance in submitting annual contributions for 2008, and describing the difficulties that late and partial payment causes the Organization (Decision 08/A/2(i)). China explained that due to the national budgetary process they are unable to meet the January 1 deadline and cannot pay the annual contribution earlier than in April, but all efforts will be made to facilitate the payment. Korea indicated that their situation is similar, and the annual contribution cannot be paid earlier than February.

Council re-iterated that for planning purposes, Contracting Parties should continue to use the guideline generally accepted at the 1999 PICES Annual Meeting (Decision 99/A/2(ii)), which states that "*the annual contributions will increase at the rate of inflation in Canada*" (Decision 08/A/2(ii)).

12.3 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. External funding and voluntary contributions received for the period since the 2007 PICES Annual Meeting for various activities of the Organization are reflected in *F&A Endnote 5*. The level of external funding has increased significantly over the last several years, and from 2004–2007, the amount of funds from voluntary contributions, grants and partnerships was about 30–50% of the total annual contribution by Contracting Parties. In 2008, fund-raising efforts by the PICES scientific community, national delegates, and the PICES Secretariat will result in even greater income. It was confirmed that despite the current global economic crisis, external funding committed for *FY 2009* appeared secure.

GC-2008

12.4 Budget

Estimated accounts for fiscal year 2008

At the recommendation of the F&A Committee, Council approved the estimated accounts for *FY* 2008 (Decision 08/A/3(i)). It was noted that the expenses for “foreign exchange loss” are unknown at this time.

Relocation and Home Leave Fund

The status of the Relocation and Home Leave Fund (RHLF) was reviewed. This Fund is allowed to fluctuate between \$90,000 and \$110,000 to minimize the need for small transfers between funds (Decision 07/A/3(iii)). Given the estimated fund balance of \$101,056 on January 1, 2009, no action was required.

Trust Fund

In *FY* 2008, the total expenses from the Trust Fund (TRF) to finance the Intern Program, and to support participation of early career scientists from all Contracting Parties and scientists from countries with “economies in transition” to scientific meetings organized and co-sponsored by PICES are estimated at \$68,450. These expenses were only partly compensated for by interest earned by the Fund, the voluntary contributions for the Intern Program, and travel grants from SCOR. The estimated total income is \$41,630. Council approved a transfer from the Working Capital Fund to the Trust Fund to recover the 2008 expenses, and to restore the Trust Fund to the level of \$110,000 by the end of the fiscal year (Decision 08/A/3(iii)).

Working Capital Fund

After all approved inter-fund transfers, the amount of funds available in the Working Capital Fund (WCF) on January 1, 2008, was \$354,519. This includes \$215,495 in encumbered funds and \$139,024 in “reserve operating” funds. In *FY* 2008, the total WCF income and expenses are estimated at a level of \$496,665 (\$173,975 are in voluntary contributions and grants) and \$268,504, respectively. After the recommended inter-fund transfers, the amount of funds available in WCF at the fiscal year end will be \$457,860. This includes \$299,431 in encumbered funds held for special and high-priority PICES projects with completion in 2009–2010, and \$158,429 in “reserve operating” funds.

Council reviewed the status of the encumbered funds designated for high-priority PICES projects and agreed that given current plans, sufficient funding is presently earmarked for the development of the new integrative scientific program, FUTURE, and for the preparation of the next North Pacific Ecosystem Status Report. At the recommendation of the F&A Committee, Council allocated unspent funds from the 2006 CCCS symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” (\$3,593) to other high priority projects, including capacity building, which were not specified at the time of the meeting (Decision 08/A/3(iv)).

Budget for *FY* 2009 and forecast budget for *FY* 2010

Council approved the proposed *FY* 2009 budget of \$785,000 (*F&A Endnote 8*). The amount of \$98,000 will be transferred from the Working Capital Fund to balance the budget, setting the total annual contribution at \$687,000, and the 2009 fees at \$114,500 per Contracting Party (Decision 08/A/3(ii)).

The *FY* 2010 forecast budget of \$803,000 was examined by the F&A Committee and presented to Council for information only. It was noted though that if the inflation rate in Canada stays at the level of 2.5–3.0%, then the 2010 annual fee should be set at the level of \$117,500 per Contracting Party. The total annual contribution would be \$705,000, and a transfer of \$98,000 from the Working Capital Fund would be required to balance the budget. The *FY* 2010 budget will be further discussed at the 2009 PICES Annual Meeting.

Report on PICES Publication Program

Council accepted the recommendation of the F&A Committee to discontinue printing the Annual Report, and instead, distribute the report electronically and deposit it in the electronic commons (Decision 08/A/7).

AGENDA ITEM 13

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 the 2007 PICES Annual Meeting (Decision 07/A/7(i)). Terms of reference and membership of the Committee are listed in *2007 GC Appendix B*. It was also decided that in 2008, the Executive Committee will review achievements of the current Executive Secretary for the previous 3 years, in preparation for his possible re-appointment (Decision 07/A/7(ii)). As decision on re-appointment shall be made at least 12 months prior to the end of the term, Council agreed, in compliance with *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.

Dr. Wada informed Council that the Executive Committee evaluated the performance report for 2004–2007 submitted by the Executive Secretary, Dr. Alexander Bychkov, and strongly recommended his re-appointment for a new 5-year term. This recommendation was circulated by e-mail to all Contracting Parties on April 10, 2008. Responses were requested by April 30, 2008. The result of voting—5 endorsements (Canada, Japan, China, Russia and U.S.A.) and 1 abstention (Korea)—was announced on May 2, 2008. At that time, it was indicated that the abstention occurred by a failure to respond by the deadline rather than an explicit withdrawal from voting. In his e-mail of May 6, Mr. Doan Jeong (Korean National Delegate) indicated that Korea had also intended to support the re-appointment of Dr. Bychkov and sent an e-mail in this regard on April 26, but for some technical reasons the vote was not received. According to *Article VII* of the Convention, the result of voting constitutes consensus of the Contracting Parties required for the appointment of the Executive Secretary. Dr. Bychkov's 5-year term of office will begin at the completion of his current term, on June 1, 2009 (Decision 08/A/8).

The Executive Committee also reviewed the detailed report for 2007 submitted by Dr. Bychkov and evaluated his annual performance as “met all” expectations not only for his ongoing commitments but also for his key commitments specifically requested by the PICES Chairman. Following the general guidelines for executive positions in the Canadian public service, it was decided that a performance pay and bonus to total 8.3% of his salary would be appropriate for this period. The report on the performance evaluation for 2007, that also includes tasks for the Executive Secretary for 2008, was circulated to all Contracting Parties on April 10, 2008.

AGENDA ITEM 14

Election of Chairman and Vice-Chairman

According to Rule 6 of the PICES Rules of Procedure, “The Chairman and the Vice-Chairman shall be elected from amongst the Delegates for a term of two years and each shall be eligible for re-election only once for a successive term. They shall take office at the conclusion of the Annual Meeting at which elected.” In addition, Rule 5(ii) states that “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.” Drs. Tokio Wada (Japan) and Lev Bocharov (Russia) were elected as the Chairman and Vice-Chairman of Council, respectively, at the 2006 PICES Annual Meeting (Yokohama, Japan), and their terms will end at the conclusion of this year's Annual Meeting. The Executive Secretary reported that he did not receive any nominations for these positions.

GC-2008

Dr. Bocharov conducted the election of the Chairman of Council in accordance with the Rules of Procedure. Dr. Wada was nominated and unanimously elected as the Chairman for a second 2-year term (Decision 08/A/9(i)). Dr. Vera Alexander (U.S.A) remains past-Chairman, and will be able to attend the meetings of Council in an *ex-officio* advisory capacity.

Dr. Wada conducted the election of the Vice-Chairman of Council in accordance with the Rules of Procedure. Dr. Bocharov was nominated and unanimously elected as the Vice-Chairman for a second 2-year term (Decision 08/A/9(ii)).

The Delegates congratulated Drs. Wada and Bocharov on their election and expressed their gratitude for their valuable contribution to Council affairs over the years. Drs. Wada and Bocharov thanked Council for their support.

AGENDA ITEM 15

Appointment of F&A Committee Chairman

According to Rule 19(iii) of the PICES Rules of Procedure, “The Chairman of the Finance and Administration Committee shall be appointed by the Council from among the Committee’s members for a period of two years and if re-appointed, total consecutive service may not exceed four years”. Dr. Laura Richards (Canada) was appointed as the F&A Committee Chairman at the 2004 PICES Annual Meeting (Honolulu, U.S.A.) and re-appointed for the next 2-year period at the 2006 PICES Annual Meeting (Yokohama, Japan). Her second term will end at the conclusion of the 2008 Annual Meeting.

Council accepted the recommendation of the F&A Committee and appointed Ms. Patricia Livingston (U.S.A.) as the Chairman of this Committee for a 2-year term (Decision 08/A/10). Ms. Livingston thanked Council members for their support. Council also expressed its gratitude to Dr. Richards for her leadership of the F&A Committee over the past 4 years.

AGENDA ITEM 16

Other business – Procedure for preparing the Council report

The PICES Rules of Procedure contain the following two clauses dealing with the development and circulation of the Governing Council report and the Annual Report of the Organization:

- The Executive Secretary shall transmit to the Contracting Parties as soon as possible after each meeting of the Council a report of the proceedings (Rule 10(vi));
- The Executive Secretary shall prepare an annual report of the activities of the Organization and transmit it to the Contracting Parties (Rule 10(viii)).

The Executive Secretary noted that even though he is responsible for the development of the Council report and overseeing the preparation of the entire Annual Report of the Organization, it is the responsibility of the Co-Chairmen of temporary expert groups and the Chairmen of Standing and Executive Committees to prepare their annual reports to reflect the results achieved by their group or Committee and the proposed and planned activities. Without these reports all issues cannot be reflected accurately in the Council report, and any delays in getting group/Committee reports will inevitably cause delays in the development of the Council report.

Council set January 15, 2009, as the deadline for circulation of the final draft of the 2008 Council report.

Dr. Richards reminded Council that it was decided that the printing of the Annual Report be discontinued, and instead, the report will be distributed electronically (Decision 08/A/7), so the Council report will be placed on the PICES website as soon as it is approved by Contracting Parties.

GC Endnote 1**Participation list**Canada

Serge Labonté (delegate)
 Laura Richards (delegate)

Japan

Yukimasa Ishida (alternate delegate)
 Harumi Yamada (advisor)

People's Republic of China

Handi Guo (alternate delegate)
 Yingren Li (advisor)
 Gongke Tan (advisor)
 Dongmei Tang (advisor)
 Zhanhai Zhang (delegate)
 Baoying Zhu (advisor)

Republic of Korea

Sik Huh (advisor)
 Doan Jeong (delegate)
 Jeonghwa Kim (alternate delegate)

Russia

Lev N. Bocharov (delegate)
 Oleg Katugin (advisor)
 Igor Shevchenko (advisor)

U.S.A.

George Boehlert (delegate)
 Patricia Livingston (advisor)
 Samuel Pooley (delegate)
 Elizabeth Tirpak (advisor)

Other

Alexander Bychkov (Executive Secretary)
 Skip McKinnell (Deputy Executive Secretary,
 Nov. 2 only)
 John E. Stein (Science Board Chairman, Nov. 2)
 Tokio Wada (PICES Chairman)

GC Endnote 2**Governing Council meeting agenda**

1. Opening remarks
2. Adoption of agenda and meeting procedures
3. Report on administration
4. Membership and observers from other countries
5. Relations with relevant international and regional organizations/programs
6. Future integrative scientific program of PICES
7. Capacity building activities and PICES Intern Program
8. Schedule, structure and financing of future Annual Meetings
9. Improvement of participation in PICES activities
10. Report on the PICES project "*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*" supported by the Japanese Trust Fund
11. Report and recommendations of the Science Board
12. Report and recommendations of the Finance and Administration Committee
13. Report of the Executive Committee for evaluating annual performance of the Executive Secretary
14. Election of PICES Chairman and Vice-Chairman
15. Appointment of F&A Committee Chairman
16. Other business – Procedure for preparing the Council report

GC Endnote 3

Report on Administration for 2008

I. Annual contributions

According to *Regulation 5* of the PICES Financial Regulations, all national contributions to PICES are payable by the first day of the financial year (January 1) to which they relate. Dues for 2008 were paid as follows:

Japan-----	December 20, 2007
U.S.A. -----	January 7, 2008
Canada -----	January 16, 2008
Russian Federation -----	February 13, 2008
Republic of Korea -----	February 15, 2008
People's Republic of China -----	May 15, 2008

All Contracting Parties met their financial obligations for *FY* 2008, except the United States. The amount in arrears is \$8,525. Even though only the Japanese contribution arrived prior to the due date, the timeliness of payment from other Contracting Parties is either stable or improved. China and Korea's progress is especially notable, with the time of the payment moving up one quarter in 2008.

II. External and additional funding

Details on external funding and voluntary contributions received for the period since the 2007 PICES Annual Meeting for various activities of the Organization are reflected in *F&A Endnote 5*.

III. Inter-sessional symposia/workshops/meetings and PICES Annual Meetings

Since the 2007 PICES Annual Meeting (October 2007), the following inter-sessional symposia, workshops and meetings were convened, for which financial, travel and logistical arrangements were made:

- inter-sessional meeting of WG 19 on *Ecosystem-based Management Science and its Application to the North Pacific*, February 21–22, 2008, Seattle, U.S.A.;
- inter-sessional meeting of WG 21 on *Non-indigenous Aquatic Species* to evaluate the protocols and reach final agreement on standards, data elements and data entry templates for the Marine/Estuarine Invasive Species Database for the PICES project on “*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*”, March 3–5, 2008, Busan, Korea;
- ICES/PICES Workshop on “*Environmental interactions of mariculture*”, April 14–15, 2008, Victoria, Canada;
- Workshop of the CFAME (*Climate Forcing and Marine Ecosystem Response*) Task Team on “*Linking and visualizing climate forcing and marine ecosystem changes: A comparative approach*”, April 15–17, 2008, Honolulu, U.S.A.;
- Workshop to develop an Implementation Plan for FUTURE in conjunction with a 1-day inter-sessional Science Board meeting, April 23–25, 2008, Seattle, U.S.A.;
- Workshop on “*Linking Global Climate Model output to (a) trends in commercial species productivity and (b) changes in broader biological communities in the world's oceans*”, May 18, 2008, Gijón, Spain;
- International Symposium on “*Effects of climate change on the world's oceans*” (co-organized by PICES, ICES and IOC, and co-sponsored by GLOBEC, SCOR and WCRP, with additional support from DFO, KORDI, NASA, NOAA and several Spanish sources), May 19–23, 2008, Gijón, Spain;
- International Symposium on “*Coping with global change in marine social-ecological systems*” (co-organized by GLOBEC, EUR-OCEANS and FAO, and co-sponsored by IFREMER, IRD, ICES, IMBER, PICES, SCOR and SSHRC), July 8–11, 2008, Rome, Italy;
- 2nd PICES Summer School on “*Ecosystem-based management and ecosystem approach*”, August 23–26, 2008, Hakodate, Japan;
- 4th PICES Workshop on “*The Okhotsk Sea and adjacent areas*”, August 27–29, 2008, Abashiri, Japan;

- International Symposium on “*Herring: Linking biology, ecology and status of populations in the context of changing environments*” (co-sponsored by ICES, PICES and GLOBEC), August 26–29, 2008, Galway, Ireland;
- ESSAS/PICES Workshops on “*Model comparisons of the ESSAS regions*” and “*IPCC modeling and downscaling atmosphere to advection*” at the ESSAS Annual Meeting, September 15–19, 2008, Halifax, Canada;
- ICES/PICES Theme Sessions on “*Coupled physical and biological models: Parameterization, validation, and applications*”, “*Marine spatial planning in support of integrated management – tools, methods, and approaches*”, and “*New methodology for tracking fish, mammal, and seabird behaviour and migrations*” at the ICES Annual Science Conference, September 22–26, 2008, Halifax, Canada;
- PICES/ICES Theme Session on “*The effects of ocean acidification on fisheries and ecosystems*” at the International Symposium on “*The ocean in a high CO₂ world – II*” (co-sponsored by SCOR, IOC, IAEA and IGBP), October 6–8, 2008, Monaco;
- ICES/PICES/GLOBEC workshop on “*Changes in distribution and abundance of clupeiform small pelagic fish in relation to climate variability and global change*”, November 3–7, 2008, Kiel, Germany.

The following workshops and scientific sessions were convened at the 2008 PICES Annual Meeting:

- 1-day BIO Workshop on “*Oceanic ecodynamics comparison of subarctic Pacific*”;
- 1-day MEQ Workshop on “*Review of selected harmful algae in the PICES Region: IV. Karenia and Prorocentrum*”, preceded by a ½-day laboratory demonstration;
- 1-day MONITOR/ESSAS Workshop on “*Status of marine ecosystems in the sub-arctic and arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008*”;
- 1½-day CCCC/POC/FIS Workshop on “*Climate scenarios for ecosystem modeling (II)*”;
- 1-day CCCC/ESSAS Workshop on “*Marine ecosystem model inter-comparisons*”;
- ¾-day Science Board Symposium on “*Beyond observations to achieving understanding and forecasting in a changing North Pacific: Forward to the FUTURE*”;
- 1-day BIO Contributed Paper Session;
- 1½-day BIO Topic Session on “*End-to-end foodwebs: Impacts of a changing ocean*”;
- 1-day FIS Contributed Paper Session;
- ¾-day FIS Topic Session on “*Institutions and ecosystem-based approaches for sustainable fisheries under fluctuating marine resources*”;
- ½-day FIS Topic Session on “*Effects of fisheries bycatch and discards on marine ecosystems and methods to mitigate the effects*”;
- ¾-day MEQ/FIS Topic Session on “*Mariculture technology and husbandry for alternate and developing culture species*”;
- ½-day MEQ Topic Session on “*Connecting the human and natural dimensions of marine ecosystems and marine management in the PICES context*”;
- 1-day MEQ Topic Session on “*Consequences of non-indigenous species introductions*”;
- ½-day MEQ Topic Session on “*Species succession and long-term data set analysis pertaining to harmful algal blooms*”;
- 1-day MONITOR/TCODE/BIO Topic Session on “*Linking biology, chemistry, and physics in our observational systems – present status and FUTURE needs*”;
- 1-day POC Contributed Paper Session
- ¾-day POC Topic Session on “*Coastal upwelling processes and their ecological effects*”;
- 1-day CCCC/POC Topic Session on “*Marine system forecast models: Moving forward to the FUTURE*”.

Preparations, arrangements or planning are in progress for:

- ICES/PICES/GLOBEC workshop on “*Changes in distribution and abundance of clupeiform small pelagic fish in relation to climate variability and global change*”, November 3–7, 2008, Kiel, Germany;
- 3rd GLOBEC Open Science Meeting (co-sponsored by PICES) and associated workshops, June 22–26, 2009, Victoria, Canada;

GC-2008

- 3rd PICES Summer School on “*Satellite oceanography*” (co-sponsored by SCOR and several Korean agencies/organizations), August 25–28, 2009, Seoul, Korea;
- 6th International Conference on “*Marine bioinvasions*” (co-sponsored by ICES, PICES, U.S. National Sea Grant College Program, Pacific States Marine Fisheries Commission and Portland State University), August 24–27, 2009, Portland, U.S.A.;
- International Symposium on “*Rebuilding depleted fish stocks: Biology, ecology, social science and management strategies*” (primary sponsors: ICES, PICES and UNCOVER; co-sponsoring organizations: NAFO, DFO and IMR), November 3–6, 2009, Warnemünde, Germany;
- 5th International Zooplankton Production Symposium (co-sponsored by PICES and ICES), spring 2011, Pucon, Chile (not formally approved yet).

IV. Publications

Publications produced after the 2007 PICES Annual Meeting, in progress or just initiated include:

Primary journals

- Selected papers from the 2005 ESSAS Symposium on “*Climate variability and sub-arctic marine ecosystems*” in a special issue of *Deep-Sea Research II* (Guest Editors: G.L. Hunt, K. Drinkwater, S. McKinnell and D.L. Mackas) – published in December 2007, Vol. 54, Nos. 23–26;
- Selected papers from the 4th International Zooplankton Production Symposium on “*Human and climate forcing of zooplankton populations*” (2007) in a special issue of *ICES Journal of Marine Science* (Guest Editors: M. Dagg, R. Harris, L. Valdés and S.-I. Uye) – published in April 2008, Vol. 65, No. 3;
- Selected papers from the PICES-2006 Topic Session on “*The human dimension of jellyfish blooms*” in *Plankton and Benthos Research* (Guest Editors: H. Iizumi and K. Ishii) – published in May 2008, Vol. 3 (supplement);
- Selected papers from the 2006 PICES/GLOBEC Symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” in a special issue of *Progress in Oceanography* (Guest Editors: H. Batchelder and S. Kim) – published in June 2008, Vol. 77, Nos. 2–3;
- Selected papers from the 5th International Conference on “*Marine bioinvasions*” (2007) in a special issue of *ICES Journal of Marine Science* (Guest Editors: J.A. Pederson and A.M.H. Blakeslee) – published in July 2008, Vol. 65, No. 5;
- Special issue of *Progress in Oceanography* on “*The Northern Humboldt Current System: Ocean dynamics, ecosystem processes, and fisheries*” (Guest Editors: A. Bertrand, R. Guevara-Carrasco, P. Soler, J. Csirke and F.P. Chavez) – published in December 2008, Vol. 79, Nos. 2–4;
- Selected papers from the 2007 NAFO/PICES/ICES Symposium on “*Reproductive and recruitment processes of exploited marine fish stocks*” in a special issue of on-line *Journal of Northwest Atlantic Fishery Science* (Guest Editors: R.D. Brodeur, M. Dickey-Collas and E. Trippel); a hard-copy run of this issue is expected in April 2009;
- Special issue of *Journal of Marine Systems* on “*Observation and modeling of the ocean circulation and marine ecosystem for CREAMS/PICES*” (Guest Editors: K.-I. Chang, S.-I. Ito, C. Mooers and J.-H. Yoon) – expected to be published in early 2009;
- Selected papers from the 2007 ICES/PICES Early Career Scientists Conference on “*New frontiers in marine science*” as a section in a regular issue of *ICES Journal of Marine Science* (Guest Editors: F. Mueter, E. North) – expected to be published in early 2009;
- Selected papers from the PICES-2007 Topic Session on “*Decadal changes in carbon biogeochemistry in the North Pacific*” as a section in a regular issue of *Journal of Oceanography* (Guest Editor: T. Saino) – expected to be published in August 2009;
- Selected papers on krill from the 4th International Zooplankton Production Symposium on “*Human and climate forcing of zooplankton populations*” in a special volume of *Deep Sea Research II* (Guest Editors: S. Kawaguchi and W. Peterson) – expected to be published in 2009;
- Selected papers from the SEEDS-II experiment in a special issue of *Deep-Sea Research II* (Guest editors: A. Tsuda, M. Wells, M. Uematsu and H. Saito) – expected to be published in 2009;

- Selected papers from the ICES/PICES Theme Session on “*Comparative marine ecosystem structure and function: Descriptors and characteristics*” at the 2007 ICES Annual Science Conference in a special issue of *Progress in Oceanography* (Guest Editors: B.A. Megrey, J.S. Link and E. Moksness) – expected to be published in 2009;
- Selected papers from the 2007 Topic Session on “*Ecosystem approach to fisheries: Improvements on traditional management for declining and depleted stocks*” in a special issue of *Fisheries Research* (Guest Editors: G.H. Kruse, Y. Ishida, T. Perry, V.I. Radchenko and C.-I. Zhang) – expected to be published in 2009;
- Selected papers from the 2008 PICES/ICES/IOC International Symposium on “*Effects of climate change on the world’s oceans*” in a special issue of *ICES Journal of Marine Science* (Guest Editors: K. Brander, J. Church, M. Marcos, W. Peterson and L. Valdés) – expected to be published in 2009;
- Selected papers from the OECOS (Oceanic Ecosystem Comparison in the Subarctic Pacific) experiment in a special issue of *Deep-Sea Research II* (Guest Editors: C. Miller and A. Yamaguchi) – expected to be published in late 2009 or early 2010;
- Special issue on “*Tides in Marginal Seas*” dedicated to Prof. Alexei Nekrasov (Guest Editors: J. Cherniawsky, M. Foreman, B. Kagan and A. Rabinovich) – expected to be published in early 2010;
- Selected papers from the Topic Session on “*Phenology and climate change in the North Pacific: Implications of variability in timing of zooplankton production to fish, seabirds, marine mammals and fisheries (humans)*” at the 2007 PICES Annual Meeting in a special issue of *Deep-Sea Research II* (Guest Editors: W. Sydeman, S. McKinnell and S. Minobe) – cancelled.

PICES Special Publications

- Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.). *Guide to Best Practices for Ocean CO₂ Measurements*. PICES Special Publication No. 3 (IOCCP Report No. 8), 191 pp. – published in October 2007.

PICES Scientific Report Series

- Hollowed, A.B., Beamish, R.J., Okey, T.A. and Schirripa, M.J. (Eds.). *Forecasting Climate Impacts on Future Production on Commercially Exploited Fish and Shellfish*. PICES Scientific Rep. No. 34, 101 pp. – published in August 2008;
- Beamish R.J. (Ed.). *Impacts of Climate and Climate Change on the Key species in the Fisheries in the North Pacific* (Final report of WG 16 on *Climate Change, Shifts in Fish Production, and Fisheries Management*). PICES Scientific Rep. No. 35, 217 pp. – published in December 2008;
- Kashiwai, M. and Kantakov, G.A. (Eds.). *Proceedings of the 4th PICES Workshop on “The Okhotsk Sea and adjacent areas”* (August 27–29, 2008, Abashiri, Japan) – expected to be published in 2009.

PICES Press – newsletter

- Two regular issues: Vol. 16, No. 1 (January 2008) and Vol. 16, No. 2 (July 2008).

Other publications

- PICES 2007 Annual Report;
- Book of Abstracts for the International Symposium on “*Effects of climate change on the world’s oceans*” (May 19–23, 2008, Gijón, Spain);
- Announcement and Book of Abstracts for the 2008 PICES Annual Meeting (October 24–November 2, 2008, Dalian, China).

Significant progress had been made in the implementation of the Action Plan resulting from the 2007 PICES Publications Review. Details can be found in *F&A Endnote 6*. The plan, once completed, will allow a smooth transition to more on-line access for PICES publications.

V. Representation at other organization meetings and travel by PICES officers

- Drs. Alexander Bychkov (Executive Secretary) and Skip McKinnell (Deputy Executive Secretary) travelled to Anchorage, U.S.A., to attend the 2008 Marine Science in Alaska Symposium and discuss joint activities with the North Pacific Research Board (January 2008);
- Dr. Sinjae Yoo (Science Board Vice-Chairman) represented PICES at the 1st NOWPAP CEARAC (Special Monitoring and Coastal Environment Assessment Regional Analysis Center) Coastal Environmental Assessment Workshops to develop common procedures for coastal environmental assessment in the region, including nutrient enrichment, eutrophication and HAB occurrence (March 2008, Toyama, Japan);
- Dr. McKinnell served as a PICES member on the Scientific Steering Committee for the Northeast Pacific Coastal Ecosystem Workshop and Forecasting Forum (April 2008, Nanaimo, Canada);
- Dr. Young-Jae Ro (MONITOR member) represented PICES at the 11th Session of the GOOS Scientific Steering Committee (April 2008, Paris, France);
- Dr. Tokio Wada (PICES Chairman), Dr. Vera Alexander (PICES Past-Chairman) and members of the Secretariat attended the workshop to develop an Implementation Plan for FUTURE and the inter-sessional Science Board meeting (April 2008, Seattle, U.S.A.);
- Dr. Fei Chai (WG 22 Co-Chairman) represented PICES at the 31st meeting of the Scientific Group under the London Convention, and the 2nd meeting of the Scientific Group under the London Protocol (May 2008, Guayaquil, Ecuador);
- Dr. Toru Suzuki (TCODE member) represented PICES at the 7th NOWPAP' DINRAC (Data and Information Network Regional Analysis Center) Focal Points Meeting to discuss approaches on exchange of marine environmental data and information in the region (May 2008, Beijing, China);
- Dr. Harold Batchelder (PICES affiliate member of SCOR Working Group 125 on *Global Zooplankton Comparisons*) attended the Working Group meeting and the associated workshop on “*Zooplankton and climate: Response modes and linkages among regions, regimes, and trophic levels*” (May 2008, Gijón, Spain);
- Dr. William Peterson (BIO member) served as the PICES convenor, and Drs. Richard Feely (CC-S member), Michael Foreman (POC Chairman) and Akihiko Yatsu (FIS member) represented PICES on the Scientific Steering Committee, for the PICES/ICES/IOC Symposium on “*Effects of climate change on the world's oceans*” (May 2008, Gijón, Spain);
- Members of the Secretariat served as organizers for the PICES/ICES/IOC Symposium on “*Effects of climate change on the world's oceans*” (May 2008, Gijón, Spain);
- Dr. Bychkov represented PICES at the 41st Session of the Executive Council of the Intergovernmental Oceanographic Commission (June 2008, Paris, France);
- Dr. Mitsutaku Makino (WG 19 member) attended the International Symposium on “*Coping with global change in marine social-ecological systems*” as a PICES member of the Symposium Discussion Panel (July 2008, Rome, Italy);
- Drs. Douglas Hay (Canada), Brenda Norcross and Yoshiro Watanabe (CFAME members) represented PICES on the Scientific Steering Committee for the International Symposium on “*Herring: Linking biology, ecology and status of populations in the context of changing environments*” (August 2008, Galway, Ireland);
- Dr. McKinnell travelled in August 2008 to Hakodate and Abashiri, Japan, to represent PICES at the 4th PICES Workshop on “*The Okhotsk Sea and adjacent areas*”, and the 2nd PICES Summer School on “*Ecosystem-based management and ecosystem approach*”;
- Drs. Angelica Peña (BIO member), Glen Jamieson (MEQ Chairman) and Kevin Weng (U.S.A.) served as PICES convenors for joint ICES/PICES Theme Sessions on “*Coupled physical and biological models: Parameterization, validation, and applications*”, “*Marine spatial planning in support of integrated management – tools, methods, and approaches*”, and “*New methodology for tracking fish, mammal, and seabird behaviour and migrations*”, respectively, and Dr. McKinnell represented PICES at the Standing Committee meetings held at the ICES Annual Science Conference (September 2008, Halifax, Canada);
- Dr. McKinnell attended the International Symposium on “*The ocean in a high CO₂ world – IP*” as an organizer of the PICES/ICES Theme Session on “*The effects of ocean acidification on fisheries and*

ecosystems” and gave a talk on issues associated with ocean acidification and Pacific salmon (October 2008, Monaco);

- Drs. Bychkov and McKinnell represented PICES at the 5th World Fisheries Congress (October 2008, Yokohama, Japan);
- Drs. Wada, John Stein (Science Board Chairman) and members of the Secretariat travelled in October 2008, to Dalian, China, for the 2008 PICES Annual Meeting;
- Dr. Bychkov represented PICES at the NPAFC Sixteenth Annual Meeting, and Dr. McKinnell represented PICES at the NPAFC International Symposium on Bering-Aleutian Salmon International Survey (November 2008, Seattle, U.S.A.);
- Dr. Sinjae Yoo represented PICES at the 5th meeting of the Regional Scientific and Technical Panel of the UNDP/GEF Yellow Sea Large Marine Ecosystem (YSLME) project (November 2008, Shanghai, China);
- Dr. McKinnell attended the annual CalCOFI Conference as editor of the North Pacific Ecosystem Status Report (November 2008, La Jolla, U.S.A.);
- Dr. Jin-Yeong Kim (FIS member) served as a PICES convenor for the ICES/PICES workshop on “*Changes in distribution and abundance of clupeiform small pelagic fish in relation to climate variability and global change*” (November 2008, Kiel, Germany).

VI. Relations with international scientific organizations and programs

The following reflects relationships with international scientific organizations and programs of regional and global scale, and with regional scientific and monitoring efforts in the North Pacific:

International Program for Deployment of profiling floats (Argo)

- Dr. Dake Chen (Argo Science Team member) attended the 2008 PICES Annual Meeting as an observer, and addressed POC and MONITOR on potential areas for collaboration between Argo and PICES. Argo also had a poster at this meeting outlining general information and highlighting scientific objectives and recent activities of the project.
- PICES agreed to co-sponsor the Third Argo Science Workshop (March 25–27, 2009, Hangzhou, China) by taking responsibility for compiling and printing the Abstract Book for this meeting. PICES’ assistance will be given full exposure and credit in all advertisements for the workshop, at the workshop itself and on any subsequent reports that emerge.

International Research Programme on Climate Variability and Predictability (CLIVAR)

- PICES Working Group (WG 20) on *Evaluation of Climate Change Projections* is the appropriate avenue to enhance collaboration with CLIVAR through its Pacific Panel. Currently, Dr. William Crawford (Canada) serves as a liaison between the two groups.
- Dr. Dongxiao Wang (Pacific CLIVAR Panel member) attended the 2008 PICES Annual Meeting as an observer and updated POC on CLIVAR activities relevant to PICES.
- CLIVAR will be approached to co-sponsor the POC/FUTURE Topic Session on “*Outlooks and forecasts of marine ecosystems from an earth system science perspective: Challenges and opportunities*”, and the POC Workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*” to be convened at the 2009 PICES Annual Meeting.

Ecosystem Studies of Sub-Arctic Seas (ESSAS)

- PICES co-sponsored and served as the local organizer for the 2005 GLOBEC Symposium on “*Climate variability and sub-arctic marine ecosystems*” held in Victoria, Canada. Selected papers from the symposium were published in December 2007 as a special issue of *Deep-Sea Research II*, Vol. 54, Nos. 23–26 (Guest Editors: G.L. Hunt, K. Drinkwater, S. McKinnell and D.L. Mackas).
- PICES co-sponsored workshops on “*Model comparisons of the ESSAS regions*” and “*IPCC modeling and downscaling atmosphere to advection*” at the ESSAS Annual Meeting (September 15–19, 2008, Halifax, Canada).
- Two joint PICES/ESSAS workshops on “*Status of marine ecosystems in the sub-arctic and arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008*” and “*Marine ecosystem model inter-comparisons*” were convened at the 2008 PICES Annual Meeting.

GC-2008

- Drs. Kenneth Drinkwater and George Hunt (ESSAS SSC Co-Chairmen) attended the 2008 PICES Annual Meeting as observers, and briefed PICES Standing Committees on ESSAS activities for the past year and those planned for 2009–2010. ESSAS and its U.S. component for the Bering Sea (BEST) also had posters at this meeting outlining general information and highlighting scientific objectives and recent activities of both projects.
- PICES agreed to send a member of Working Group (WG 20) on *Evaluation of Climate Change Projections* to attend the 2009 ESSAS Annual Meeting (June 15–21, 2009, Seattle, U.S.A.).

Global Ocean Ecosystem Dynamics project (GLOBEC)

- The PICES Climate Change and Carrying Capacity (CCCC) Program provides a mechanism for integrating national GLOBEC research programs in the North Pacific, and is a regional component of the international GLOBEC effort.
- The PICES/GLOBEC Symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” was held April 19–21, 2006, in Honolulu, U.S.A. Selected papers from the symposium were published in June 2008, as a special issue of *Progress in Oceanography*, Vol. 77, Nos. 2–3 (Guest Editors H. Batchelder and S. Kim). This volume is considered as a part of GLOBEC synthesis efforts.
- Results from the CCCC Program will be included in several chapters of the GLOBEC Synthesis Book to be published in 2009 or 2010.
- PICES and GLOBEC worked with ICES to organize the 4th International Zooplankton Production Symposium on “*Human and climate forcing of zooplankton populations*” held May 28–June 1, 2007, in Hiroshima, Japan. Selected papers from the symposium were published in April 2008, as a special issue of *ICES Journal of Marine Science*, Vol. 65, No. 3 (Guest Editors: M. Dagg, R. Harris, L. Valdés and S.-I. Uye).
- GLOBEC co-sponsored the PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 19–23, 2008, in Gijón, Spain) by compiling the Book of Abstracts.
- PICES co-sponsored the International Symposium on “*Coping with global change in marine social-ecological systems*” led by GLOBEC (July 8–11, 2008, in Rome, Italy).
- PICES agreed to co-sponsor the 3rd GLOBEC Open Science Meeting (June 22–26, 2009, Victoria, Canada) by providing travel support for invited speakers from the Pacific (up to \$10,000) and early career scientists from PICES member countries (up to \$5,000), and by assisting with local arrangements.
- Dr. Manuel Barange (Executive Director of GLOBEC) attended the 2008 PICES Annual Meeting as an observer, and briefed the Executive Committee of the CCCC Implementation Panel on: (1) discussions within a GLOBEC-IMBER Transition Task Team on a way forward for international marine ecosystem science after the completion of GLOBEC, and (2) plans for the 3rd GLOBEC Open Science Meeting.

Global Ocean Observing System (GOOS)

- PICES was represented at the 11th Session of the GOOS Scientific Steering Committee (April 2008, Paris, France).
- The Topic Session on “*Linking biology, chemistry, and physics in our observational systems – present status and FUTURE needs*” and the workshop on “*Status of marine ecosystems in the sub-arctic and arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008*”, both highly relevant to GOOS, were convened at the 2008 PICES Annual Meeting.

International Council for the Exploration of the Sea (ICES)

- Publication from the 4th International Zooplankton Production Symposium (see under GLOBEC).
- ICES and PICES worked with the U.S. National Sea Grant College Program and the MIT Sea Grant College Program to organize the 5th International Conference on “*Marine bioinvasions*” (May 21–24, 2007, in Cambridge, U.S.A.). Selected papers from the conference were published in July 2008, as a special issue of *ICES Journal of Marine Science*, Vol. 65, No. 5 (Guest Editors: J.A. Pederson and A.M.H. Blakeslee).
- PICES and ICES initiated the organization and took part as major international sponsors (with IOC) of the International Symposium on “*Effects of climate change on the world’s oceans*” (May 19–23, 2008, Gijón, Spain).

- PICES co-sponsored the International Symposium on “*Herring: Linking biology, ecology and status of populations in the context of changing environments*” led by ICES (August 26–29, 2008, Galway, Ireland).
- Three joint Theme Sessions on “*Coupled physical and biological models: Parameterization, validation, and applications*”, “*Marine spatial planning in support of integrated management – tools, methods, and approaches*”, and “*New methodology for tracking fish, mammal, and seabird behaviour and migrations*” were convened at the ICES Annual Science Conference (September 22–26, 2008, Halifax, Canada).
- The PICES/ICES Theme Session on “*The effects of ocean acidification on fisheries and ecosystems*” was held at the International Symposium on “*The Ocean in a high CO₂ world – II*” (October 6–8, 2008, Monaco).
- Dr. McKinnell (Deputy Executive Secretary) represented PICES at the Standing Committee meetings held at the ICES Annual Science Conference (September 2008, Halifax, Canada).
- Dr. Adolf Kellermann (Head of ICES Science Programme) attended the 2008 PICES Annual Meeting as an observer, and participated in the Science Board meeting to present an update on the continuing science reform in ICES and discuss joint activities of the two Organizations in 2009 and beyond.
- PICES and ICES are working together as major international sponsors for the 6th International Conference on “*Marine bioinvasions*” (August 24–27, 2009, Portland, U.S.A) and the International Symposium on “*Rebuilding depleted fish stocks: Biology, ecology, social science and management strategies*” (November 3–6, 2009, Warnemünde, Germany).
- PICES and ICES agreed to initiate planning and serve as major international sponsors of the 5th International Zooplankton Production Symposium (March 14–18, 2011, Pucon, Chile).
- At the invitation by ICES, PICES agreed to co-sponsor the International Symposia on “*The effects of environmental variability on cephalopod populations*” (September 3–11, 2009, Vigo, Spain), and “*Carrying capacity: What does it mean in a changing ocean?*” (2010, Lisbon, Portugal).
- ICES’ experts on marine bioinvasions are involved in the PICES 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 (project duration is from April 1, 2007 to March 31, 2012).
- PICES and ICES established a joint Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* and agreed that this Working Group will convene the International Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 26–29, 2010, Sendai, Japan).

Integrated Marine Biogeochemistry and Eco-system Research (IMBER)

- IMBER co-sponsored the Topic Session on “*End-to-end foodwebs: Impacts of a changing ocean*” at the 2008 PICES Annual Meeting.
- Dr. Hiroaki Saito (IMBER SSC member) represented IMBER at the 2008 PICES Annual Meeting. IMBER also had a poster at this meeting outlining general information and highlighting scientific objectives and recent activities of the project.
- There is a strong interest in including issues of marine biogeochemistry and food webs that would link PICES with IMBER in a new integrative scientific program of PICES, FUTURE.
- IMBER will be approached to co-sponsor the POC/FUTURE Topic Session on “*Outlooks and forecasts of marine ecosystems from an earth system science perspective: Challenges and opportunities*” to be convened at the 2009 PICES Annual Meeting.

Intergovernmental Oceanographic Commission of UNESCO (IOC)

- IOC teamed with PICES and ICES in organizing the International Symposium on “*Effects of climate change on the world’s oceans*” (May 19–23, 2008, Gijón, Spain).
- PICES was represented at the 41st Session of the Executive Council of the Intergovernmental Oceanographic Commission (June 2008, Paris, France).
- Dr. Patricio Bernal (General Secretary of IOC) attended the 2008 PICES Annual Meeting as an observer, and shared his views on potential areas of collaboration between IOC and PICES at meetings of several expert groups.
- PICES and IOC agreed to cooperate on several fronts:
 - developing understanding of the vulnerability of fisheries to climate variability and change as a potential input to the 5th IPCC Assessment Report;

GC-2008

- monitoring, including PICES involvement at the level of the Scientific Program Committee in the OceanObs'09 Conference (September 21–25, 2009, Venice, Italy) led by IOC (see also under GOOS);
- data integration and synthesis, including an information network on ocean acidification and a common database on natural iron (see also under IOCCP);
- harmful algal blooms (see below).
- 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 to be compiled and stored annually in the format specified in the HAE-DAT database. HAE-DAT is hosted by IOC, with equal credit to the partner organizations (PICES and ICES). Building a common data resource allows inter-comparison of HAB species composition and magnitude of environmental and economic impacts. Discussion on this joint work proceeds at each PICES Annual Meeting.
- IOC experts on harmful algal blooms are involved in the PICES 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 (project duration is from April 1, 2007 to March 31, 2012).

International Ocean Carbon Coordinated Project (IOCCP)

- IOCCP is working on establishing international agreements on observation methods, best practices, data management, and data sharing that will lead to the joint development of global data products and synthesis activities documenting the ocean carbon cycle. PICES, through its Working Groups on *CO₂ in the North Pacific* (WG 13, 1998–2001) and *Biogeochemical Data Integration and Synthesis* (WG 17, 2002–2005), and the Section on *Carbon and Climate* (2006–present), has been long acting as a regional coordinator for these activities. The Section on *Carbon and Climate* provides clear channels of communication to IOCCP, and to large-scale IGBP programs such as SOLAS and IMBER.
- IOCCP and PICES co-sponsored the publishing of the “*Guide to best practices for ocean CO₂ measurements*”, as PICES Special Publication No. 3 and IOCCP Report No. 8 (Eds. A.G. Dickson, C.L. Sabine and J.R. Christian), in December 2007. The guide is available on-line from the CDIAC (Carbon Dioxide Information Analysis Center) Ocean CO₂ Program website in individual chapters or as a whole electronic document, and hard copies are also available upon request from PICES and CDIAC. To increase the use of the Guide, volunteers are being sought to assist with translations of the Guide to languages other than English.
- IOCCP maintains the ocean acidification network website and assisted with the implementation of the SCOR/IOC/IAEA/IGBP International Symposium on “*The ocean in a high CO₂ world – II*” (October 6–8, 2008, Monaco). By the invitation of the organizers, PICES agreed to convene, jointly with ICES, a Theme Session on “*The effects of ocean acidification on fisheries and ecosystems*” at this symposium.

North Atlantic Fisheries Organization (NAFO)

- NAFO and PICES (with ICES as the other sponsor) partnered to organize the International Symposium on “*Reproductive and recruitment processes in exploited marine fish stocks*” (October 1–3, 2007, Lisbon, Portugal). Selected papers from the symposium were published on-line as a special issue of *Journal of Northwest Atlantic Fishery Science* (Guest Editors: R.D. Brodeur, M. Dickey-Collas and E. Trippel). A hard-copy run of this issue is expected in April 2009.

North Pacific Anadromous Fish Commission (NPAFC)

- Dr. Yukimasa Ishida (CSRS Chairman) represented NPAFC at the 2008 PICES Annual Meeting.
- Dr. Alexander Bychkov (Executive Secretary) represented PICES at the NPAFC Sixteenth Annual Meeting (November 17–21, 2009, Seattle, U.S.A.) and Dr. Skip McKinnell (Deputy Executive Secretary) represented PICES at the NPAFC International Symposium on Bering–Aleutian Salmon International Survey (November 2008, Seattle, U.S.A.).
- NPAFC was invited to (1) participate in the development of the second PICES North Pacific Ecosystem Status Report; (2) co-sponsor the PICES/ICES Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*”, and (3) contribution to the Implementation Plan for FUTURE.

North Pacific Research Board (NPRB)

- In 2007, NPRB and PICES co-sponsored a series of workshops on “*Forecasting climate impacts on future production of commercially exploited fish and shellfish*”. PICES Scientific Report No. 34 (August 2008) provides a summary of these workshops.
- In addition to the grant of \$90,000 for the development of the second PICES North Pacific Ecosystem Status Report, NPRB committed US\$15,700 to support the involvement of Dr. Michael Dagg (BIO Chairman) in this project as a Co-Editor (this grant will be handled through LUMCON–Louisiana Universities Marine Consortium).
- NPRB approved a contribution of US\$50,000 per year for the next 5 years of the North Pacific Continuous Plankton Recorder (CPR) project.

Northwest Pacific Action Plan (NOWPAP)

- PICES was involved in the 1st (March 7, 2008) and 2nd (September 11, 2008) NOWPAP/CEARAC Coastal Environmental Assessment Workshops held in Toyama (Japan), to develop common procedures for coastal environmental assessment in the NOWPAP region, including nutrient enrichment, eutrophication and HAB occurrence.
- PICES was present as an observer at the 7th NOWPAP/DINRAC Focal Points Meeting (May 13–14, 2008, Beijing, China) to discuss approaches on exchange of marine environmental data and information in the region.
- A statement on “NOWPAP and PICES: Potential areas for collaboration from PICES perspective” was sent to the 13th Intergovernmental Meeting of NOWPAP (October 20–21, 2008, Busan, Korea).
- Dr. Jeung Sook Park (NOWPAP Scientific Affairs Officer) attended the 2008 PICES Annual Meeting as an observer, and addressed MEQ on potential areas for collaboration between NOWPAP and PICES. NOWPAP also had a poster at this meeting outlining general information and highlighting scientific objectives and recent activities of the project.
- A presentation on HAB-related activities of NOWPAP was made by a representative of CEARAC at the 2008 meeting of PICES Section on *Ecology of Harmful Algal Blooms in the North Pacific*. An article on activities of this section was published in the NOWPAP/CEARAC newsletter.
- PICES was one of the supporters for the 2nd NOWPAP Training Course on “*Remote Sensing Data Analysis*” (November 1–5, 2008, Jeju, Korea).

Sir Alister Hardy Foundation for Ocean Science (SAHFOS)

- PICES Advisory Panel on *Continuous Plankton Recorder Survey in the North Pacific* (CRP-AP) review and advise on the most appropriate locations, timing and frequency of CPR routes for the North Pacific CPR project managed by SAHFOS and endorsed by PICES. The CPR is now recognized as the only long-term indicator of global change in the North Pacific providing biological information on this large geographic scale. This information is being widely used by the North Pacific scientific community as an indicator of biological responses to annual changes in climate.

Scientific Committee on Oceanic Research (SCOR)

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

- PICES strongly supported the formation of SCOR Working Group (WG 125) on *Global Comparisons of Zooplankton Time Series* and agreed to provide funding for an associate member from the North Pacific (Dr. Harold P. Batchelder, Oregon State University, U.S.A.) to participate in its activities. The most recent meeting of SCOR WG 125 and the associated workshop on “*Zooplankton and climate: Response modes and linkages among regions, regimes, and trophic levels*” were held in conjunction with the PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 2008, Gijón, Spain).
- Activities of PICES Working Group (WG 22) on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* are closely linked to the mandate of SCOR Working Group (WG 131) on *The Legacy of in situ Iron Enrichment: Data Compilation and Modeling* to compile a database for open access of the completed iron-enrichment experiments. PICES is prepared to consider co-sponsoring a joint meeting of these groups to work out the details of bringing together the data sets in a way that will make preparation of the database possible.

GC-2008

- Since 2005, PICES Section on *Ecology of Harmful Algal Blooms in the North Pacific* has been convening an annual series of workshops, “*Review of selected harmful algae in the PICES region*”, to document the existing knowledge on the eco-physiology of HAB species that impact all, or most, countries in the North Pacific. The previous workshops, held in conjunction with PICES Annual Meetings, focused on *Pseudo-nitzschia* and *Alexandrium* (2005), *Dinophysis* and *Cochlodinium* (2006), *Heterosigma akashiwo* and other harmful raphidophytes (2007), and *Karenia* and *Prorocentrum* (2008). These workshops are normally preceded by a laboratory demonstration on cell and toxin identification and detection methods/technique. We intend to continue this series, and the SCOR Global Ecology and Oceanography of Harmful Algal Blooms Program (GEOHAB) was invited to play an active role in the future workshops.
- 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 2008, SCOR allocated US\$7,500 for the PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 19–23, 2008, Gijón, Spain) and US\$5,000 for the 2008 PICES Annual Meeting. SCOR also committed US\$5000 for the 3rd PICES Summer School on “*Satellite Oceanography*” (August 25–28, 2009, Seoul, Korea) and \$2500 for SCOR-relevant sessions at the 2009 PICES Annual Meeting.

Surface Ocean-Lower Atmosphere Study (SOLAS)

- The PICES Working Group (WG 22) on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* is the appropriate avenue to maintain and enhance collaboration with SOLAS. Currently, Dr. Shigenobu Takeda (WG 22 Co-Chairman and SOLAS SSC member) serves as a liaison between the two groups.
- SOLAS was represented as an observer at the 2008 PICES Annual Meeting and had a poster outlining general information and highlighting scientific objectives and recent activities of the project.
- SOLAS will be approached to co-sponsor the BIO Workshop on “*Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses*” to be convened at the 2009 PICES Annual Meeting.
- Selected papers from the SEEDS-II (Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study II) experiment are expected to be published in 2009 as a special issue of *Progress in Oceanography* (Guest Editors: A. Tsuda, M. Wells, M. Uematsu and H. Saito).

GC Endnote 4

Comments on the affiliate status system and draft *Affiliate Member Policy*

(as received, with minor language editing)

Japanese comments (E-mail of September 29, 2008):

Dear Dr. Wada, PICES Chairman, and Dr. Bychkov, Executive Secretary,

We read the document of PICES AFFILIATE MEMBER POLICY. We understand that the scientific cooperation with scientists of non-member countries is very important for PICES activities. For example, the Ecosystem Based Management Working Group (WG 19) had a lot of input from not only scientists of member countries, but also from a scientist of non-member country such as Australia who was invited by PICES. Like this, the current PICES system can achieve the scientific cooperation between PICES and non-member countries. So, it is not necessary to introduce an additional system such as affiliate member policy for scientific cooperation with non-member countries. Also, even if non-member country contributes to approximately 10% of the current annual contribution per Contracting Party to PICES, we have concerns about a heavy burden in man power and financial aspect, if we introduce this system. Therefore, Japan makes an objection to introduce the affiliate member policy for scientific cooperation with non-member countries to PICES system.

Best regards,
Takaji Iida, Representative of Japanese delegates
Fisheries Agency of Japan

U.S. comments (E-mail of September 29, 2008):

Consistent with discussions in Victoria, the US delegation has the following comments on the affiliate status system:

(1) Policy and procedure for selecting an Affiliate Member: Since affiliates are to represent a non-member country, it would be preferable if the Secretariat undertook the consultation with the foreign ministry of the government in which the organization is located automatically, perhaps even requesting a letter to the effect that the government supports an organization as the affiliate. The concern is that some organization could apply for affiliate status and be granted that status without that government's support, possibly leading to later disagreements within the country.

(2) Influence of the Affiliate Status System on the current practices of PICES: Sufficient safeguards, such as inability to serve as committee chairs, have been instituted in the guidelines to avoid problems here. Furthermore, the rules of procedure will have to be reviewed carefully so as to define precisely what actions affiliates may or may not take, *e.g.*, affiliates cannot participate in decisions of the Contracting Parties under Article VII.

(3) We believe that appropriate revisions should be made to the PICES policy document to provide more clarity on the responsibilities and rights of affiliate members. The policy should avoid legally binding language in the context of a policy document like this. Some suggested editorial changes are provided on the attached file.*

George Boehlert, U.S. National Delegate
Hatfield Marine Science Center, Oregon State University

* Circulated to the delegates but not included in this report.

GC Endnote 5**List of organizations and programs present as observers at the 2008 PICES Annual Meeting**

Alaska Ocean Observing System (AOOS)	Dr. Phillip R. Mundy
APEC's Marine Resources Conservation WG (APEC-MRC)	Mr. Gongke Tan
International Program for deployment of profiling floats (Argo)	Dr. Dake Chen
Bering Sea Ecosystem Study (BEST)	Dr. George L. Hunt, Jr.
Climate Variability and Predictability Program (CLIVAR)	Dr. Dongxiao Wang
Ecosystem Study of Sub-Arctic Seas (ESSAS)	Dr. Kenneth Drinkwater
Global Ocean Ecosystem Dynamics (GLOBEC)	Dr. Manuel Barange
Group of Experts on Scientific Aspects of Marine Pollution (GESAMP)	Dr. Rudolf Wu
Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)	Dr. Hiroaki Saito
Intergovernmental Oceanographic Commission (IOC) of UNESCO	Dr. Patricio Bernal
International Association of Marine Science Libraries (IAMSLIC)	Mr. Brian Voss
International Council for the Exploration of the Sea (ICES)	Dr. Adolf Kellermann
International Whaling Commission (IWC)	Dr. Hidehiro Kato
North Pacific Anadromous Fish Commission (NPAFC)	Dr. Yukimasa Ishida
Northwest Association of Networked Ocean Observing Systems (NANOOS)	Dr. Jack Barth
Northwest Pacific Action Plan (NOWPAP)	Dr. Jeung Sook Park
Pacific Coast Observing System (PaCOOS)	Dr. John Stein
Pacific Arctic Group (PAG)	Dr. Jianfeng He
Sir Alister Hardy Foundation for Ocean Science (SAHFOS)	Mr. Sandy Shan
Surface Ocean Low Atmosphere Study (SOLAS)	Dr. Sonia Batten
World Climate Research Programme (WCRP)	Dr. Shigenobu Takeda
	Dr. Dongxiao Wang

GC Endnote 6

Study Group on Restructuring the PICES Annual Meeting

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 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.

Therefore, a Study Group should be established, under the direction of Council, 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. Clarifying the responsibilities of the Science Board, Financial and Administration Committee, and Scientific/Technical 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.

* Annual Meeting means not only the plenary and subsequent scientific sessions, but also the meetings of the Governing Council, Science Board, Financial and Administration Committee, Scientific and Technical Committees and their subsidiary bodies, as well as workshops and other pre-annual meeting obligations.

Terms of Reference

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.

Membership

The Study Group 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.

GC Endnote 7

PICES project
on “Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim” Financial
report for Year 1 (April 1, 2007 – March 31, 2008)

Background

In April 2007, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency (JFA) of Japan, provided a voluntary contribution to PICES for a 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 thus, involvement of developing Pacific Rim countries is required in activities under this project.

The project has two distinct components, one on harmful algal blooms (HABs) and the other on marine non-indigenous species (MNIS), and is conducted by two PICES expert groups under the Marine Environmental Quality Committee (MEQ), Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB Section) and Working Group on *Non-indigenous Aquatic Species* (WG 21). Each group oversees a specific sub-project. The HAB sub-project, with Dr. Vera L. Trainer (Northwest Fisheries Science Center, Seattle, WA, U.S.A., E-mail: Vera.L.Trainer@noaa.gov) as the principle investigator (PI), focuses on preparing and teaching country-specific training courses most needed to ensure seafood safety in developing countries. Within the MNIS sub-project, two specific initiatives have been identified. The first is the development of a comprehensive MNIS database, with Dr. Henry Lee II (U.S. Environment and Protection Agency, Newport, OR, U.S.A., E-mail: lee.henry@epa.gov) as the PI. The second is a taxonomy initiative that includes rapid assessment surveys and associated collector surveys in PICES member countries, with Dr. Thomas Therriault (Fisheries and Oceans Canada, Nanaimo, BC, Canada, E-mail: thomas.therriault@dfo-mpo.gc.ca) as the PI. The Chairman of MEQ, Dr. Glen Jamieson (Fisheries and Oceans Canada, Nanaimo, BC, Canada, E-mail: glen.jamieson@dfo-mpo.gc.ca) serves as the Project Scientific Coordinator and is responsible for reporting annually on the progress of the scientific implementation of the project. This scientific report, to be submitted as a separate document simultaneously with the financial report, will 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.

Financial principles and budget categories

The following financial principles, agreed to by 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 10% overhead on the annual budget shall be retained by PICES to offset expenses related to the Secretariat’s involvement in the project;
- 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.

GC-2008

- 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 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

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 (April 1, 2007 to March 31, 2008) were transferred to this account on July 27, 2007.

BUDGET EXECUTION FOR FISCAL YEAR 1

The budget allocated for *Year 1* was \$184,980. The initially proposed budget breakdown is shown in Table 1. Work plans for both sub-projects were discussed and revised at the PICES Sixteenth Annual Meeting held from October 26 to November 5, 2007, in Victoria, BC, Canada. Consequently, allocations between the budget categories were adjusted: \$5,800 (10%) from the travel and meetings category and \$7,200 (8%) from the contracts were moved to the equipment category as indicated in Table 1. This table also includes actual expenses and remaining funds for each of the budget categories, and the project account balance as of March 31, 2008. There is a surplus of \$10,668 at the fiscal year end. Table 2 provides more details on actual expenses for the major categories.

Table 1 Allocations and expenses for *Year 1* of the PICES MAFF project.

Category	Initial Allocations	Final Allocations	Actual Expenses	Remainder
Travel & meetings	58,000	52,200	48,652	3,548
Contracts	90,000	82,800	81,822	978
Equipment	16,500	29,500	29,162	338
Miscellaneous	1,980	1,980	223	1,757
Overhead	18,500	18,500	18,500	–
Total	184,980	184,980	178,359	6,621
Interest earned				4,047
Account Balance				10,668

Table 2 Breakdown of expenses for various budget categories for *Year 1* of the PICES MAFF project.

Category/Activity	Expenses
Travel & meetings	48,652
Joint meeting of PICES and ICES experts on MNIS (May 25–26, 2007, Cambridge, U.S.A.) in conjunction with the 5 th International Conference on “ <i>Marine bioinvasions</i> ” (May 21–24) to discuss possible directions for the MNIS sub-project and potential for collaboration between the two organizations to better implement this sub-project	8,304
Travel of MNIS experts to PICES XVI to test the first version of the database and to discuss the proposed taxonomy initiative, including the rapid assessment surveys and associated collector surveys, under the MNIS sub-project	4,673
Meetings of PICES and IOC/WESTPAC HAB experts (Oct. 24–25, 2007, Seattle, U.S.A. and Nov. 25–27, 2007, Tokyo, Japan) to discuss possible directions for the HAB sub-project, what might be learned from past IOC/WESTPAC training classes, and potential for collaboration with these organizations to enhance the effectiveness of a HAB training program	6,718
Participation of PICES and WESTPAC experts in the 2 nd Asian GEOHAB meeting (Jan. 28–Feb. 1, 2008, Nha Trang, Vietnam) to introduce activities of the PICES HAB Section and the MAFF project, and to obtain information about research and monitoring needs pertaining to HABs and seafood safety in southeast Asian countries in order to determine an immediate and long-term Action Plan for a HAB training program	9,532
Inter-sessional WG 21 meeting (March 3–5, 2008, Busan, Korea) to evaluate the protocols and reach final agreement on standards, data elements and data entry templates for the MNIS database	19,425

GC-2008

Contracts	81,822
To develop a prototype MNIS database to support the scientific information to be provided by participating scientists (Ms. Deborah Reusser, U.S. Geological Survey)	40,730
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)	20,012
To provide assistance to project Coordinators and sub-project Principle Investigators (Ms. Rosalie Rutka, Stranby Technical Services)	21,080
Equipment	29,162
Equipment and materials for a HAB training program in developing countries	28,000
Access database software for China, Japan, Korea and Russia	1,162
Miscellaneous	223
Cheque and bank charges	194
Mail charges	29

Recommendation on the use of *Year 1* surplus

As indicated above, the first year of the project ended with a surplus of \$10,668, generated partly by the unused funds and partly by bank interest.

One of the tasks under the MNIS sub-project is entering species distributions at the eco-regional scale for all taxa, to the extent practical, into a MNIS database. It is recommended that an equivalent of \$6,000 US be used from the surplus to support data entry of species distribution in Japanese waters. This task is expected to be completed by August 31, 2008, through the contract with Marine Ecological Institute Inc., supervised by the member of WG 21, Dr. Hisashi Yokoyama (National Research Institute of Aquaculture).

It is also recommended that the remaining funds (approximately \$4,000) be used to support participation of scientists from Pacific Rim countries in a rapid assessment survey at two port locations in China (one on the Yellow Sea and one on the Bohai Sea) immediately prior to PICES XVII to be held in October 2008, in Dalian, China. This rapid assessment survey and an associated collector survey are being planned under a taxonomy initiative of the MNIS sub-project.

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*, was selected as the PICES external auditor for *FYs* 2003–2005 at the 2003 inter-sessional Governing Council meeting in Victoria, Canada (Decision 03/A/1(ii)), and retained as the auditor for *FYs* 2006–2008 at the 2005 Annual Meeting in Vladivostok, Russia (Decision 05/A/1(ii)).

The status of the PICES/MAFF account, for the period from April 1 to December 31, 2007, was assessed during the regular PICES audit for *FY 2007*. The financial statements were submitted to *Flader & Hale* on March 21, 2008, and the audit was completed on April 21, 2007. In the auditor's opinion, the financial statements are an accurate representation of the MAFF account as of December 31, 2008, and changes in the fund balance are in accordance with Canadian generally accepted accounting principles. The financial statements for the rest of *Year 1* of the MAFF project (January 1 to March 31, 2008) will be evaluated during the regular PICES audit for *FY 2008*.

GC Appendix A**2008 Governing Council decisions****08/A/1: Auditor**

- i. Council accepted the audited accounts of *FY* 2007.
- ii. Council retained *Flader & Hale* as the external auditor for *FYs* 2009-2011.

08/A/2: Annual contributions

- i. Council instructed the Executive Secretary to send a letter to Contracting Parties commending them for improved performance in submitting annual contributions for *FY* 2008, and describing the difficulties that late and/or partial payment causes the Organization.
- ii. For planning of their funding requests for annual contributions, Contracting Parties should continue to use the guideline generally accepted at the PICES Eighth Annual Meeting (Decision 99/A/2(ii)), which states that the annual contributions will increase at the rate of inflation in Canada.

08/A/3: Budget

- i. Council accepted the estimated accounts for *FY* 2008.
- ii. Council approved the 2009 budget of \$785,000. The amount of \$98,000 will be transferred from the Working Capital Fund to balance the budget, setting the total annual contribution at \$687,000, and the 2009 annual fee at \$114,500 per Contracting Party.
- iii. Council approved a transfer from the Working Capital Fund to the Trust Fund to recover the 2008 expenses, and to restore the Trust Fund to the level of \$110,000 by the end of the fiscal year.
- iv. Council approved that the amount of \$3,593 in unspent funds from the 2006 CCCC symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” be earmarked for high-priority projects other than the development of the new integrative scientific program, FUTURE, and the preparation of the next North Pacific Ecosystem Status Report.

08/A/4: Scientific cooperation with non-member countries

Council agreed that changing the PICES Rules of Procedures in order to accommodate scientists from non-member countries or other organizations to PICES’ expert groups (*ex-officio* membership) is a viable alternative approach to the affiliate status system, and requested Dr. Laura Richards, former Chairman of the Study Group on *Scientific Cooperation between PICES and Non-member Countries*, to work with the Secretariat to prepare actual amendments for consideration at the next meeting of Council.

08/A/5: Future PICES Annual Meetings and inter-sessional Science Board and Governing Council meetings

- i. Council agreed to provide \$40,000 to Korea to partially cover costs for the 2009 PICES Annual Meeting to be held October 23–November 1, in Jeju, with the Ministry of Land, Transport and Maritime Affairs (MLTL), the Korea Ocean Research and Development Institute (KORDI) and the National Fisheries Research and Development Institute (NFRDI) as the local organizers.
- ii. Council approved in principle the theme of the 2010 PICES Annual Meeting, “*North Pacific ecosystems today, and challenges in understanding and forecasting change*”, and instructed Science Board to finalize the theme description by the 2009 inter-sessional Science Board meeting.
- iii. Following the established 6-year rotation cycle, Council requested the Russia Federation to explore the feasibility of hosting the 2011 PICES Annual Meeting, and inform the Secretariat on this matter by March 31, 2009.

GC-2008

- iv. Council approved a new naming convention for future Annual Meetings that includes the name of the Organization and the year of the meeting (PICES-2009, PICES-2010, *etc.*). For consistency, a similar approach will be used for inter-sessional meetings of Science Board and Council (ISB-2009, IGC-2009).
- v. Council accepted the same registration fee structure for 2009 as was maintained for 2004–2008:

Type of registration fee	CDN \$
Regular	225
Early	150
Student	50
Spousal/guest	50

- vi. A Study Group on *Restructuring the PICES Annual Meeting* has been established under the direction of Council, to review the current practice and structure of the PICES Annual Meeting. The terms of reference and membership of the Study Group are listed in *GC Appendix B*.
- vii. Council approved inter-sessional Science Board and Council meetings to be held in conjunction with a workshop to finalize the development of an Implementation Plan for FUTURE, and accepted an offer from the State Oceanic Administration of China to host these events in Qingdao, in April 2009.

08/A/6: Intern Program

- i. Council accepted changes in the background documentation for the Intern Program (*F&A Endnote 7*).
- ii. Council extended the deadline of nominations for the 2010 PICES Internship until the Governing Council meeting at the 2009 PICES Annual Meeting.
- iii. Council instructed the Executive Secretary to invite Contracting Parties to provide voluntary contributions to support the Intern Program in 2009 and beyond.
- iv. Council confirmed that the stipend should be kept at the current level of \$2,000 per month. The nominating Contracting Party could consider supplementing this modest stipend, depending on the intern's personal circumstances.

08/A/7: PICES Annual Report

Council decided to discontinue printing the Annual Report, and instead, distribute it electronically and deposit it in the electronic commons.

08/A/8: Executive Secretary position

Council approved the re-appointment of Dr. Alexander Bychkov, Executive Secretary, for a new 5-year term to start June 1, 2009.

08/A/9: Election of Chairman and Vice-Chairman

- i. Council unanimously elected Dr. Tokio Wada (Japan) as the Chairman of PICES for a second 2-year term (2008–2010). Accordingly, Dr. Vera Alexander (U.S.A.) remains the Past-Chairman.
- ii. Council unanimously elected Dr. Lev N. Bocharov (Russia) as the Vice-Chairman of PICES for a second 2-year term (2008–2010).

08/A/10: Appointment of F&A Committee Chairman

Council appointed Ms. Patricia Livingston (U.S.A.) as the Chairman of the Finance and Administration Committee for a 2-year term (2008–2010).

08/S/1: 2009 PICES Annual Meeting

The following scientific sessions are to be convened (a List of Acronyms can be found at the end of the Annual Report):

- ¾-day Science Board Symposium on “*Understanding ecosystem dynamics and pursuing ecosystem approaches to management*”;
- 1-day BIO Contributed Paper Session;
- 1-day FIS Topic Session on “*Ecosystem-based approaches for the assessment of fisheries under data-limited situations*”;
- 1-day FIS Contributed Paper Session;
- ½-day FIS/BIO Topic Session on “*Early life stages of marine resources as indicators of climate variability and ecosystem resilience*”;
- ½-day MEQ Topic Session on “*Mitigation of harmful algal blooms*”;
- ½-day MEQ Topic Session on “*The role of submerged aquatic vegetation in the context of climate change*”;
- 1-day MEQ/FIS Topic Session on “*Marine spatial planning in support of integrated management – tools, methods, and approaches*”;
- 1-day MONITOR Topic Session on “*State of the art of real-time monitoring and its implication for the FUTURE oceanographic study*”;
- 1-day POC Contributed Paper Session;
- 1-day POC/BIO Topic Session on “*Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific*”;
- 1½-day POC/FUTURE Topic Session on “*Outlooks and forecasts of marine ecosystems from an earth system science perspective: Challenges and opportunities*”.

The following workshops are to be convened (a List of Acronyms can be found at the end of the Annual Report):

- ¾-day BIO Workshop on “*Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses*”;
- ½-day BIO Workshop on “*Standardizing methods for estimating jellyfish concentration and development of an international monitoring network*”;
- ½-day BIO Workshop on “*Integrating marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in the North Pacific*”;
[After ICES agreed to co-sponsor this workshop, its title was changed to “*Integrating marine mammal populations and rates of prey consumption in models and forecasts of climate change-ecosystem change in the North Pacific and North Atlantic Oceans*”.]
- 2-day BIO Workshop on “*Marine ecosystem model inter-comparisons (II)*”;
- 1-day FIS Workshop on “*Understanding the links between fishing technology, bycatch, marine ecosystems and ecosystem-based management*”;
- 1½-day MEQ Workshop on “*Review of selected harmful algae in the PICES region: V. Cyst forming HAB species*” (includes 1-day laboratory demonstration);
- 1½-day MEQ/FIS Workshop on “*Interactions between aquaculture activity and environment*” (includes ½-day field trip);
- 1-day POC Workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*”;
- 1-day POC/BIO Workshop on “*Mesoscale eddies and their roles in North Pacific ecosystems*”;
- 1½-day POC/BIO Workshop on “*Carbon data synthesis*”.

The following business meetings are to be held (a List of Acronyms can be found at the end of the Annual Report):

- 1-day Science Board meeting;
- ½-day meetings of Scientific (BIO, FIS, MEQ and POC) and Technical (MONITOR and TCODE) Committees to be run concurrently;

GC-2008

- ½-day meetings of the POC/BIO Section on *Carbon and Climate*, immediately after the POC/BIO Workshop on “*Carbon data synthesis*”;
- 1-day meeting of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific*;
- 1-day meeting of the POC Working Group 20 on *Evaluations of Climate Change Projections*;
- 2-day meeting of the MEQ Working Group 21 on *Non-indigenous Aquatic Species*;
- ⅓-day meeting of the BIO Working Group 22 on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean*, immediately after the BIO Workshop on “*Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses*”;
- 1-day meeting of the BIO Working Group 23 on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim*;
- ½-day meetings of the MEQ/FIS Working Group 24 on *Environmental Interactions of Marine Aquaculture*, immediately after the MEQ/FIS Workshop on “*Interactions between aquaculture activity and environment*”;
- 1-day meeting of the Study Group on *Communications*.

08/S/2: Inter-sessional symposia/workshops/meetings

The following inter-sessional meetings and workshops are to be convened/co-sponsored in 2009 and beyond (a List of Acronyms can be found at the end of the Annual Report):

- PICES Harmful Algal Bloom training course, January 15–23, 2009, Manila, Philippines;
- Third Argo Science Workshop: The future of Argo (co-sponsored by PICES and several Chinese agencies/organizations), March 25–27, 2009, Hangzhou, China;
- 11th Salmon Ecology Workshop (related to the development of the North Pacific Ecosystem Status Report for the Alaska Current, California Current and the Bering Sea), April 7–8, 2009, Juneau, U.S.A.;
- North Pacific Ecosystem Status Report Workshop on “*Status and trends in East Asian marginal seas*”, April 21–22, 2009, Busan, Korea, in conjunction with the 15th Pacific–Asian Marginal Seas (PAMS) meeting on “*Observations, understanding, and prediction of climate variability in PAMS*”, April 23–25;
- Workshop to develop an Implementation Plan for the new PICES integrative scientific program, FUTURE (April 26–27, 2009), in conjunction with inter-sessional Science Board (April 28) and Governing Council (April 29) meetings, Qingdao, China;
- Meeting of the PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*, June 21, 2009, Victoria, Canada;
- 3rd GLOBEC Open Science Meeting (co-sponsored by PICES), June 22–26, 2009, Victoria, Canada;
- 3rd PICES Summer School on “*Satellite oceanography*” (co-sponsored by SCOR and several Korean agencies/organizations), August 25–28, 2009, Seoul, Korea;
- 6th International Conference on “*Marine Bioinvasions*” (co-sponsored by ICES, PICES, U.S. National Sea Grant College Program, Pacific States Marine Fisheries Commission and Portland State University), August 24–27, 2009, Portland, U.S.A.;
- CIAC’09 Symposium on “*The effects of environmental variability on cephalopod populations*” (co-sponsored by ICES and PICES), September 3–11, 2009, Vigo, Spain;
- OceanObs’09 Conference—*Ocean information for society: Sustaining benefits, realizing the potential* (PICES is endorsing organization and is present on the Program Committee), September 21–25, 2009, Venice, Italy;
- ICES/PICES Theme Sessions on “*Climate impacts on marine fishes: Discovering centennial patterns and disentangling current processes*” and “*Global Ocean Observing Systems*” at the ICES Annual Science Conference, September 21–25, 2009, Berlin, Germany (the second session was postponed until 2010);
- PICES Rapid Assessment Survey (RAS-2009) for *non-indigenous aquatic species*, October 19–22, 2009, several ports in Korea
- International Symposium on “*Rebuilding depleted fish stocks: Biology, ecology, social science and management strategies*” (primary sponsors: ICES, PICES and UNCOVER; co-sponsoring organizations: NAFO, DFO and IMR), November 3–6, 2009, Warnemünde, Germany;

- North Pacific Ecosystem Status Report Synthesis Workshop, December 1–3, 2009, Honolulu, U.S.A. (by invitation);
- PICES/ICES Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*”, April 26–29, 2010, Sendai, Japan;
- 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*” (primary sponsor: Alaska Sea Grant; co-sponsored by PICES), spring or fall 2010, Anchorage, U.S.A.;
- ICES/PICES Symposium on “*Carrying capacity: What does it mean in a changing ocean?*”, 2010, Lisbon, Portugal;
- 5th International Zooplankton Production Symposium (primary sponsors: PICES and ICES), March 14–18, 2011, Pucon, Chile.

08/S/3: Travel support

PICES will provide travel support for:

2009 PICES Annual Meeting

- Invited speakers for Science Board Symposium and Topic Sessions, with the normal allocation of approximately \$5,000 per Committee; additional requests are subject to fund availability;
- Two invited speakers for each of the following BIO Workshops: “*Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses*” and “*Marine ecosystem model inter-comparisons (II)*”; and 1 invited speaker for each of the following BIO Workshops: “*Standardizing methods for estimating jellyfish concentration and development of an international monitoring network*” and “*Integrating marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in the North Pacific*”;
- One invited speaker for the FIS Workshop on “*Understanding the links between fishing technology, bycatch, marine ecosystems and ecosystem-based management*”;
- One invited speaker for the MEQ Workshop on “*Review of selected harmful algae in the PICES region: V. Cyst forming HAB species*”;
- One invited speaker for the MEQ/FIS Workshop on “*Interactions between aquaculture activity and environment*”;
- Two invited speakers for the POC Workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*”;
- One invited speaker for each of the following POC/BIO Workshops: “*Mesoscale eddies and their roles in North Pacific ecosystems*” and “*Carbon data synthesis*”.

Inter-sessional meetings

- Dr. Sonia Batten, Principle Investigator of the PICES North Pacific Continuous Plankton Recorder (CPR) project, to visit Japan to introduce CPR activities to the Asian scientific community and develop joint scientific projects, spring 2009, Yokohama, Japan;
- A representative of MONITOR to attend the 9th Session of the IOC-WMO-UNEP Intergovernmental Committee for GOOS (I-GOOS-IX), June 10–12, 2009, Paris, France;
- A PICES representative to attend the 25th Session of the IOC Assembly, June 16–25, 2009, Paris, France;
- A member of WG 20 to attend the 2009 ESSAS Annual Meeting, June 15–21, 2009, Seattle, U.S.A.;
- Two PICES scientists to attend the workshop on “*Krill biology and ecology in the world’s oceans*”, June 22–23, 2009, Victoria, Canada (in conjunction with the Third GLOBEC Open Science Meeting);
- Invited speakers from the Pacific (up to \$10,000) and early career scientists from PICES member countries (up to \$5,000) to attend the Third GLOBEC Open Science Meeting, June 22–26, 2009, Victoria, Canada;
- Invited speakers from the Pacific (up to \$10,000) and early career scientists from PICES member countries (up to \$5,000) to attend the 6th International Conference on “*Marine Bioinvasions*”, August 24–27, 2009, Portland, U.S.A.;
- A guest lecturer and 5 non-Korean early career scientists to attend the Third PICES Summer School on “*Satellite oceanography*”, August 25–28, 2009, Seoul, Korea;

GC-2008

- A PICES convenor for the CIAC'09 Symposium on “*The effects of environmental variability on cephalopod populations*”, September 3–11, 2009, Vigo, Spain;
- A PICES convenor for the joint ICES/PICES Theme Session on “*Climate impacts on marine fishes: Discovering centennial patterns and disentangling current processes*” at the ICES Annual Science Conference, September 21–25, 2009, Berlin, Germany;
- A PICES member of the Program Committee for the OceanObs'09 Conference, September 21–25, 2009, Venice, Italy;
- A PICES representative to attend the SCOR Executive Committee Meeting, October 20–22, 2009, Beijing, China;
- A PICES representative to attend the NPAFC Seventeenth Annual Meeting, November 2–6, 2009, Niigata, Japan;
- A Pacific plenary speaker, PICES convenor and PICES SSC member for the symposium on “*Rebuilding depleted fish stocks: Biology, ecology, social science and management strategies*”, November 3–6, 2009, Warnemünde, Germany;
- Two non-American invited speakers from the Pacific for the 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*”, spring or fall 2010, Anchorage, U.S.A.;
- A Pacific invited speaker for the ICES/PICES Symposium on “*Carrying capacity: What does it mean in a changing ocean?*”, 2010, Lisbon, Portugal.

08/S/4: Publications

The following publications are to be produced:

Primary journals (2009–2010)

- *Journal of Marine Systems* (2009) – special issue on “*Observation and modeling of the ocean circulation and marine ecosystem for CREAMS/PICES*” (Guest Editors: K.-I. Chang, S.-I. Ito, C. Mooers and J.-H. Yoon);
- *ICES Journal of Marine Science* (2009) – special section in a regular issue based on selected papers from the ICES/PICES Early Career Scientists Conference on “*New frontiers in marine science*” (Guest Editors: F. Mueter and E. North);
- *Journal of Northwest Atlantic Fishery Science* (2009) – special issue based on selected papers from the NAFO/PICES/ICES Symposium on “*Reproductive and recruitment processes of exploited marine fish stocks*” (Guest Editors: R. Brodeur, M. Dickey-Collas and E. Trippel). JNAFS is primarily an electronic journal, but a hard-copy run of this issue is expected in April 2009;
- *Journal of Oceanography* (2009) – special section in a regular issue based on selected papers from the PICES-2007 Topic Session on “*Decadal changes in carbon biogeochemistry in the North Pacific*” (Guest Editor: T. Saino);
- *Deep-Sea Research II* (2009) – special issue based on selected papers on krill from the 4th International Zooplankton Production Symposium on “*Human and climate forcing of zooplankton populations*” (Guest Editors: W. Peterson and S. Kawaguchi);
- *Deep-Sea Research II* (2009) – special issue based on papers from the SEEDS-II experiment (Guest Editors: A. Tsuda, M. Wells, M. Uematsu and H. Saito);
- *Progress in Oceanography* (2009) – special issue based on selected papers from the ICES/PICES Theme Session on “*Comparative marine ecosystem structure and function: Descriptors and characteristics*” at the 2007 ICES Annual Science Conference (Guest Editors: B.A. Megrey, J.S. Link and E. Moksness);
- *Fisheries Research* (2009) – special issue based on selected papers from the PICES-2007 Topic Session on “*Ecosystem approach to fisheries: Improvements on traditional management for declining and depleted stocks*” (Guest Editors: G.H. Kruse, Y. Ishida, T. Perry, V.I. Radchenko and C.-I. Zhang);
- *Deep-Sea Research II* (2009 or early 2010) – special issue based on selected papers from the OECOS (Oceanic Ecosystem Comparison in the Subarctic Pacific) experiment (Guest Editors: C. Miller and A. Yamaguchi);

- *Progress in Oceanography* (2010) – special issue based on selected papers from SCOR Working Group on *Zooplankton Time Series*. (Guest Editors: P. Pepin, D. Mackas and H. Verheye)
- *Continental Shelf Research* (early 2010) – special issue on “*Tides in Marginal Seas*” dedicated to Prof. Alexei Nekrasov (Guest Editors: J. Cherniawsky, M. Foreman, B. Kagan and A. Rabinovich);
- *Marine Ecology Progress Series* (2010) special issue on “*Phenology and climate change in the North Pacific*” (Guest Editor: W. Sydeman).

PICES Scientific Report series (2009)

- Proceedings of the Fourth PICES Workshop on “*The Okhotsk Sea and adjacent areas*” (Editors: M. Kashiwai and G. Kantakov);
- Final report of WG19 on *Ecosystem-based Management Science and its Application to the North Pacific* (Editors: G. Jamieson, P. Livingston and C.-I. Zhang);
- Final report for the Climate Change and Carrying Capacity Program (Editor: M. Kishi);
- Final report of the Advisory Panel on *Micronekton Sampling Inter-calibration Experiment* (Editors: E. Pakhomov and O. Yamamura).

PICES Special Publications (2010)

- Second North Pacific Ecosystem Status Report.

Other publications (2009–2010)

- Brochure on “*Ecosystem-based management science and its application to the North Pacific*” (2009);
- Brochure on “*The status and trends of the North Pacific Ocean*” – summary of the Second North Pacific Ecosystem Status Report for policy makers, managers, commercial stakeholders and other interested members of society (2010).

08/S/5: Future of current groups

- i. To comply with procedures accepted for the production of the next North Pacific Ecosystem Status Report, the revised term of reference (3) for MONITOR was approved to read “Contribute to the development of the North Pacific Ecosystem Status Report, advising editors and lead authors on monitoring issues, identifying the need for particular time series and their continuities, the period on which they need to be updated for the FUTURE forecast products, and recommend to Science Board that they endorse the need to establish or maintain a particular time series.”
- ii. The lifespan of the POC Working Group (WG 20) on *Evaluations of Climate Change Projections* was extended until October 2010, so it can provide the new PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* with the climate projection information they requested to complete the majority of their analysis during 2009–2010.
- iii. The lifespan of the MEQ Working Group (WG 21) on *Non-indigenous Aquatic Species* was extended until October 2012, and its revised terms of reference were approved (*GC Appendix B*). These changes reflect involvement of WG 21 in a project on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” supported by the Ministry of Agriculture, Forestry and Fisheries of Japan.
- iv. Responsibility for the project on “*Marine ecosystem model inter-comparisons*” (approved in 2007) was moved from the CCCC Program to BIO. The goal of this project is quantitative comparison of different structures and parameterizations of ecosystem models using identical physical forcing (2007 *MODEL Endnote 4*), and the work will be integrated into FUTURE when the program is operational.

08/S/6: New PICES groups

- i. A Working Group (WG 24) on *Environmental Interactions of Marine Aquaculture* (WG-EIMA) was established under the direction of FIS and MEQ, with terms of reference as described in *GC Appendix B*.
- ii. A joint PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS) received approval-in-principle for its formation, under condition that the proposed terms of reference are revised to the satisfaction of Science Board. The revised terms of reference approved by the PICES Science Board (in December 2008) and the ICES Scientific Committee (January 2009) are

GC-2008

included in *GC Appendix B*. Parent committees for WG-FCCIFS are FIS and POC in PICES, and OOC (Oceanography Committee) in ICES.

08/S/7: Chairmen and Vice-Chairmen for permanent Committees and expert groups

The following reflects changes and continuations in Chairmanship/Vice-Chairmanship for Scientific and Technical Committees and expert groups:

- Dr. Mikhail Stepanenko (Russia) to replace Dr. Gordon H. Kruse as FIS Chairman;
- Dr. Phillip R. Mundy (U.S.A.) to replace Dr. Charles B. Miller as CPR-AP Chairman.

08/S/8: Relations with other organizations and programs

Council confirmed keeping the 2007 *Standing List of International and Regional Organizations and Programs* (*SB Endnote 3*) and agreed with the identified priorities for interaction in 2008–2009.

GC Appendix B**Study Group on Restructuring the PICES Annual Meeting**Terms of Reference

1. To review the current practice and structure of the PICES Annual Meeting to:
 - consider ways of improving the time balance and order among various events of the Annual Meeting;
 - shorten the duration of the Annual Meeting; and
 - 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.

Membership

The Study Group 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.

MEQ Working Group (WG 21) on *Non-indigenous Aquatic Species* (WG-NIAS)Terms of Reference (revised)

1. Assesses the status of non-indigenous aquatic species in the PICES area by:
 - completing an inventory of currently reported estuarine and marine aquatic non-indigenous species in PICES member countries;
 - compiling definitions of terms and making recommendations on use of terms;
 - summarizing the situation on bioinvasions in the North Pacific; and
 - comparing and contrasting this situation to other regions.
2. Assemble an inventory of expertise and programs related to non-indigenous aquatic species in PICES member countries by:
 - compiling a list of existing databases of non-indigenous aquatic species experts; and
 - compiling sources of information on relevant national research and monitoring programs in PICES member countries.
3. Summarize initiatives on prevention and mitigation measures (*e.g.*, ICES Code of Practice for the Introduction and Transfer of Marine Organisms; IMO Ballast Water Management Convention and national policies of PICES member countries), and develop recommendations for best practices for prevention and mitigation.
4. Promote collaboration between ICES and PICES Working Groups on non-indigenous species by:
 - holding joint meetings of the related ICES Working Groups and PICES WG-21 as conveniently and as practical; and
 - developing and recommending an approach for enhanced linkages between ICES and PICES on non-indigenous aquatic species.
5. Develop a comprehensive Non-Indigenous Aquatic Database.
6. Establish a North Pacific Marine Non-Indigenous Aquatic Species taxonomy initiative.
7. Publish an interim report in 2010 and a final report in 2012, summarizing results and recommendations.

MEQ/FIS Working Group (WG 24) on *Environmental Interactions of Marine Aquaculture* (WG-EIMA)

Mission Statement

Develop standard methods and tools to assess and compare the environmental interactions and characteristics of existing and planned marine aquaculture activities in PICES member countries.

Strategy Statement

The Working Group should contain expertise corresponding to the three terms of reference (TORs) outlined below. Working sessions on environmental interaction models of marine aquaculture, risk assessment case studies and infectious diseases will be held at PICES Annual Meetings (AMs) and when possible, at other times as needed. A symposium (likely in the third year) will highlight models and information generated by all three TORs to evaluate environmental interactions associated with aquaculture. Final results will be reported as a PICES publication and, hopefully, also in the peer-reviewed literature. The Working Group will maintain contacts and linkages with PICES Working Groups on *Ecosystem-based Management Science and its Application to the North Pacific* (WG 19) and on *Non-indigenous Aquatic Species* (WG 21), and two ICES Working Groups on *Environmental Interactions of Marine Aquaculture* and on *Pathology and Diseases of Marine Organisms*.

Goals and Actions (Terms of Reference)

1. Evaluate approaches currently being used in the different PICES countries to assess and model the interactions of aquaculture operations with surrounding environments. This will involve conducting a comparative assessment of the methodologies, applications, and outputs of different approaches to assess finfish, shellfish, seaweed, and/or integrated multi-trophic aquaculture. Assessments of the approaches will include case studies of their application. As the possibilities for different types of aquaculture and their interactions to be assessed are so vast, it is suggested that a process be developed that prioritize and limits the options. A possible process would:
 - (a) List types of aquaculture and identify major culture technologies and related species of highest interest to member states. Select three or four important culture technologies and associated species and assess their environmental effects and associated interactions;
 - (b) Review the scientific literature to ascertain if these possible interactions have been determined to be significant;
 - (c) Identify methodologies used to predict the effects of these interactions and the history/uncertainty associated with these predictions;
 - (d) Examine a variety of institutional decision-making models that are used to limit the effects and associated monitoring and mitigation protocols.
2. Review and assess current risk assessment methods used to assess environmental interactions of aquaculture and determine what, if anything, should be changed for application in PICES countries to reflect ecosystem-specific aspects. Following the review and assessment, identify appropriate case studies to compare results among countries in the PICES region. This will be achieved by holding a workshop in the second year to compare and discuss possible standardization of methodologies and the selection of potential case studies for assessment with a standardized approach. Much of the information for this exercise can be derived from “item c” in TOR 1 above. Case studies may then be developed. Responsibilities and functions will be similar to the ICES Working Group on *Environmental Interactions of Mariculture* (WGEIM), so the feasibility of holding a joint meeting with this group will be explored.
3. Assess methods to detect, identify, evaluate and report on infectious disease events and potential interactions between wild and farmed marine animals. If appropriate, develop a recommended standardized approach for detection/evaluation/reporting from wild and cultured populations. The focus of this activity will be on OIE-notifiable diseases and other infectious diseases of regional/economic importance. Discuss and document new and emerging infectious diseases in the PICES region, methods for their detection, and develop models to conduct risk assessments of their potential impacts on both

endemic wild and farmed species. If resources are available it would be advisable to test these models by conducting risk assessments on a few (2–3) emerging pathogens. Responsibilities and functions will be similar to the ICES Working Group on *Pathology and Diseases of Marine Organisms* (WGPDMO), so the possibility of a joint meeting will be explored.

4. As a conclusion to all the above, we propose to hold a PICES session or separate symposium in the third year to present case studies and results, and submit for publication as a PICES document, in an appropriate scientific journal, a summary paper that examines development and application of aquaculture–environment interaction models.

PICES-ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS)

Terms of Reference

1. Promote research on climate change impacts on marine ecosystems by scientists in ICES and PICES member nations through coordinated communication, exchange of methodology, and organization of meetings to discuss and publish results;
2. In collaboration with relevant expert groups in PICES and ICES, develop frameworks and methodologies for forecasting the impacts of climate change on marine ecosystems, with particular emphasis on the distribution, abundance and production of commercial fish and shellfish;
3. Review the results of designated case studies to test methods;
4. Explore techniques for estimating and communicating uncertainty in forecasts;
5. Explore strategies for research and management under climate change scenarios, given the limitations of our forecasts;
6. Plan for a science symposium in early 2010 to present, discuss and publish forecasts of climate change impacts on the world's marine ecosystems, with particular emphasis on commercial fish and shellfish resources;
7. Produce publications that are relevant to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change;
8. Publish report(s) summarizing work.

REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE

The Finance and Administration Committee (hereafter F&A) met from 09:00–13:30 on October 29, and from 12:30–13:30 on October 31, 2008, under the chairmanship of Dr. Laura Richards.

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, noting that a discussion of the Rules of Procedure would be included under Agenda Item 15–Other Business (*F&A Endnote 2*).

AGENDA ITEM 3

Audited accounts for FY 2007

The *FY 2007* financial statements were submitted to *Flader & Hale* on March 21, 2008, and the Auditor's Report was completed on April 21, 2008. This report (*F&A Endnote 3*) was electronically circulated to all Contracting Parties on May 1, 2008, and hard copies were sent to members of the F&A Committee by mail. In the auditor's opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2007, and the results of its operations and changes in the fund balances are in accordance with Canadian generally accepted accounting principles. The Committee reviewed the Auditor's Report and recommended it for approval by Council.

Flader & Hale had been selected as the external PICES auditor for *FYs 2003–2005* at the first inter-sessional Governing Council meeting (April 2003, Victoria, Canada) (Decision 03/A/1(ii)). At the 2005 PICES Annual Meeting (Vladivostok, Russia), Council retained this company as the auditor for *FYs 2006–2008* (Decision 05/A/1(ii)). After reviewing bids from two accounting companies (*Flader & Hale* and *Cowland Paterson & Co.*), the Committee recommended that Council retain *Flader & Hale* for an additional 3-year term (*FYs 2009–2011*).

AGENDA ITEM 4

Annual contributions

As stated in Financial Regulation 5(ii), all national contributions to PICES “*shall be considered due as of the first day of the financial year (January 1) to which they relate*”. The Executive Secretary reported on the 2008 annual fee payment dates, and provided information on the payment of national contributions from 2000 to 2008 (*F&A Endnote 4*).

The Committee noted that all Contracting Parties met their financial obligations for *FY 2008*, except the United States. The United States indicated that the arrears payment of \$8,525 for 2008 would be made in conjunction with the 2009 annual contribution.

F&A-2008

Even though only the Japanese contribution arrived prior to the due date (January 1, 2008), the timeliness of payment from other Contracting Parties is either stable or improved. China and Korea's progress is especially notable, with the time of the payment moving up one quarter in 2008. The Committee again recommended that Council instruct the Executive Secretary to send a letter to Contracting Parties commending them for improved performance in submitting annual contributions for *FY* 2008, and describing the difficulties that late and/or partial payment causes the Organization.

Japan expressed concerns about the continual increases in the annual contributions. Canada explained that increases are necessary to compensate for salary adjustments which cannot be controlled since they are linked to Canadian wage scales and cost of living increases. The Committee confirmed its previous recommendation that for planning purposes, Contracting Parties should continue to use the guideline generally accepted at the 1999 PICES Annual Meeting (Decision 99/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 the Executive Secretary in developing future budgets.

AGENDA ITEM 5

Fund-raising activities

The Executive Secretary reported on fund-raising efforts for the period since the 2007 PICES Annual Meeting (*F&A Endnote 5*). Fund-raising continues to be an important component of PICES activities, and more than a third of the current operational budget is supported by external contributions and partnerships. Korea suggested that the Executive Secretary verify whether existing commitments would continue to be honoured, given the current global economic situation. Japan (in relation to the voluntary contribution by the Ministry of Agriculture, Forestry and Fisheries) and the Executive Secretary (in relation to other contributions and grants) commented that external funding for 2009 appeared secure.

AGENDA ITEM 6

Report on PICES Publication Program

Mr. Brian Voss (NOAA Libraries, Seattle, WA) presented a progress report on the Action Plan for the PICES Publication Program (*F&A Endnote 6*). The report was enthusiastically received, noting that significant progress had been made. The Committee recommended that the Secretariat continue to work with the International Association of Aquatic and Marine Science Libraries and Information Centers (IAMSLIC) on the items identified in the Action Plan. The Committee noted that plan activities had a minimal financial commitment but did require dedicated staff time. The plan, once completed, would allow a smooth transition of PICES publications to more on-line access. In terms of immediate action, the Committee recommended to discontinue printing the Annual Report and instead, distribute it electronically and deposit it in the electronic commons.

AGENDA ITEM 7

Financing of high priority projects

At the 2007 PICES Annual Meeting, the Committee discussed the use of the encumbered funds designated for high-priority PICES projects and suggested that \$40,000 be earmarked for the development of the new PICES integrative scientific program, **FUTURE** (**F**orecasting and **U**nderstanding **T**rends, **U**ncertainty and **R**esponses of North Pacific Marine Ecosystems), and the remainder (\$103,092) be assigned for the preparation of the next North Pacific Ecosystem Status Report. Given current plans, these two activities appear to have sufficient financial support. The Committee recommended that additional funds be allocated to other high priority projects, including capacity building, which were not specified at the time of the F&A meeting. This would include \$3,593 in unspent funds from the 2006 CCCC symposium on "*Climate variability and ecosystem impacts on*

the North Pacific: A basin-scale synthesis". This project was completed by publication of a special issue of *Progress in Oceanography* in June 2008 (Vol. 77, Nos. 2–3, pp. 83–268).

AGENDA ITEM 8

PICES Intern Program

The Committee reviewed the current status of the Intern Program. At the recommendation of the Executive Secretary, the term for the 2008 PICES intern, Mr. Key-Seok Choe (Project Management Team, Korea Ocean Research and Development Institute), has been extended to January 31, 2009. Therefore, Council agreed to postpone the deadline of nominations for the 2009 PICES internship until the beginning of the 2008 PICES Annual Meeting (Decision 07/A/6(ii)). On October 28, Mr. Yongling Zhu (Director of Foreign Affairs Office, Second Institute of Oceanography, State Oceanic Administration, China) was selected as the 2009 PICES intern.

It is estimated that at the end of *FY* 2008, the Organization will be holding about \$15,000 for the Intern Program. With the current stipend level of \$2,000 per month (Decision 07/A/6(iii)), this amount is sufficient to maintain the Program for 6–7 months in 2009. In the absence of voluntary contributions, Council approved the use of registration fees collected from the Annual Meetings to fund the Intern Program (Decision 01/A/4(iv)). Given this option, the Committee recommended that Mr. Zhu be offered a 12-month term to start as soon as possible after February 1, 2009, rather than a 6-month term with a possibility of extension.

The Committee also recommended that Contracting Parties be invited to provide additional financial support for the PICES Intern Program in 2009 and beyond. Canada noted that the choice of wording in this request would be important and suggested that the Executive Secretary verify the wording to be used in the letter with the F&A member from each Contracting Party.

The Committee reviewed the background documentation for the Intern Program and recommended updates to align the description of the program with current practice. The changes related to supervision (under the PICES Secretariat), start date (normally begins on or about February 1) and level of education (university degree with a M.Sc. or Ph.D. as an asset). The updated document is included as *F&A Endnote 7*.

AGENDA ITEM 9

Salary scales and adjustments for the PICES secretariat staff

The F&A Chairman provided a verbal explanation of the position/salary classification system for the Canadian government public service on which the salary scales and adjustments for the Secretariat staff are based.

AGENDA ITEM 10

Budget

Estimated accounts for *FY* 2008 (Agenda Item 10a)

The Committee reviewed the estimated accounts for *FY* 2008 and recommended their acceptance by Council, noting that the expenses for "foreign exchange loss" are unknown at this time. The Contracting Parties should acknowledge the impact of currency fluctuations when transferring funds into and out of Canadian dollars.

Interest and other income (Agenda Item 10b)

In *FY* 2007, the total income was \$589,906. This amount includes \$155,118 in voluntary contributions and grants (\$120,636 credited to the Working Capital Fund and \$34,482 credited to the Trust Fund), and a transfer of \$95,600 from Fisheries and Oceans Canada for the 2007 PICES Annual Meeting.

F&A-2008

In *FY* 2008, the estimated total income is \$541,923. This amount includes \$212,605 in voluntary contributions and grants (\$173,975 credited to the Working Capital Fund and \$38,630 credited to the Trust Fund).

Relocation and Home Leave Fund (Agenda Item 10c)

At the 2007 PICES Annual Meeting, 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 07/A/3(iii)). Given the estimated fund balance of \$101,056 on January 1, 2009, no action is required.

Trust Fund (Agenda Item 10d)

In *FY* 2008, the total Trust Fund (TRF) income is estimated at \$41,630 (\$38,630 in voluntary contributions and grants) and estimated expenses are \$68,450. The Committee recommended a transfer of about \$25,000 from the Working Capital Fund to recover the 2008 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 1* (April 1, 2007 to March 31, 2008) of the project.

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, 2008, was \$354,519. This includes \$215,495 in encumbered funds and \$139,024 in “reserve operating” funds. In *FY* 2008, the total WCF income and expenses are estimated at a level of \$496,665 (\$173,975 are in voluntary contributions and grants) and \$268,504, respectively. After the recommended inter-fund transfers, the amount of funds available in WCF at the fiscal year end will be \$457,860. This includes \$299,431 in encumbered funds, and \$158,429 in “reserve operating” funds.

Budget for *FY* 2009 and forecast budget for *FY* 2010 (Agenda Item 10g)

The Committee reviewed the proposed *FY* 2009 budget of \$785,000 (*F&A Endnote 8*) and recommended its approval by Council. The Committee also recommended a transfer of \$98,000 from the Working Capital Fund to balance the budget, setting the total annual contribution at \$687,000, and the 2009 fees at \$114,500 per Contracting Party. The 2009 annual fee is about 3% higher than in 2008, and this increase was noted to be consistent with the guideline generally accepted at the 1999 PICES Annual Meeting (Decision 99/A/2(ii)), stating that “*the annual contribution will increase at the rate of inflation in Canada*”. The annual Canadian Consumer Price Index (CPI), used as a measure of inflation, was 3.1% in June, 3.4% in July and 3.5% in August 2008.

The Executive Secretary presented the forecast *FY* 2010 budget of \$803,000 and noted that this budget is prepared, based on preliminary information available as of September 1, 2008 and is 2.3% higher than the *FY* 2009 budget. If the inflation rate in Canada stays at the level of 2.5-3.0%, then the 2010 annual fee should be set at the level of \$117,500 per Contracting Party. The total annual contribution would be \$705,000, and a transfer of \$98,000 from the Working Capital Fund would be required to balance the budget.

AGENDA ITEM 11

Schedule, structure and financing of future Annual Meetings

The 2009 PICES Annual Meeting will be held from October 23–November 1, in Korea (Decision 07/A/5(ii)). Because of a restructuring within the Korean government, the local organizing committee will be composed of the Ministry of Land, Transport and Maritime Affairs (MLTL), the Korea Ocean Research and Development

Institute (KORDI) and the National Fisheries Research and Development Institute (NFRDI). The venue has changed from Busan to Jeju. The Korean delegation confirmed that they require \$40,000 from the General Fund to help offset the costs for the meeting.

The United States will host the 2010 PICES Annual Meeting, but has not yet suggested dates or a venue.

In keeping with the six-year rotation cycle (Decision 94/A/6), the Russian Federation was invited to explore the possibility of hosting the 2011 PICES Annual Meeting and inform the Secretariat on this matter by March 31, 2009.

At the 2001 PICES Annual Meeting (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 01/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 04/A/5(iv)). The Committee reviewed the registration fee structure for 2008 and recommended that Council maintain the same fee structure for the 2009 PICES Annual Meeting.

Type of registration fee	CDN \$
Regular	225
Early	150
Student	50
Spousal	50

At the 2005 PICES Annual Meeting (Vladivostok, Russia), Council re-iterated its support for the concept of inter-sessional Science Board meetings with the participation of Council members, but suggested that the need for such a meeting should be evaluated each year and that, given meeting costs (including time commitment of the members), an inter-sessional meeting should be held only if the agenda is substantive. The Committee confirmed these views in 2008.

Science Board has already indicated the importance of having an inter-sessional meeting in 2009, to be held in conjunction with a workshop to finalize the development of an Implementation Plan for FUTURE. The Committee supported this request and suggested that if there is no offer to host the meeting and workshop, these events would be hosted by the PICES Secretariat in Victoria, Canada.

AGENDA ITEM 12

Administrative matters

The Committee reviewed the progress on the status of income tax levies for personnel at the PICES Secretariat and directed the Executive Secretary to continue communications with the British Columbia government on the possibility for an *ex gratia grant* equal to the amount of the provincial personal income taxes remitted, which will be paid back to the Organization at the end of each fiscal year.

AGENDA ITEM 13

Space, facilities and services for the PICES Secretariat office

PICES has a Headquarters Agreement with the Government of Canada that entered into force on December 15, 1993. In accordance with this agreement, Fisheries and Oceans Canada (DFO) hosts the PICES Secretariat at the Institute of Ocean Sciences (IOS) in Sidney, British Columbia, Canada.

F&A-2008

AGENDA ITEM 14

Appointment of F&A Committee Chairman

According to Rule 19(iii) of the PICES Rules of Procedure, “*The Chairman of the Finance and Administration Committee shall be appointed by the Council from among the Committee’s members for a period of two years and if re-appointed, total consecutive service may not exceed four years*”. Dr. Laura Richards (Canada) was appointed as the F&A Committee Chairman at the 2004 PICES Annual Meeting (Honolulu, U.S.A.) and re-appointed for the next two-year period at the 2006 PICES Annual Meeting (Yokohama, Japan). Her second term will end at the conclusion of the 2008 Annual Meeting. The Committee thanked her for her efforts over the past four years.

The Committee recommended that Council appoint Ms. Patricia Livingston (U.S.A.) as the next F&A Chairman.

AGENDA ITEM 15

Other business

The Committee reviewed the Rules of Procedures and suggested changes for consideration by Council in order to accommodate experts from non-member countries to subsidiary bodies of Standing Committees. These proposed changes are not expected to have financial implications, except costs related to the distribution of PICES publications to these experts.

AGENDA ITEM 16

Adoption of the F&A report and recommendations to Council

The draft report was circulated and approved by all F&A members. All recommendations to Council were brought forward by Dr. Richards at the first session of Council on November 1, 2008.

F&A Endnote 1**Participation list**Canada

Robin M. Brown
Serge Labonté

Japan

Yukimasa Ishida (advisor)
Harumi Yamada

People's Republic of China

Yingren Li (alternate delegate)
Gongke Tan (advisor)

Republic of Korea

Sik Huh (advisor)
Doan Jeong
Jin-Yeong Kim (advisor)

Russia

Igor Shevchenko

U.S.A.

Patricia Livingston
Elizabeth Tirpak

Other

Laura Richards (F&A Chairman)
Tokio Wada (PICES 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* 2007 and selection of the external auditor for *FYs* 2009–2011
4. Annual contributions
5. Fund-raising activities
6. Report on PICES Publication Program
7. Financing of PICES high priority projects
8. PICES Intern Program
9. Salary scales and adjustments for the PICES Secretariat staff
10. Budget
 - a. Estimated accounts for *FY* 2008
 - 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* 2009 and forecast budget for *FY* 2010
11. Schedule, structure and financing of future Annual Meetings
12. Administrative matters
13. Space, facilities and services for the PICES Secretariat office
14. Appointment of F&A Committee Chairman
15. Other business
16. 2008 F&A report and recommendations to Governing Council

F&A-2008

F&A Endnote 3

Auditor's Report (2007) to the Organization

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, 2007 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, 2007 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.

CHARTERED ACCOUNTANTS

Sidney, B.C.
April 21, 2008

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF FINANCIAL POSITION
AS AT DECEMBER 31, 2007

ASSETS	2007	2006
CURRENT ASSETS		
Cash and short term deposits (note 4)	\$ 939,641	\$ 726,512
Accounts receivable	29,264	57,538
Accrued interest receivable	1,393	-
Prepaid expenses	2,455	2,665
	\$ 972,753	\$ 786,715
LIABILITIES		
CURRENT LIABILITIES		
Accounts payable	\$ 38,588	\$ 48,545
Funds held for Contracting Parties (note 3)	111,000	108,500
	149,588	157,045
FUND BALANCES		
WORKING CAPITAL FUND (note 4)	450,519	414,964
TRUST FUND	110,000	110,000
RELOCATION AND HOME LEAVE FUND	108,577	104,706
MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES FUND	154,069	-
	823,165	629,670
	\$ 972,753	\$ 786,715

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF OPERATIONS AND CHANGES IN FUND BALANCES
FOR THE YEAR ENDED DECEMBER 31, 2007**

	General Fund	Working Capital Fund	Trust Fund	Relocation and Home Leave Fund	Ministry of Agriculture, Forestry and Fisheries Fund	2007 Total	2006 Total
FUND BALANCES, beginning of year	\$ -	\$ 414,964	\$ 110,000	\$ 104,706	\$ -	\$ 629,670	\$ 655,867
SOURCES OF FUNDS							
Contributions from Contracting Parties	651,000	-	-	-	-	651,000	633,000
Budgeted transfer to General Fund (note 5)	94,000	(94,000)	-	-	-	-	-
Voluntary contributions and grants (note 6)	-	216,236	34,482	-	184,980	435,698	189,007
Interest and other income (note 7)	-	332,032	3,285	3,871	3,411	342,599	167,512
	745,000	454,268	37,767	3,871	188,391	1,429,698	989,519
FUND BALANCES, before expenditures	745,000	869,232	147,767	108,577	188,391	2,058,967	1,645,386
EXPENDITURES							
Personnel services (note 8)	416,732	51,163	-	-	-	467,895	446,292
Annual Meeting	17,486	97,563	-	-	-	115,049	42,071
Special meetings	75,183	207,335	-	-	25,729	308,247	215,959
Travel	84,094	1,437	33,138	-	-	118,669	120,581
Printing	68,432	-	-	-	-	68,432	66,242
Communication	35,786	-	-	-	-	35,786	35,457
Equipment	8,673	-	-	-	-	8,673	6,868
Supplies	5,790	-	-	-	-	5,790	7,375
Contractual services	16,206	19,200	-	-	8,593	43,999	35,083
Miscellaneous	3,505	1,073	-	-	-	4,578	3,726
Intern program	-	-	27,153	-	-	27,153	26,394
Relocation	-	-	-	-	-	-	8,232
Bering Sea Indicators Project	-	17,187	-	-	-	17,187	-
Foreign exchange loss (note 9)	14,344	-	-	-	-	14,344	1,436
	746,231	394,958	60,291	-	34,322	1,235,802	1,015,716
NET FUNDS AVAILABLE	(1,231)	474,274	87,476	108,577	154,069	823,165	629,670
TRANSFER FROM							
WORKING CAPITAL FUND (note 4)	1,231	(1,231)	-	-	-	-	-
INTERFUND TRANSFERS (note 5)	-	(22,524)	22,524	-	-	-	-
FUND BALANCES, end of year	\$ -	\$ 450,519	\$ 110,000	\$ 108,577	\$ 154,069	\$ 823,165	\$ 629,670

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2007**

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 \$8,673 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.

(d) Income Tax

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

F&A-2008

(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 \$111,000.

4. WORKING CAPITAL FUND

Of the total amount in the Working Capital Fund, \$215,495 of cash and short term deposits is restricted for specific designated projects.

Pursuant to decision 07/A/3(ii) of the Governing Council, \$96,000 of the funds held in the Working Capital Fund will be transferred to the General Fund at the beginning of the 2008 fiscal year to balance the budget, setting the total annual contribution at \$666,000, and the 2008 annual fee at \$111,000 per Contracting Party.

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

5. INTERFUND TRANSFERS

The Governing Council approved the transfer of \$94,000 at the beginning of 2007 from the Working Capital Fund to the General Fund (Decision 06/A/3/ii) to balance the budget, setting the total annual contribution at \$651,000, and the 2007 annual fee at \$108,500 per Contracting Party.

The Governing Council approved the transfer of funds from the Working Capital Fund to restore the Trust Fund to \$110,000 by the end of 2007 (Decision 07/A/3/iv). The amount of the transfer was \$22,524.

6. VOLUNTARY CONTRIBUTIONS AND GRANTS

	Working Capital	
	Fund	Trust Fund
NPRB (U.S.A.) contribution for 2007 ESSAS/PICES Workshops	\$ 5,880	\$ -
Contributions for 2008 Climate Change Symposium:		
DFO (Canada)	20,000	-
KORDI (Korea)	4,012	-
DFO (Canada) contribution for PICES XVI	95,600	-
SNU (Korea) contribution for part-time position at Secretariat	19,200	-
NPRB (U.S.A.) funds for the Bering Sea Indicators Project	29,481	-
NPRB (U.S.A.) contribution for 2007 FIS Forecasting workshop	10,949	-
Contributions for the 2007 Early Career Scientists Conference:		
KORDI (Korea)	2,101	-
NMFS (U.S.A.)	29,013	-
Contributions for Intern Program:		
DFO (Canada)	-	10,000
NMFS (U.S.A.)	-	14,507
Travel grants for PICES XVI:		
GLOBEC	-	2,200
NSF (U.S.A.)	-	2,899
SCOR	-	4,876
	\$ 216,236	\$ 34,482

7. INTEREST AND OTHER INCOME

	Working Capital		Relocation and	Ministry of
	Fund	Trust	Home Leave	Agriculture,
		Fund	Fund	Forestry and
				Fisheries Fund
DFO postage reimbursement	\$ 15,000	\$ -	\$ -	\$ -
Displays at PICES VXI	8,000	-	-	-
Interest income	22,530	3,285	3,871	3,411
Income tax levies	68,133	-	-	-
GST, PST & WCB rebates	18,264	-	-	-
Registration Fees:				
PICES XVI	73,615	-	-	-
Climate Change Symposium	417	-	-	-
Zooplankton Symposium	124,322	-	-	-
Other income	1,751	-	-	-
	\$ 332,032	\$ 3,285	\$ 3,871	\$ 3,411

8. PERSONNEL SERVICES

The expenditures in the Working Capital Fund for personnel services in 2007 include retroactive salary and benefit adjustments for staff members (\$19,102) and payments to the International Fisheries Commissions Pension Society (IFC) related to the unfunded pension liability (\$32,061).

9. FOREIGN EXCHANGE LOSS

At year end all funds held in foreign currency (US \$102,965) 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 (2007 = 0.9881, 2006 = 1.1653), and not by the actual purchase or sale of any foreign currencies.

10. 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 instalments over a period of 15 years. The total amount payable in each of the next five years is \$25,200.

11. 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, 2000–2008¹

	<i>Canada</i>	<i>China</i>	<i>Japan</i>	<i>Korea</i>	<i>Russia</i>	<i>U.S.A.</i>
2000	Feb. 9, 00	Aug. 29, 00	Nov. 30, 99	June 1, 00	Nov. 2, 00	Jan. 18, 00
2001	Jan. 24, 01	Dec. 10, 01	Dec. 13, 00	Aug. 23, 01	May 18, 01	Jan. 3, 01
2002	Jan. 21, 02	Oct. 8, 02²	Nov. 27, 01	Aug. 26, 02	June 10, 02³	Dec. 24, 01
2003	Jan. 13, 03	Oct. 3, 03⁴	Dec. 11, 02	May 5, 03	Apr. 2, 03⁵	Dec. 6, 02
2004	Jan. 5, 04	Aug. 10, 04	Dec. 26, 03	Mar. 24, 04	Mar. 2, 04	Feb. 9, 04⁶
2005	Dec. 24, 04	Sept. 22, 05⁷	Mar. 2, 05	Mar. 30, 05	Mar. 31, 05 ⁸	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, 08⁹

¹ payments made later than in the first quarter of the PICES fiscal year or partial payments are indicated in bold

² partial (95.7%) payment, remainder paid October 3, 2003 (21 months overdue)

³ partial (72%) payment, remainder paid October 10, 2002 (9 months overdue)

⁴ partial (78%) payment, remainder paid Aug. 10, 2004 (19 months overdue)

⁵ partial (96.5%) payment, remainder paid July 18, 2003 (6 months overdue)

⁶ partial (50%) payment, remainder paid September 8, 2004 (8 months overdue)

⁷ partial (86%) payment, remainder paid December 30, 2005 (12 months overdue)

⁸ partial (96.6%) payment, remainder paid April 25, 2005 (4 months overdue)

⁹ partial (92.3%) payment, remainder will be paid in conjunction with the 2009 annual contribution

F&A Endnote 5

External funding and special contributions received since the 2007 PICES Annual Meeting

Since the 2007 PICES Annual Meeting (Victoria, Canada), the following additional support was received or committed for various activities initiated/sponsored by PICES:

Special projects

- The Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan, contributed CAD\$161,466 for the second year (from April 1, 2008–March 31, 2009) 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.
- Fisheries and Oceans Canada (DFO) approved an annual funding for the North Pacific Continuous Plankton Recorder (CPR) project. This will start in the current fiscal year and is intended to continue into the future (open-ended funding). In 2008, funding will be \$75,000, and then \$50,000 per year.
- The North Pacific Research Board (NPRB, U.S.A.) approved US\$50,000 per year for the next 5 years of the North Pacific CPR project.
- In 2005, NPRB approved a grant of \$90,000 for the development of the next PICES North Pacific Ecosystem Status Report, and transferred the seed amount of \$37,080 to PICES. The remainder of \$53,123 was received this year. In 2008, NPRB also committed an additional US\$15,700 to support the involvement of Dr. Michael Dagg (BIO Chairman) in this project as a report Co-Editor (this grant will be handled through LUMCON–Louisiana Universities Marine Consortium).
- The Korea Ocean Research and Development Institute (KORDI) provided \$40,508 (US\$40,000) for the development of the next North Pacific Ecosystem Status Report.
- The U.S. National Marine Fisheries Service (NMFS) contributed \$23,724 (US\$22,500) to the development of the new PICES integrative scientific program, FUTURE.

Symposia/sessions/workshops

- The U.S. National Oceanic and Atmospheric Administration (NOAA) and the U.S. National Aeronautics and Space Administration (NASA) provided financial support for the symposium on “*Effects of climate change on the world’s oceans*” (May 19–23, 2008, Gijón, Spain). Funds from NOAA (US\$50,000) were transferred to PICES, and the contribution by NASA (US\$20,000) was handled through the Jet Propulsion Laboratory. In 2007, DFO and KORDI provided \$20,000 and \$4,012 (US\$4,000), respectively, for this symposium.
- The Tokyo University of Agriculture allocated substantial funding to co-sponsor the 4th PICES workshop on “*The Okhotsk Sea and adjacent areas*” (August 27–29, 2008, Abashiri, Japan). Funds for the workshop were managed by Dr. Makoto Kashiwai.
- IMBER (Integrated Marine Biogeochemistry and Ecosystem Research), ESSAS (Ecosystem Study of Sub-Arctic Seas) and U.S. BEST (Bering Ecosystem Study) accepted PICES’ invitation to co-sponsor relevant sessions/workshops to be held at the 2008 PICES Annual Meeting and covered travel of additional invited speakers for the Topic Session on “*End-to-end food webs: Impacts of a changing ocean*” (IMBER) and the workshop on “*Status of marine ecosystems in the sub-arctic and arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008*” (ESSAS and BEST).

Capacity building

- NMFS and KORDI contributed \$15,816 (US\$15,000) and \$10,127 (US\$10,000), respectively, to the Trust Fund to support the PICES Intern Program.
- The Scientific Committee on Oceanic Research (SCOR) allocated US\$7,500 for the symposium on “*Effects of climate change on the world’s oceans*” (May 19–23, 2008, Gijón, Spain) and US\$5,000 to support travel of scientists from countries with “economies in transition” to SCOR-relevant sessions and workshops at the 2008 PICES Annual Meeting.
- Several Japanese programs (Japan–Korea Core University Program, Japan–China Students Exchange Program and Sustainability Governance Program of Hokkaido University) provided major funding for the

second PICES Summer School on “*Biomass-based management*”, (August 22–25, 2008, Hakodate, Japan). Funds for the school were managed by Dr. Yasunori Sakurai.

Publications

- SCOR contributed \$3,400 to the publication of the “*Guide to Best Practices for Ocean CO₂ Measurements*” (Eds. A.G. Dickson, C.L. Sabine and J.R. Christian, PICES Special Publication 3, 191 pp., December 2007).

Operations of the PICES Secretariat

- A 10% overhead (\$18,500) of the *Year 1* budget (\$184,980) 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.
- The Sir Alistair Hardy Foundation (SAHFOS, UK) contributed \$500 for the maintenance of the CPR webpage.

F&A Endnote 6

Progress report on implementation of the Action Plan for PICES Publications Program

Description of activities since October 2007

In the F&A Committee meeting at the 2007 PICES Annual Meeting, Janet Webster and Brian Voss presented the PICES Publication Program Review, along with a concise Action Plan based on the recommendations in the Review. The Review was well received by the Committee and the Action Plan was approved with a request that the Secretariat prioritize the items, as well as provide a cost estimate for each. In other sessions at that Annual Meeting, a Study Group on *Communication* (SG-COM) was initiated as well as the FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems) Program, both of which have implications for the PICES Publications Program as well as the Review and Action Plan.

In early 2008, Mr. Key-Seok Choe arrived from KORDI in Korea to begin his one-year assignment as an intern at the PICES Secretariat. A portion of his time over the year was to be dedicated to implementation of the Action Plan. The significant events in the year were:

- March: Key-Seok, Janet and Brian met at the Cyamus (West Coast of North America and Hawaiian Regional Group of IAMSLIC) meeting in Friday Harbor, WA to formally initiate the collaboration on the Action Plan, provide an update to the group and ask for group input on various issues.
- April: Key-Seok traveled to Seattle in conjunction with the Inter-sessional Science Board meeting and Workshop held there. At that meeting, Key-Seok tested a survey exploring use of scientific literature and PICES publications on the members present. This was expanded to an online survey distributed to all individuals on the PICES publications distribution list.
- July: Key-Seok again traveled to Seattle to work with Brian on the details of implementing the Action Plan. This culminated with a conference call with Janet to further discuss the way forward.

Between meetings, Janet, Brian and Key-Seok worked individually and in conjunction with the Secretariat and other parties identified in the Review to accomplish individual goals within the Action Plan.

Progress on Action Plan items

Ideally, each of the goals in the Action Plan was to be completed or near completion by the 2008 PICES Annual Meeting. Several factors have slowed progress toward that ideal, including the amount of time needed to familiarize the PICES intern with the project combined with time available between the PICES Secretariat, Janet and Brian to simultaneously collaborate to achieve goals in the Action Plan. To a degree, this was foreseen in the review and reflected in the first recommendation to establish a position within the Secretariat dedicated solely to Publications, if only for this time of transition. Much progress has been made however, and continues to proceed. Notably,

F&A-2008

- Janet has strengthened the relationship with PICES and ASFA (Aquatic Sciences and Fisheries Abstracts) to insure more timely and complete indexing of publications.
- Brian has enhanced OCLC WorldCat records to more comprehensively reflect PICES' online presence. OCLC (Online Computer Library Center) WorldCat (<http://www.worldcat.org/>) is a library catalog shared by over 41,000 international member libraries which supports the development of local catalogs as well as interlibrary loan among member libraries.
- Key-Seok has added a majority of the existing online publications to Aquatic Commons. Aquatic Commons is the OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting <http://www.openarchives.org/>) compliant digital repository managed by IAMSLIC (International Association of Aquatic and Marine Science Libraries and Information Centers).

New and recurring issues

Finances

One goal of the F&A Committee is to recover money through the transition to online-only distribution. Cost savings may not be realized, however, unless financial and administrative support can be transferred from the mailing and print-based burdens to the new costs incurred under online-only distribution mechanisms. Among the new costs assumed in online-only distribution are ongoing tasks to be overseen, if not completed, by the Secretariat. These include maintaining currency in the digital repository, commercial indexes and library catalog records as new publications are released.

Access

Access to PICES publications through a robust web site, a digital archive and stable library partners continues to emerge as a workable strategy. As suggested by a colleague at the Cyamus meeting, Brian contacted the Pacific Rim Digital Library Alliance (<http://prdla.ucmercedlibrary.info/>), "a consortium of academic libraries joined together to facilitate improved access to scholarly research materials throughout the Pacific Rim" to gain more insight on what is already being done in this arena specifically across the Pacific region. Among their other efforts, the Alliance recently initiated pilot programs to explore international interlibrary loan (ILL) issues. In those programs, they learned that the need for ILL across national borders was nominal and that existing ILL procedures, especially those within the OCLC system, readily met operational needs. In fact, the special arrangements within the pilot created overhead that reduced the efficacy of the standard systems (correspondence with R. Bruce Miller, Secretariat Chair, Pacific Rim Digital Library Alliance). Consequently, we do not recommend PICES engaging in any direct library activities, but rather to continue to partner with IAMSLIC. As is detailed further below, two surveys exploring issues of access and usage of scientific literature among PICES Publications recipients were recommended in the 2007 review. We hope to work closely with the Study Group on Communication to not only utilize the data that has been gathered, but also assist in gathering the remaining data.

Communication

"The Journey to PICES" indicates that many of the issues we are facing differ little from those that emerged during the formation of PICES and its first years of existence. With regard to communications, lack of technology access, language barriers, and limited funding to support consistent, sustained participation by scientists in PICES initiatives were noted in the book. Also, developments in the year since the Action Plan was adopted, including the PICES new integrative scientific program, FUTURE, and the Study Group on *Communication*, will surely affect the existing publication program. Both may require new types of publications directed at audiences beyond the North Pacific science community. For example, one of the goals may be to increase civil society's exposure to PICES and ocean issues in the North Pacific. This will require having experts available for conversations with the media and writers that can translate science into plain language.

Recommendations

The Action Plan is a first step and completes the foundation from which to make more significant changes in the Publications Program, while neither disrupting or upsetting current users nor overwhelming the current Secretariat staff with new users. We have several recommendations to PICES. Two could be implemented immediately resulting in some minor cost savings. The others represent a sustained commitment to transitioning the Publications Program to be more online, more accessible and more connected with other PICES efforts.

- **Discontinue printing of annual report and distribute electronically:** We found in our survey of current users of PICES publications that few use the annual report with any regularity and even fewer used it in print.
- **Update the distribution list:** Through our survey work, we will identify email addresses for all current recipients of PICES Publications. If these data are added to their distribution database records, distribution could switch to electronic more seamlessly. Further surveys of individual recipients could capture distribution preferences for individual publication series. Those preferences could then be saved in the distribution database as well.
- **Continue to work on the items described in the Action Plan:** While we have made progress, there is still work to do. This includes completing changes to the web site, completing agreements with publishers and authors, and integrating new processes into the existing workflow.
- **Commit to depositing PICES Publications into the Aquatic Commons:** Key-Seok Choe has deposited many PICES publications into the Aquatic Commons, a stable, digital repository sponsored by IAMSLIC. This mechanism provides a backup to the PICES web site, a permanent URL for publications in case the PICES web site changes servers, a searchable venue, and a means for some indexers to more readily integrate PICES publications into their products. All lead to more usage and visibility of PICES publications.
- **Work with the Communications Study Group and other groups in PICES:** Others have an interest in publications as a means of promoting PICES science to a broader audience. Cooperation among these groups will be valuable.

We have appreciated working with Key-Seok. He has provided valuable insight as well as hard work in implementing the Action Plan. As part of his work, he has learned how to deposit digital materials into the Aquatic Commons, making PICES one of the first international organizations to do so. He also has assisted in developing and conducting various surveys of PICES scientists as well as libraries and institutions receiving PICES publications. His presence made it possible to accomplish much of what we have to date. We anticipate continuing to work with the PICES Secretariat on this valuable project.

The following is a detailed description of progress on each item in the Action Plan.

A. Managing the Publication Workflow

1. *Establish a new position (if only temporary) to assist with carrying out recommended actions and to consolidate and manage the whole publications workflow.*
This is not feasible given the current budget and staffing of the Secretariat. The Secretariat will continue to balance the cost and utility of using outside contractors with hiring another staff person.
2. *Post the PICES Style Manual (Instructions to Authors and Editors) to the PICES website. Add similar information to print publications as appropriate.*
The PICES Style Manual of each publication will be posted on the PICES website by the end of 2008. These have been identified and simply need reformatting to pdf or html as appropriate and posting.

B. Increasing Recognition of PICES as a Publisher

1. *Include recommended citation formats and summaries of publications on additional series as appropriate.* The suggested citation format, the publication's website URL and series descriptions were first printed on each issue the scientific report series in 2004 and in the annual report series in 2007. The series descriptions were revised in 2008. This revision and additional information should continue to be included in these series and added to all PICES publications in a format that is fitting for the publication. The books should retain the "About PICES" section while including the above in an appropriate style.

The following are the recommended citation formats for each type of PICES publication:

Scientific Report

Brodeur, R. and Yamamura, O. (Eds.) 2005. Micronekton of the North Pacific. PICES Scientific Report. No. 30, 115 pp.

Haltuch, M. 2008. "Northern California Current (U.S.) groundfish production." pp.33-34 In: Forecasting Climate Impacts on Future Production of Commercially Exploited Fish and Shellfish. PICES Scientific Report. No.34.

Book

Hayes, D. 2001. Historical Atlas of the North Pacific Ocean: Maps of discovery and scientific exploration, 1500-2000. Seattle: Published under the auspices of North Pacific Marine Science Organization [by] Sasquatch Books.

Special Publication

Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to best practices for ocean CO2 measurements. PICES Special Publication 3, 191 pp.

PICES. 2004. Marine ecosystems of the North Pacific. PICES Special Publication 1, 280 pp.

Special Issue of Journal

Ladd, C., Stabeno, P. & Cokelet, E.D. 2005. "A note on cross-shelf exchange in the northern Gulf of Alaska." In: Linkages between coastal and open ocean ecosystems, S.M. McKinnell & G.A. McFarlane (eds). Deep-Sea Research II 52 (5-6): 667-679.

PICES Press:

Napp, J.M. 2008. "The Bering Sea: Current Status and Recent Events". PICES Press 16 (2): 30-31.

Annual Report

PICES. 2008. Annual Report. North Pacific Marine Science Organization (Sixteenth Meeting, Victoria, Canada). 419 pp.

PICES. 2008. "Report of Governing Council." Pp.15-64 In: Annual Report. North Pacific Marine Science Organization (Sixteenth Meeting, Victoria, Canada).

2. *Investigate possibilities of branding PICES at the article level in the journal special issues.* Beginning in 2005, PICES established issue level branding on the cover or inside cover page of PICES special issues, and in 2007 began establishing article level branding in the Acknowledgments Section at the end of each article in special issues. Though seemingly redundant, article level branding is necessitated by the frequency with which users directly access an article or only obtain a single article in an online environment and never see the cover or prologue. There are two main ways of improving the branding of PICES at the article level. One is a small logo at the top of the article and the other is moving the credit line from the Acknowledgement section into the Abstract. We continue to work with editors and publishers on these and other possibilities.

3. *Add information on the PICES publications introductory web page for ordering publications as well as more specific contact information for publications.*

One of the core missions of PICES is to facilitate and deliver information to its member countries. Over the long-term, the least labor intensive system for ordering publications would be a fully-automated purchase and payment system like a shopping mall. This takes a lot of initial effort and cost to establish. The second-best choice would be a web-ordering form. Like the first choice, this also has complications: it is hard to set an international pattern for ordering PICES Publications because of the variables in shipping and transactions among countries. Thus far, given these variables, PICES has handled requests individually, determining charges on a cost recovery as well as ability to pay basis. PICES has decided to designate one contact person to be in charge of publication orders, and will post that name on the website. The contact information still needs to be added to the Publications page.

C. Enhancing Access through Library and Indexer Cooperation

1. *Enhance existing OCLC catalog records with links to current digital versions of PICES publications.*
OCLC WorldCat library catalog records are all updated as of spring 2008. Periodic monitoring will be needed for new records. As mentioned above these records are the source from which thousands of libraries populate their local catalogs as well as provide interlibrary loan services. Though this catalog is recently free to search online via <http://www.worldcat.org/>, it is historically more of a librarian's tool. Therefore, presently the catalog is still heavily used by librarian's and less so by researchers.
2. *Establish agreements with select libraries for ongoing print archiving, following surveys under Part D.*
Archiving agreements will be discussed after the completion of the PICES survey at the end of 2008. We hope to provide the Study Group on *Communication* with useful data from these surveys and engage them in a discussion on all aspects of implementing not only these agreements but also changes to the distribution of publications to individuals receiving PICES publications.
3. *Establish agreements with commercial indexers that insure indexing of all PICES publications to the article level.*

Conversations were held with two Indexing Companies, ProQuest (ASFA) and NISC (Fish and Fisheries Worldwide). Both index PICES publications as received. ProQuest stopped receiving PICES publications, so indexing lapsed. NISC collects the indexing from library at the South African Institute for Aquatic Biodiversity (formerly the J.L. B. Smith Institute of Ichthyology. The name change in 2003 may have hampered delivery of publications and their consequent indexing.

Aquatic Sciences and Fisheries Abstracts through ProQuest:

ProQuest editor, Vicki Soto, oversees the production of Aquatic Sciences and Fisheries Abstracts. Much of the content is entered by international centers coordinated by the ASFA Secretariat located at FAO in Rome. ProQuest contracts with the Secretariat to enhance the database with additional content. ProQuest provides the user interface and web accessible platform. Typically, Ms. Soto gathers publication information from mainstream publishers leaving small publishers such as PICES to be picked up by the ASFA input center in their respective countries. As PICES is an international organization, the Canadian input center does not track and input PICES publications. Consequently, we need to develop a better and more consistent process to ensure indexing of PICES publications in ASFA.

Fish and Fisheries Worldwide through NISC:

Input to this database is gathered from multiple sources including the collection of the South African Institute for Aquatic Biodiversity. SAISB scientists decide which publications and content are worthy of inclusion, and consequently index this. In general, PICES publications are well covered including the PICES Press. Gaps in coverage are probably due to non-delivery of issues, selective indexing decisions, and changes in indexers.

Several mechanisms should be pursued:

- Add Ms. Soto to the distribution list so ProQuest has PICES publications available for indexing. There may still be a lag, but this would be a cost-effective, straight-forward approach. They would accept electronic copies.
- Continue to enter PICES publications into the Aquatic Commons. Ms. Soto believes this will be an efficient way for ProQuest to capture the metadata to add to ASFA. If this process continues, ProQuest may no longer need to receive print or electronic copies.
- Make sure the correct mailing address is in the Distribution List. SAIAB Library (Margaret Smith Library, SAIAB, Private Bag 1015, Grahamstown, 6140, SOUTH AFRICA).

4. *Add all publications to a searchable digital repository following pilot project in Part E.*

IAMSLIC's Aquatic Commons (AC) digital repository can be an "article level" index without creating single records for each article in an issue, by using a contents field that is visible to web search engines. AC is also a tool to index new publications more quickly than Aquatic Sciences and Fisheries Abstracts (ASFA). ASFA will look to both AC and the PICES website to stay aware of new publications. AC is also important as a free resource and an OAI-PMH harvestable resource that is currently being harvested by the Avano repository at Ifremer. In essence, Avano, regularly and automatically copies and archives metadata (and in some cases the data files/pdfs as well) from Aquatic Commons and any other OAI-PMH compliant repository that is registered with them with no human intervention. ASFA, in contrast, is a fee resource usually purchased by libraries at an institutional rate and is not OAI-PMH compliant. Worldcat is more of a book title and journal title level database that is mainly useful to identify libraries with print copies of publications. While it (and ASFA) may link to online versions they do not maintain or control access to those versions. Therefore access is dependent on websites staying consistent and/or readers having paid subscription access to those pdfs. The digital repository aspect of AC also means that the pdf version of the publication is always immediately linked and freely accessible via the metadata record. At present, sixty-eight items from PICES Press, Annual Reports, Scientific Reports, Special Publications and Technical Reports have been added into the Aquatic Commons.

D. Improving Distribution Efficiencies

1. *Review and enhance data on distribution lists.*

They will be updated after the institution/library survey responses are received.

2. *Create and conduct surveys of each of the three groups of PICES distribution recipients and Contracting Parties.*

The PICES Secretariat maintains three distinct lists for distributing new publications to each group. One list contains names and addresses of individual researchers in the PICES community. The second contains library names and addresses and the third contains institution names and addresses. These libraries and institutions may be universities, government agencies, non-governmental agencies. One survey of individuals was completed in the spring of 2008. A report of those results will be presented to the Study Group on *Communication*. The libraries and institutions survey is ready to implement and will also be discussed by the Study Group on *Communication* before doing so.

3. *Add RSS (Really Simple Syndication) functionality to website.*

This was determined to not be worth the effort due to the low rate of change on the publications web page. Still, there may be opportunities to improve the website, including an RSS feed on the PICES main page so those interested can easily stay informed of new developments at PICES with little sustained effort on the part of the Secretariat.

E. Increasing Visibility and Ensuring Perpetuity through a Digital Repository

1. *Establish a pilot project to develop a collection of PICES Publications in the IAMSLIC digital repository 'Aquatic Commons'*

Adding the Annual Reports, PICES Press and Scientific Reports to the Aquatic Commons has been accomplished as noted earlier.

2. *Retrospectively scan items to complete the collection of digital publications.*

Missing electronic copies of two Scientific Reports were located and uploaded to the PICES web page as well as deposited in the Aquatic Commons. PICES has posted earlier editions of some Annual Reports. Digitization of the older annual reports is under consideration.

3. *Negotiate with publishers for the right to deposit appropriate versions of journal articles into the repository and/or on the PICES website.*

Little progress has been made on direct negotiations. The two main publishers PICES special journal issues are Elsevier and Oxford. According to the SHERPA/RoMEO database (<http://www.sherpa.ac.uk/romeo.php>), both allow posting of post-prints or authors' proof copies to an institutional repository, though Oxford imposes a 12-month waiting period after which an author can archive a post-print. In either case, there are additional restrictions, that currently prevent PICES or special issue authors from posting articles "as is" from the publisher website. Consequently, it may be more expeditious to work with PICES authors to get their permission to post these articles or encourage them to do so.

4. *Develop a copyright agreement between PICES and all authors that grants PICES rights to archive and provide access to digital content.*

An agreement needs to cover all PICES publications. Of those individuals surveyed, 75% indicated a willingness to give PICES the right to post publications online. An example of such an agreement would include a non-exclusive right to archive and provide online access to the author's work. It would be predicated on the author having the right to do so, e.g. having retained this right at the time of publishing with a publisher other than PICES. We suggest that PICES encourage all authors, when submitting to a commercial publisher, include the SPARC Author's Addendum provided by the Science Commons (<http://scholars.sciencecommons.org/>). This is a straightforward way to retain certain rights in regards to the author's work. The authors could in turn grant these rights to PICES as the archive and point of open access.

5. *Review all PICES-related efforts related to metadata creation and online publication. Propose workflows that capitalize on OAI-PMH compliance with Aquatic Commons and federated metadata searching through TCODE's North Pacific Ecosystems Metadata site.*

Accomplishing this Action Item concerns direction and policy for PICES communications. So, it will require substantive discussion with the F&A Committee, the PICES Secretariat, TCODE, FUTURE, the Study Group on Communication and the Governing Council. The PICES website could be a primary portal to science information and data on the North Pacific. But given limitations of staffing, careful consideration must be given to priorities and possibilities. This will be discussed as part of the presentation to the Study Group on Communication in Dalian.

In the near term, links should be made from the PICES publications page to all PICES information and data. This reflects an understanding of how various efforts within PICES complement each other.

Some examples include:

- The North Pacific Ecosystem Metadatabase (<http://www.pmel.noaa.gov/np/mdb/>)
- The Aquatic Commons (<http://aquacomm.fcla.edu/>)
- Euphasid protocol (in Projects)

F&A Endnote 7

PICES Intern Program
(proposed changes are highlighted in grey)

Introduction

A PICES Intern Program will allow 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 PICES Secretariat would supervise up to one intern at any point in time. PICES would benefit from the Intern Program **directly** through the presence of an additional professional in the Secretariat and **indirectly**, over a period of years, by strengthening the capacity of member states to coordinate their involvement in PICES programs.

Objectives

The PICES Intern Program has two goals:

- 1) professional development of marine scientists and managers from PICES member countries;
- 2) increasing the capacity of the PICES Secretariat to support the work of PICES.

Nature of the internship

Under the supervision of the PICES Secretariat, interns will work on projects of the Secretariat relevant to their professional interests and development needs, including ESL (English as a Second Language) training if required. Interns may be given a wide variety of tasks as to assist in:

- preparing information for and providing secretarial support to PICES Working Groups and Scientific and Technical Committees;
- organizing scientific meetings;
- preparing and editing various PICES publications;
- coordinating international cooperative programs in marine science; and
- coordinating PICES activities with efforts of other relevant organizations.

Internships will normally begin on or about February 1 and extend for a period up to a maximum of 12 months.

Qualifications of candidates

Applicants must be staff of the academic or government sector of PICES member-countries, have a university degree (M.Sc. or Ph.D. will be an asset), the ability to read, write and speak English (taking into consideration whether or not English is the candidate's native language), the ability to use computers and the internet, and demonstrated personal initiative.

Guidelines for application and selection procedure

In the selection process, it is important to ensure balanced distribution of internships among member countries. There will be an annual competition for PICES interns. A member country that has had an intern in any year is eligible to have an intern in the following two years only if there are no applicants from other member countries.

- The PICES Intern Program will be advertised on the PICES website. National delegates are encouraged to take additional measures to advertise the PICES Intern Program within their countries.
- Applicants will apply to their national delegate for PICES, describing their interests and qualifications, providing a resume delineating their academic and work experience and three professional references.

Applicants will send a copy of their application to the PICES Secretariat.

- The national PICES delegate will review applications from his/her country and transmit his/her nominee(s) to the PICES Secretariat for final selection. Applications must be received by the Executive Secretary by the date of the first Governing Council meeting at the PICES Annual Meeting.
- The Chairman of PICES will select the successful candidate in consultation with the Executive Secretary and the Chairman of Science Board.
- The Executive Secretary will inform all Governing Council members of the result of the competition.

Financial support

PICES interns will be provided a stipend of CDN\$2,000 per month by the Secretariat. Travel costs for the intern to and from his/her home country and the location of the Secretariat will be normally borne by the individual's home country. Travel expenses associated with the intern's work in the Secretariat will be covered by PICES. Since the intern will continue to be an employee with his/her home institution while at the Secretariat, his/her medical insurance and all other benefits will remain the responsibility of the intern's home country.

F&A Endnote 8

Proposed FY 2009 budget

Source	Amount			
Annual contributions from six Contracting Parties	687,000 (2009 Annual Fee for each Contracting Party is \$114,500)			
Guaranteed adjustments	98,000			
Net income tax levies	65,000			
Overhead from MAFF project	16,000			
Tax (GST, PST) rebates	7,000			
Interest	10,000			
Total	785,000			
Additional income	Amount			
Registration fees from Annual Meeting	60,000			
Encumbered funds from DFO for postage	5,000			
Total	65,000			
External funding	Amount			
Encumbered funds kept for PICES projects				
North Pacific Ecosystem Status Report	212,642			
Development of FUTURE	38,017			
2008 Climate Change Symposium publication	35,179			
Not assigned (remainder from 2006 CCCC Symposium)	3,593			
Total	289,431			
Category	Base	Additional income	External funding	Total
Personnel services	512,000	—	—	512,000
Annual Meeting	40,000	20,000	—	60,000
Special meetings/travel	120,000	40,000	—	160,000
Publications	62,000	—	35,000	97,000
Communications	30,000	5,000	—	35,000
Office/Administrative expenses	21,000	—	—	21,000
Projects	—	—	140,000	140,000
Total	785,000	65,000	175,000	1,025,000

REPORT OF THE 2008 INTER-SESSIONAL SCIENCE BOARD MEETING

The sixth inter-sessional Science Board meeting, met from 8:45–17:00 h on April 25, 2008 at the Deca Hotel, Seattle, U.S.A., following a successful 2-day workshop to implement a new science program for PICES on “*Forecasting an Understanding Trends, Uncertainty and Responses on North Pacific Marine Ecosystems*” (FUTURE) prior to the inter-sessional meeting. Science Board Chairman, Dr. John E. Stein, called the meeting to order and welcomed participants, including new Technical Committee members, Dr. Hiroya Sugisaki (MONITOR) and Bernard A. Megrey (TCODE) (*SB-IM Endnote 1*). The meeting agenda is provided in *SB-IM Endnote 2*.

AGENDA ITEM 2

Action items from the FUTURE implementation workshop

Dr. Stein summarized the events of the FUTURE implementation workshop that took place April 23–24. Because FUTURE will have a time span of about 10 years, he advised participants who would not be seeing the Program through to completion to encourage younger colleagues who were interested in any aspects of FUTURE to become involved.

Action: Science Board members to communicate with the next generation of scientists who may be interested in being involved in FUTURE.

AGENDA ITEM 3

Mid-term updates

The following interim report highlights are found in the full Committee reports of this Annual Report.

Biological Oceanography Committee (BIO)

BIO Committee Chairman, Dr. Michael J. Dagg, presented his Committee’s interim report which includes the following highlights. The Section on *Carbon and Climate’s* (CC-S) revised terms of reference were accepted by BIO (and POC) and endorsed by Science Board. Dr. Dagg indicated that he would like to defer decision on the Advisory Panel on *Marine Birds and Mammals’s* (MBM-AP) request to modify its terms of reference until PICES XVII in order to give the BIO Committee time to discuss the modifications. MIE-AP is working to complete sample sorting from its first (MIE-1) cruise and to make up a verified species list for a PICES Scientific Report. It is not clear how closely Dr. Andrei V. Suntsov, now at Scripps Institution of Oceanography, California, will be able to work with Dr. Richard Brodeur, at the Hatfield Marine Science Center, Oregon, in order to complete the report by PICES XVII.

Action

Dr. Dagg to:

- Discuss MBM-AP’s recommendation for revised terms of reference with BIO and inform Science Board of the results by PICES XVII;
- Discuss status of MIE-AP’s PICES Scientific Report with MIE Co-Chairmen.

Fishery Science Committee (FIS)

FIS Committee Chairman, Dr. Gordon H. Kruse, discussed the following main points of his Committee’s interim report. Dr. Akihiko Yatsu (representing Japan), became a new member, replacing Dr. Yukimasa Ishida.

The FIS subsidiary group working on forecasting climate impacts on future fish production has drafted a report on their two NPRB-sponsored workshops on “*Forecasting climate impacts on future production of commercially exploited fish and shellfish*”. The group, now working in conjunction with CFAME and WG 20, has planned a workshop to be held on May 18, 2008 in conjunction with the International Symposium on the Effects of Climate Change on the World’s Oceans in Gijón, Spain.

An ICES/PICES/UNCOVER Symposium on “*Rebuilding depleted fish stocks – Biology, ecology, social science and management strategies*” will be held November 2–5, 2009 in Warnemünde/Rostock, Germany. Dr. Kruse was named as a PICES co-convenor. Since PICES works closely with ICES on many events, Dr. Kruse requested that PICES consider offering either travel support for a PICES member of the ICES SSC (an Asian scientist if Dr. Kruse is to be a Co-convenor) or a Pacific plenary speaker (Ray Hilborn, U.S.A.), and travel support for early career scientists.

Marine Environmental Quality Committee (MEQ)

Dr. Glen Jamieson, Chairman of the MEQ Committee, presented his Committee’s interim report. At the 2007 inter-sessional Science Board meeting in Yokohama, Japan’s Ministry of Agriculture, Forestry and Fisheries announced that it was making voluntary contributions to PICES which would allow MEQ to coordinate the SSP Project to be studied by HAB-S and WG 21. Dr. Jamieson related progress on both the HAB-S Seafood Safety Project (SSP) and the Alien Species Project (ASP). SSP Principal Investigators (PIs) are focusing first on Southeast Asia, and have been in frequent contact with IOC/WESTPAC regarding project strategy and plans since the IOC has involvement in countries of PI interest. Dr. Jamieson requested advice from Science Board on how SSP investigators should interact with the IOC. Also, because the funding from Japan was for 5 years, Dr. Jamieson pointed out that PICES WG 21 on *Non-indigenous Aquatic Species* will need to continue to be involved after its expected 3-year lifespan, to 2009, as funding from MAFF is for 5 years.

The Working Group on *Ecosystem-based management science and its application to the North Pacific* (WG 19) is planning to have a draft final report ready for their meeting in late spring, 2008, to allow for review and revision before presenting the final at PICES XVII in Dalian, China. When the Working Group terminates after PICES XVII, a Task Team is planned that will build upon the work of WG 19 and be integrated into the context of FUTURE. The proposed name for the proposed Task Team is *PICES Understanding, Linking and Synthesis of Ecosystems* (PULSE) whose emphasis will be on developing a more integrative, science-based ecosystem-scale understanding of the human dimension in FUTURE. The Task Team will be a good place to engage social scientists, and it was proposed to place it under the FUTURE program.

The Working Group on *Non-indigenous Aquatic Species* (WG 21) is presently focusing on work related to MAFF funding, and is currently finalizing the setup of a comprehensive non-indigenous species (NIS) database which will be available online in October 2008. A meeting on Rapid Assessment for Marine NIS will take place in October, and there will be discussion to determine whether to use a centralized or a distributed database for each PICES member country to contain and compare species information. In order to complete the MAFF work, the Working Group proposes to revise its terms of reference to include this work, and extend the group’s duration. Science Board expressed a willingness to extend the 3-year timeline for the Group provided they expand their terms of reference to be more explicit, show more milestones, and provide more deliverables.

Action

Secretariat to:

- Consult with the Japanese government to determine if the SSP should be a joint PICES/IOC project in Latin America and Southeast Asia;
- Determine whether or not PICES should continue to be involved in a SSP after the termination of MAFF funding for the SSP.
- Ms. Darlene Smith and Dr. Vasily Radashevsky, Co-Chairs of WG 21, to provide Science Board with more explicit terms of reference, showing its milestones and providing more deliverables.

Physical Oceanography and Climate Committee (POC)

POC Committee Chairman, Dr. Michael Foreman, presented his Committee's interim report to Science Board. The CREAMS/PICES-AP will hold a workshop on the Korean EAST-I Program in June or July in Seoul, Korea, but the Workshop on "*Flux studies in marginal seas*" has been postponed until spring 2009. A second PICES summer school on "*Ecosystem-based management*" will be held August 23–26, 2008 at Hokkaido University, Hakodate, Japan. A third PICES summer school on "*Satellite oceanography*" is planned for Busan, Korea in 2009.

The Working Group on "*Evaluations of climate change projections*" (WG 20) Co-Chairman, Dr. Michael Foreman, participated in a CFAME workshop in Honolulu, U.S.A. April 15–17, 2008. Preparations are being made by CFAME to publish papers in peer-reviewed journals, such as *Science*, and to provide a PICES Scientific Report. Dr. Foreman requested that PICES provide funding to offset the cost of finalizing figures for CFAME's submission. WG 20 is holding a joint workshop with CFAME and FIS at PICES XVII, and suggests that CFAME member, Dr. Vera Agostini (U.S.A.), be invited to present a talk at the Science Board Symposium.

Dr. Foreman announced that the POC Committee would like to propose publishing a set of papers on "Tides in Marginal Seas" as a special publication in *Progress in Oceanography* in memory of the Russian physical oceanographer, Professor Alexei Nekrasov, who recently passed away. Guest editors will be Drs. Boris Kagan, Alexander Rabinovich and Michael Foreman, and the deadline for submissions is November 2008. PICES Executive Secretary, Dr. Bychkov, stated that PICES will support the proposal provided that 60% of the papers apply to the PICES region.

Membership changes: Drs. Dake Chen and Zhanggui Wang, representing China, replaced Drs. Jinping Zhao and Mingyu Zhou.

Action:

- Secretariat to provide funding up to \$2K for CFAME figures to appear in a PICES Scientific Report and paper to be submitted to a primary publication.
- Science Board Chairman to contact Dr. Agostini to be an invited speaker at the Science Board Symposium.

Technical Committee on Monitoring (MONITOR)

MONITOR Technical Committee Chairman, Dr. Hiroya Sugisaki, presented a brief update of his Committee's activities. The Continuous Plankton Recorder Advisory Panel (CPR-AP) now has an East–West (Canada–Japan) transect. Data for 600 samples can be found on-line on the PICES website. Ongoing funding remains an issue for the CPR Pacific project. At PICES XVI, MONITOR asked Science Board to approve the establishment of a consortium that would share the costs among a group of donors. The Secretariat sent letters to five organizations in the U.S. and one in Canada, and responses received indicated general support for the idea of a consortium, but so far there is a firm commitment only from the North Pacific Research Board for \$50K in 2008.

Professor Young-Jae Ro attended the 2008 GOOS Scientific Steering Committee meeting (GSSC-XI) and scientific workshop in Paris, France on April 7–10 where he gave a talk on the activities of PICES and MONITOR.

Technical Committee on Data Exchange (TCODE)

TCODE Technical Committee Chairman, Dr. Bernard A. Megrey, presented highlights of his Committee's interim report to Science Board. Dr. Megrey contacted current and former chairmen of the ICES Working Group on *Data and information management* (WGDIM) to discuss areas of potential collaboration between TCODE and WGDIM. TCODE was invited to give a presentation of a WGDIM-sponsored session on

SB-IM-2008

“*Environmental and fisheries data management, access, and integration*” at the ICES ASC in Halifax, Canada in September 2008.

It is hoped that Dr. Toru Suzuki will agree to stand in for Dr. Ling Tong who is not able to represent PICES at the upcoming 7th NOWPAP DINRAC (Northwest Pacific Action Plan Data and Information Regional Activity Center) Focal Points meeting in Beijing, China, May 13–14, 2008.

PICES Technical Report No. 1 on *Metadata Federation of PICES Member Countries* has been updated to include instructions to install the clearinghouse software and metadata on a Windows server. Installation instructions for a Linux server were circulated with the original document.

Drs. Igor I. Shevchenko and Megrey are administering a server rented by the PICES Secretariat from AdHost (a Seattle internet provider) which will help consolidate all PICES metadata clearinghouse nodes onto one computer. Plans are being made for the Secretariat to transfer their digital library to this resource, which will provide faster access to large PDF and Power Point files of meeting presentations. The Russian TINRO node and the U.S. NPEM node have been successfully ported. TCODE is working with the National Marine Data and Information Service in Tianjin, China to establish their node and for Korea and Japan to transfer their nodes.

TCODE is working with MONITOR to implement the global (GOOS) and regional (IOOS) ocean observing systems.

Action: Secretariat to contact Dr. Toru Suzuki to represent PICES at the NOWPAP DINRAC Focal Points meeting in Beijing, China May 2008.

Climate Change and Carrying Capacity Program Implementation Panel (CCCC-IP)

Implementation Panel Co-Chairman, Dr. Harold P. Batchelder, highlighted items of the CCCC-IP’s interim report. Papers covering three themes from the Symposium on “*Climate variability and ecosystem impacts on the North Pacific*” held in Honolulu, U.S.A. in April 2006 will be published in a special issue of *Progress in Oceanography* within the next few weeks. A final CCCC report will be written by Co-Chairman, Prof. Michio J. Kishi for a PICES Scientific Report. Dr. Batchelder will assist by gathering all PICES-sponsored papers published since the CCCC’s inception.

The Climate Forecasting and Marine Ecosystems Task Team (CFAME) held an inter-sessional meeting on “*Linking and visualizing climate-forcing mechanisms and marine ecosystem changes: A comparative approach*” in Honolulu, April 15–17, 2008. Invited members from WG 20 and WG 19 also participated. After PICES XVII, CFAME plans to submit a summary paper of climate–ecosystem effects on three North Pacific ecosystems to a top science journal and a further three manuscripts, one for each ecosystem, to a different journal. A PICES Scientific Report will also be produced.

Action

- Dr. Batchelder to contact GLOBEC International for archived PICES-sponsored papers;
- Secretariat to contact National GLOBEC projects for lists of CCCC-related papers.

AGENDA ITEM 4

Action Plans of each Committee and Program

Dr. Stein reminded members that as the FUTURE Implementation Plan develops, Committees will need to discuss how their Action Plans will align with FUTURE.

Action: Committee Chairmen to discuss with their members how Committee Action Plans will align with FUTURE, before PICES XVII.

AGENDA ITEM 5

High priority activities

At the 2007 inter-sessional Science Board/Governing Council meeting in Yokohama, Japan, Science Board unanimously endorsed PICES Deputy Executive Secretary, Dr. Skip McKinnell, to take the lead in the preparation and publication of the next North Pacific Ecosystem Status Report (NPESR). However, Dr. McKinnell was unable to devote the majority of his time to this project without jeopardizing his duties and responsibilities within the Secretariat. In view of this, a plan to invite an outside expert who could dedicate time to preparing the report, in collaboration and consultation with Dr. McKinnell, was discussed. Experts for each PICES region will form the editorial board.

Action

- Drs. Stein/Pooley to send a proposal to NOAA for a scientist willing and able to dedicate time to preparing the second North Pacific Ecosystem Status Report;
- Dr. McKinnell to contact experts to form an editorial board for NPESR;
- MEQ Committee to search for a contaminants expert for the report.

AGENDA ITEM 6

Interactions with other organizations

Since 2003, PICES has experienced steady growth in the number of organizations or programs that have accepted invitations to be observers at PICES Annual Meetings. The highest attendance to date was at PICES XVII in 2007, with 25 organizations being represented. Of these, representatives of 19 addressed either Council, Science Board or Committees. The BIO, FIS, and POC Committees hosted the most observers, and their Chairmen recommended that in future, the invitees address only essential items and limit their presentations to 5 minutes.

Science Board agreed to co-sponsor a GLOBEC Open Science Meeting in Victoria, Canada on June 22–26, 2009. PICES will provide travel support for invited speakers and early career scientists, and will assist with local arrangements, as needed.

At the request of PICES, Science Board Vice-Chairman, Dr. Sinjae Yoo, and MONITOR Chairman, Dr. Hiroya Sugisaki, attended NOWPAP's First Coastal Environmental Assessment Workshop in Toyama, Japan on March 7, 2008. Dr. Yoo recommended that it would be mutually beneficial for PICES and NOWPAP to become more involved with each other's activities, especially in the development of FUTURE. Dr. Yoo advised sending an expert on eutrophication to a YSLME-NOWPAP workshop on eutrophication in Senyang, China in June 2008.

The Standing List of International Organizations and Programs, which indicates high priority organizations/programs to whose meetings PICES should regularly send a representative, was reviewed and updated (*IM-SB Endnote 3*).

Action

Secretariat to:

- Instruct potential observers to provide background information in a letter or poster presentation, and to focus only on specific meetings and funding requests at a meeting;
- Contact Dr. Paul Harrison (Hong Kong University of Science and Technology) to represent PICES at the eutrophication workshop in Senyang, China.

SB-IM-2008

AGENDA ITEM 7

2007 Wooster Award and POMA

Members discussed adjustments to be made to the selection criteria for the POMA (PICES Ocean Monitoring Service Award): one award will be given per year; unselected worthy nominations will be retained in a pool of potential candidates for subsequent year(s) and any unranked nominations will need to be resubmitted in order to be considered again; MONITOR and TCODE Technical Committees are to provide rankings independent of each other. Documents for the 2007 Wooster Award and POMA were reviewed and discussed *in camera* by Science Board.

Action: Secretariat to revise POMA selection criteria.

AGENDA ITEM 8

PICES policy on Affiliate status

Science Board reviewed a draft report of the Affiliate Members Policy and it was unanimously endorsed. Members concluded that items b. (scientists from affiliated institutes could be members of a Scientific Program, Scientific or Technical Committee) and c. (scientists from affiliate institutes could be full members of Sections, Task Teams, Study Groups, and Working Groups of PICES) of the ICES affiliate model were the most relevant to Science Board.

Action: PICES Chairman, F&A Chairman, and Secretariat to prepare a second draft of the Affiliated Status policy.

AGENDA ITEM 9

Status of inter-sessional workshops/symposia

Science Board recommended travel support for scientists to attend the 6th International Conference on “*Marine Bioinvasions*” to be held in summer 2009 in Portland, U.S.A.

AGENDA ITEM 10

Status of proposed publications (Agenda Item 10)

A set of selected papers from a co-sponsored ICES/PICES topic session on “*Comparative marine ecosystem structure and function: descriptors and characteristics*” convened by Drs. Bernard A. Megrey, Jason S. Link, Webjørn Melle and Ian Perry will be published in *Progress in Oceanography* in 2009. Guest editors will be Bernard A. Megrey, Jason S. Link, and Erland Moksness.

Science Board endorsed the proposed special issue of papers on “*Tides in marginal seas*” dedicated to the memory of Russian physical oceanographer, Professor Alexei Nekrasov to the journal *Progress in Oceanography*. Dr. Batchelder stated that there might be a final CFAME report to be published in the PICES Scientific Report series although it is preferred that it be incorporated into the final report of CCCC Program scheduled for submission in 2009. Science Board supported funding for the preparation of high quality figures for a CFAME paper to be submitted to a primary journal, as long as the figures could be used in a PICES Scientific Report. Dr. Kruse announced that papers from PICES XVII Topic Session S4 on “*Institutions and ecosystem-based approaches for sustainable fisheries under fluctuating marine resources*” may go to a primary journal/PICES Scientific Report.

Action: Secretariat to contact the editor of *Progress in Oceanography* to make arrangements for a special issue on “*Tides in marginal seas*”.

AGENDA ITEM 11

Status of preparations for PICES XVII

The status of proposed invited speakers for PICES XVII was reviewed and discussed. Dr. Stein proposed that Dr. Vera Agostini would be a valuable contribution to the Science Board Symposium as an invited speaker but that PICES should only need to pay half her expenses. Since not all invited speakers have been decided for this year's Annual Meeting, it was decided that, in future, Science Board will consider proposals for sessions only when convenors have been recruited; when there are more than 2 convenors for a session, the Committee Chairman will appoint one convenor to take responsibility for invitations. Invited speakers are to be selected by no later than the end of the year. Science Board recommended that there be no workshop for the FUTURE Writing Team at PICES XVII.

To expedite preparation of Science Board decisions in a report to Council at future Annual Meetings, Dr. Stein proposed that Committee/ Program Chairmen use a template that he had developed which consists of two parts: one for Science Board business and one with Science Board decisions to present to Council for endorsement.

Dr. Batchelder proposed that PICES change its nomenclature for PICES Annual Meetings from the Roman numeral system to a year-venue system, *i.e.*, PICES 2008, Dalian.

Action

- Science Board Chairman to circulate recommendations template by email to Science Board after making minor edits.

Committee Chairmen to:

- Have convenors recruited and session summaries prepared for PICES XVIII by the Annual Meeting in Dalian;
- Decide on invited speakers for PICES XVIII by December 2008;
- Appoint a lead convenor to organize invitations if there are more than 2 convenors for a session.

AGENDA ITEM 12

Selection of PICES XVIII topic sessions

Science Board reviewed the suggested theme for PICES XVIII and recommended three minor modifications. Dr. Stein asked the Committee/Program Chairmen to immediately begin discussions on potential topic sessions and convenors/speakers.

Action: Secretariat to make minor modifications to theme for PICES XVIII.

AGENDA ITEM 13

Capacity building actions

Dr. Yoo presented a draft proposal for a 4-day PICES summer school on “*Satellite Oceanography*” in Seoul, Korea in 2009. The major coordinator of the school will be a scientist from Seoul National University. Dr. Yoo requested that PICES fund travel costs for 5 non-Korean students and 1 foreign lecturer.

Dr. McKinnell suggested that a capacity building programming language course on “R” (a freeware scientific programming and graphics language similar to Matlab) be held at a future Annual Meeting, as it is becoming a useful tool in marine sciences. Science Board expressed interest but no firm plans were made on when to hold the course.

SB-IM-2008

AGENDA ITEM 14

Status of membership

Science Board reviewed the memberships all Committees/Program and their subsidiary bodies and noted that China had added members in several areas. The Board suggested that a participation list would be a useful tool in determining attendance at future PICES Annual Meetings.

AGENDA ITEM 15

Committee Chairmen and Vice-Chairmen

Dr. Kruse announced that he will not seek re-election as FIS Chairman at PICES XVII. Dr. Batchelder declared that CCCC will be holding its last meeting at PICES XVII.

AGENDA ITEM 16

Proposals for new PICES expert groups

The proposal to form a Task Team on *PICES understanding, linking and synthesis of ecosystems* (PULSE) under MEQ was endorsed by Science Board. It was recommended that the proposal be forwarded to the FUTURE Writing Team Co-Chairmen, Dr. James E. Overland and Hiroaki Saito for consideration as a component of FUTURE.

An ICES/PICES co-sponsored meeting on “*Environmental interactions of marine aquaculture*” was held in Victoria, Canada on April 14–18 to assess whether or not there was sufficient interest to establish a working group. All PICES countries except China were represented. Since the ICES/PICES and inter-sessional Science Board meetings were held so closely together, Dr. Michael Rust had only a short time to prepare a draft Action Plan for a Working Group on *Environmental interactions of marine aquaculture* before submitting it to Science Board just prior to its meeting, leaving little time for review. After the FIS and MEQ Committee Chairmen distribute the Plan to their members for discussion, recommendations will be anticipated for discussion at PICES XVII.

Action

- Secretariat to send a proposal for a Task Team on *PICES understanding, linking and synthesis of ecosystems* (PULSE) to FUTURE Writing Team Co-chairmen for consideration as a component of FUTURE.
- Drs. Jamieson and Kruse to discuss the draft Action Plan for a Working Group on *Environmental interactions of marine aquaculture* with their Committees and have recommendations ready by PICES XVII.

AGENDA ITEM 17

Other business (Agenda Item 17)

Travel support requests for the ICES Symposium on “*Rebuilding depleted fish stocks – Biology, ecology, social science and management strategies*” and the selection of an appropriate representative to send to the YSLME-NOWPAP workshop on eutrophication in Senyang, China were finalized (see Agenda Items 2 and 6).

SB-IM Endnote 1**Science Board participation list**Science Board

Harold P. Batchelder (Co-Chairman, CCCC-IP)
 Michael J. Dagg (Chairman, BIO)
 Michael G. Foreman (Chairman, POC)
 Glen Jamieson (Chairman, MEQ)
 Michio J. Kishi (Co-Chairman, CCCC-IP)
 Gordon H. Kruse (Chairman, FIS)
 Bernard A. Megrey (Chairman, TCODE)
 John E. Stein (Chairman, Science Board)
 Hiroya Sugisaki (Chairman, MONITOR)
 Sinjae Yoo (Vice-Chairman, Science Board)

Governing Council

Vera Alexander (Past Chairman, PICES)
 Samuel Pooley (Delegate, U.S.A.)
 Igor I. Shevchenko (Advisor, Russia)
 Ming Yuan Zhu (Alternate Delegate, People's
 Republic of China)
 Tokio Wada (Chairman, PICES)

PICES Secretariat

Alexander Bychkov (Executive Secretary)
 Christina Chiu (Deputy Executive Secretary on
 Administration)
 Skip McKinnell (Deputy Executive Secretary)

SB-IM Endnote 2**Inter-sessional Science Board meeting agenda*****Friday, April 25, 2008***

1. Welcome and introduction of new members
2. Action items from the FUTURE implementation workshop
3. Mid-term update on activities of Committees and CCCC Program and their Subsidiary Bodies
 - 3.1 BIO (Dagg)
 - 3.2 FIS (Kruse)
 - 3.3 MEQ (Jamieson)
 - 3.4 POC (Foreman)
 - 3.5 MONITOR (Sugisaki)
 - 3.6 TCODE (Megrey)
 - 3.7 CCCC (Batchelder/Kishi)
4. Action Plans of each Committee and Program
5. High priority activities
6. Interactions with other organizations
7. 2007 Wooster and POMA Awards
8. PICES policy on Affiliate status
9. Status of proposed inter-sessional workshops/symposia
10. Status of proposed publications
11. Status of preparations for PICES XVII (Dalian, China)
12. Selection of PICES XVIII topic sessions (Busan, Korea)
13. Capacity building actions
14. Status of proposed changes in membership for committees/program and their subsidiary bodies
15. Committee Chairmen and Vice-Chairmen
16. Proposals for new PICES expert groups
17. Other items

IM-SB Endnote 3

Standing List of International Organizations and Programs

The Standing List of International Organizations and Programs, which facilitates PICES interactions with other programs, and indicates high priority organizations/programs to whose meetings PICES should regularly send a representative, was updated by Science Board at the inter-sessional Science Board meeting in Seattle, U.S.A. in April 2008. Updates to the list for 2008 were the addition of YSLME, changes from BEST to BEST/BSIERP and from NANOOS-IOOS to NANOOS, and deletion of SCOPE:

YSLME	Yellow Sea Large Marine Ecosystem project
BEST/BSIERP	Bering Ecosystem Study/Bering Sea Integrated Ecosystem Research Program
NANOOS	Northwest Association of Networked Ocean Observing Systems

The following list is used, in part, to assist the Executive Secretary and Science Board in making decisions regarding travel to meetings of other international organizations. Council approved the revised Standing List of International Organizations and Programs, and agreed with the identified priorities for interaction in 2008–2009 (below) as recommended by Science Board. (The programs and studies marked with an asterisk denote those having the highest priority for PICES with respect to scientific cooperation and facilitation in the coming year.)

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/BSIERP*	Bering Ecosystem Study/Bering Sea Integrated Ecosystem Research Program
CLIVAR*	Climate Variability and Predictability Program
CoML*	Census of Marine Life
CREAMS*	Circulation Research in the East Asian Marginal Seas
DBCP	Data Buoy Cooperation Panel
ECOR	Engineering Committee on Oceanic Resources
ESSAS*	Ecosystem Studies of Sub-Arctic Seas
FAO	Food and Agriculture Organization
GCOS*	Global Climate Observing System
GEM*	Gulf of Alaska Ecosystem Monitoring and Research Program of <i>Exxon Valdez</i> Oil Spill Trustee Council (EVOS)
GEOSS	Global Earth Observing System of Systems
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GIPME	Global Investigation of Pollution in the Marine Environment
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
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 Ocean Observing System
PAG	Pacific Arctic Group
PORSEC	Pacific Ocean Remote Sensing Conference
PSA	Pacific Science Association
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
SAHFOS*	Sir Alister Hardy Foundation for Ocean Science
SCOR*	Scientific Committee on Oceanic Research
SOLAS*	Surface Ocean Low Atmosphere Study
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program
START	South Asian Regional Committee for the System for Analysis, Research and Training
UNEP	United Nations Environment Program
WCRP	World Climate Research Program
WESTPAC*	Cooperative Study of the Western Pacific, IOC Sub Committee for the Western Pacific
WMO	World Meteorological Organization
YSLME	Yellow Sea Large Marine Ecosystem project

REPORT OF SCIENCE BOARD

The Science Board met on October 26, 2008 (12:30–14:00) to review the agenda and to discuss procedures for the Science Board Symposium and Topic Session awards, the Closing Session, other items relating to the PICES scientific sessions at the Annual Meeting, and the FISP Open Forum. A meeting between members of the Future Integrative Science Plan Writing Team (FISP-WT) and Science Board members took place on October 28 from 18:00–20:00 to review and discuss the second draft of the Implementation Plan of FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems) prior to Committee meetings and Open Forum. The Open Forum on the Implementation Plan of FUTURE took place on October 30 from 17:00–18:30 and was convened by Dr. John E. Stein. Co-Chairmen of the Writing Team of the Implementation Plan (IP-WT) of FUTURE, Drs. James Overland and Hiroaki Saito, presented the status of the second draft of the Plan, and Committee Chairmen gave their perspectives, followed by comments and suggestions by the broader scientific community. The Science Board met again on November 1 (9:00–17:00) to discuss the remainder of the agenda. (See *SB Endnote 1* for list of participants.)

October 26, 2008

Science Board Chairman, Dr. John E. Stein, welcomed Science Board members and guests and called the meeting to order. The agenda was discussed and adopted as presented in *SB Endnote 2*.

AGENDA ITEM 2

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

Procedures were reviewed and it was agreed that the format of the previous year would be used in judging presentations for the Science Board Symposium, Topic Sessions, and posters. Each Committee Chairman was responsible for selecting the award recipients. The time and place of the Open Forum was confirmed by the Science Board Chairman.

AGENDA ITEM 3

Relations with specific international programs/organizations (Agenda Item 3)

Invited guest, Dr. Adolf Kellermann (Head, ICES Science Programme) gave an update of the ICES Strategic Plan which included the need to establish effective mechanisms of collaboration within ICES and with other organizations to deliver and add value to ICES science and advisory programs. Dr. Kellermann described six ICES events where PICES collaboration was being sought.

Dr. Patricio Bernal, Director, Intergovernmental Oceanographic Commission (IOC), UNESCO, addressed Science Board to discuss IOC joining the efforts of PICES and ICES in addressing the effects of climate change on the oceans. He noted the importance of looking at the impact of climate change on ecosystems of the North Pacific and the need to package this information into an integrated report for policy makers. Science Board endorsed IOC collaborating with PICES in joint efforts to understand the vulnerability of fisheries to climate variability and change as a potential contribution to the fifth IPCC Assessment Report; in cooperating in forming an information network on ocean acidification and a common database on natural iron in the ocean; and in having PICES become involved in the Programme Committee for the OceanObs'09 conference.

Science Board endorsed MONITOR Chairman, Dr. Hiroya Sugisaki, to co-convene an ICES/GOOS Scientific Session on “*Global ocean observing systems*” at the ICES Annual Science Conference, September 21–25, 2009, Berlin, Germany. (This session was later postponed until 2010.)

SB-2008

Science Board agreed that there were common interests and potential linkages between PICES and PAG (Pacific Arctic Group), an independent discussion/information sharing forum for countries bordering the Pacific Arctic region. It was recommended that PICES explore collaboration with this group, and keep it in the Standing List of International and Regional Organizations and Programs (*SB Endnote 3*).

Science Board agreed with the criterion to remove an organization or program from the Standing List if no reply has been received by the Secretariat after the third year of trying to establish contact.

AGENDA ITEM 4

Report of the FUTURE Implementation Writing Team

IP-WT Co-Chairmen, Drs. Hiroaki Saito and James Overland, were invited to update Science Board and to discuss the second draft of the Implementation Plan. Dr. Overland indicated that Governing Council was interested in expanding the vision of PICES to have more outreach in disseminating information to resource managers. He described three layers of products—Status, Outlooks, and Forecasts—that were the objectives of FUTURE and gave expected timelines for the completion of tasks under these objectives.

AGENDA ITEM 5

Implementation of Science Board recommendations and Governing Council decisions from PICES XVI and the 2008 inter-sessional SB meeting

Science Board accepted the report on decisions and recommendations that were of relevance from PICES XVI (see *GC Endnote 3*) and the 2008 inter-sessional Science Board meeting.

AGENDA ITEM 6

Status of action items from the 2008 inter-sessional Science Board meeting

BIO Committee Chairman, Dr. Michael Dagg, reported that the modified terms of reference proposed by the Advisory Panel on *Marine Birds and Mammals* (MBM-AP) was reviewed and accepted by the Committee. The request that MBM-AP member, Dr. Hidehiro Kato, permanently serve as a liaison between PICES and the International Whaling Commission (IWC) at their annual scientific meetings was approved by BIO. There were no items to report in regard to the status of the final report by the Advisory Panel on *Micronekton Sampling Inter-calibration Experiment* (MIE-AP) for the PICES Scientific Report series.

MEQ Committee Chairman, Dr. Glen Jamieson, informed Science Board that the Working Group on *Non-indigenous Aquatic Species* (WG 21) had revised its terms of reference so that it could extend its duration to address the work required to complete the MAFF (Ministry of Agriculture, Forestry and Fisheries, Japan), project that was funded for 5 years (from April 1, 2007 to March 31, 2012).

November 1, 2008

AGENDA ITEM 7

Report of elections of new Committee Chairmen

The following are changes and continuations in Chairmanship/Vice-Chairmanship for Scientific and Technical Committees and expert groups:

- Dr. Mikhail Stepanenko (Russia) to replace Dr. Gordon H. Kruse as FIS Committee Chairman;
- Dr. Gordon Kruse to become Vice-Chairman of FIS;
- Dr. Phillip R. Mundy (U.S.A.) to replace Dr. Charles B. Miller as CPR-AP Chairman.

AGENDA ITEM 8

Reports from Scientific and Technical Committee and IP CCCC Program Chairmen

Reports were presented by Committee and IP CCCC Program Chairmen to Science Board. Included in the reports were proposals for inter-sessional activities, including travel and publications for 2009. Specific details of the individual reports can be found elsewhere in this Annual Report.

Inter-sessional activities

- A 3rd Argo Science Workshop: The future of Argo, (co-sponsored by PICES and several Chinese agencies and organizations) March 25–27, 2009, Hangzhou, China;
- The 11th Salmon Ocean Ecology Workshop, April 7–8, 2009, Juneau, U.S.A.;
- North Pacific Ecosystem Status Report Workshop on “*Status and trends in East Asian marginal seas*”, April 21–22, 2009, Busan, Korea, in conjunction with the 15th Pacific–Asian Marginal Seas (PAMS) meeting on “*Observations, understanding and prediction of climate variability in PAMS*”, April 23–25;
- A workshop to develop an Implementation Plan for the new PICES science integrative program, FUTURE, April 26–27, 2009, and an inter-sessional Science Board meeting, April 28, 2009, Qingdao, China;
- A meeting of PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*, June 21, 2009, Victoria, Canada;
- GLOBEC/PICES workshop on “*Krill biology and ecology in the world’s oceans*” June 22–23, 2009, Victoria, Canada;
- A 3rd PICES summer school on “*Satellite oceanography*” (co-sponsored by SCOR and several Korean agencies and organizations), August, 25–28, 2009, Seoul, Korea;
- A 6th International Conference on “*Marine bioinvasions*” (co-sponsored by ICES, PICES, U.S. National Sea Grant College Program, Pacific States Marine Fisheries Commission, and Portland State University), August 24–27, 2009, Portland, U.S.A.;
- CIAC ’09 Symposium on “*The effects of environmental variability on cephalopod populations*” (co-sponsored by ICES, PICES), September 3–11, 2009, Vigo, Spain;
- OceanObs ’09 conference on “*Ocean information for society: Sustaining benefits, realizing the potential*” (with PICES as endorsing organization), September 21–25, 2009, Venice, Italy;
- ICES/PICES Theme Sessions on “*Climate impacts on marine fishes: Discovering centennial patterns and disentangling current processes*” and “*Global ocean observing systems*” at the ICES Annual Science Conference, September 21–25, 2009, Berlin, Germany (the latter session was postponed until 2010);
- PICES Rapid Assessment Survey (RAS-2009) for non-indigenous aquatic species, October 19–22, 2009, various ports in Korea;
- International Symposium on “*Rebuilding depleted fish stocks: Biology, ecology, social science and management strategies*” [carried over from last year’s Annual Science Board Report] (primary sponsors: ICES, PICES and UNCOVER; co-sponsoring organizations: NAFO, DFO and IMR), November 3–6, 2009, Warnemünde, Germany;
- A PICES/ICES Symposium on “*Forecasting climate change impacts on fish and shellfish*”, April 26–29, 2010, Sendai, Japan;
- The 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*” (co-sponsored by Alaska Sea Grant College Program, ICES, PICES, FAO), spring or fall, 2010, Anchorage, U.S.A.;
- An ICES/PICES Symposium on “*Carrying capacity what does it mean in a changing ocean?*” 2010, Portugal;
- A 5th International Zooplankton Production Symposium (co-sponsored primarily by ICES and PICES), March 2011, Pucon, Chile.

SB-2008

Travel requests

PICES-2009

- Invited speakers for the Science Board Symposium and Topic Sessions;
- 2 invited speakers for BIO workshop on “*Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses*”;
- 2 invited speakers for BIO workshop on “*Marine ecosystem model inter-comparisons (II)*”.
- 1 invited speaker for the BIO workshop on “*Standardizing methods for estimating jellyfish concentration and development of an international monitoring network*”;
- 1 invited speaker for the BIO workshop on “*Integrating marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in the North Pacific*”;
- 1 invited speaker for the FIS Workshop on “*Understanding the links between fishing technology, bycatch, marine ecosystems and ecosystem-based management*”;
- 1 invited speaker for MEQ (HAB-S) workshop on “*Review of selected harmful algae in the PICES region: V. Cyst forming HAB species*”;
- 1 invited speaker for the MEQ/FIS Workshop on “*Advanced aquaculture strategies and technologies and interactions between aquaculture activity and environment*” [later renamed as “*Interactions between aquaculture and marine eco-systems*”];
- 2 invited speakers for the POC workshop on “*Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales*”;
- 1 invited speaker for the POC/BIO workshop on “*Carbon data synthesis*”;
- 1 invited speaker for POC/BIO workshop on “*Mesoscale eddies and their roles in North Pacific ecosystems*”;

Inter-sessional meetings

- Dr. Sonia Batten, Principle Investigator of the PICES North Pacific Continuous Plankton Recorder (CPR) project, to introduce CPR activities to the Asian scientific community and to develop joint projects, spring 2009, in Yokohama, Japan;
- 1 MONITOR representative to attend the 9th session of the IOC/WMO/UNEP Intergovernmental Committee for GOOS (I-GOOS-IX), June 10–12 2009, Paris, France;
- A WG 20 member to attend the 2009 ESSAS Annual Meeting, June 15–21, 2009, Seattle, U.S.A.;
- 2 PICES scientists to attend a GLOBEC/PICES workshop on “*Krill biology and ecology in the World’s oceans*” June 22–23, 2009, Victoria, Canada (in conjunction with the 3rd GLOBEC Open Science Meeting);
- Invited speakers (up to \$10,000) from the Pacific and early career scientists from PICES member countries to attend the 6th International Conference on “*Marine bioinvasions*”, August 24–27, 2009, Portland, U.S.A.;
- 1 guest lecturer and 5 non-Korean students for the 3rd PICES summer school on “*Satellite oceanography*”, August 25–28, 2009, Seoul, Korea;
- 1 PICES convenor for the CIAC ’09 Symposium on “*The effects of environmental variability on cephalopod populations*” September 3–11, 2009, Vigo, Spain;
- 1 PICES convenor for ICES/PICES Theme Session on “*Climate impacts on marine fishes: Discovering centennial patterns and disentangling current processes*” at the ICES Annual Science Conference, September 21–25, 2009, Berlin, Germany;
- 1 PICES member to be on the Program Committee for the IOC OceansObs ’09 conference on “*Ocean information for society: Sustaining benefits, realizing the potential*”, September 21–25, 2009, Venice, Italy;
- 1 PICES member to attend the ICES Annual Science Conference, September 21–25, 2009, Berlin, Germany;
- 2 non-American PICES members to co-convene the 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*”, spring or fall, 2010, Anchorage, U.S.A.;
- 1 Pacific invited speaker for the ICES/PICES Symposium on “*Carrying Capacity what does it mean in a changing ocean?*” 2010, Portugal.

Publications

Special issues of primary journals (2009–2010)

- *Journal of Marine Systems* (2009; Guest Editors: K.-I. Chang, C. Mooers, J.-H. Yoon and S.-I. Ito) – special issue of selected papers from the 2006 CREAMS/PICES Workshop on “*Model–data inter-comparison for the Japan/East Sea*”;
- *ICES Journal of Marine Science* (2009; Guest Editors: F. Mueter and E. North) – Special section in a regular issue of selected papers from the ICES/PICES Early Career Scientists Conference on “*New frontiers in marine science*” (approved in 2007);
- *Journal of Northwest Atlantic Fishery Science* (2009; Guest Editors: R. Brodeur, M. Dickey-Collas and E. Trippel) – special issue of selected papers from the NAFO/PICES/ICES Symposium on “*Reproductive and recruitment processes of exploited marine fish stocks*” (the electronic version was published in 2008; a hard copy run is expected in April 2009);
- *Journal of Oceanography* (2009; Guest Editor: T. Saino) – selected papers from the PICES XV Topic Session on “*Decadal changes in carbon biogeochemistry in the North Pacific*” (approved in 2007);
- *Fisheries Research* (2009; Guest Editors: G.H. Kruse, Y. Ishida, T. Perry, V. Radchenko and C.-I. Zhang) – Special issue of selected papers from the PICES XVI Topic Session on “*Ecosystem approach to fisheries: Improvements on traditional management for declining and depleted stocks*”;
- *Deep-Sea Research II* (2009; Guest Editors: W. Peterson and S. Kawaguchi) – Special issue of selected papers on krill from the 4th International Zooplankton Production Symposium on “*Human and climate forcing of zooplankton populations*” (approved in 2007);
- *Deep-Sea Research II* (2009; Guest Editors: A. Tsuda, M. Wells, M. Uematsu and H. Saito) – Special issue of selected papers from the SEEDS-II experiment;
- *Deep-Sea Research II* (2009 or early 2010; Guest Editors: A. Yamaguchi and C. Miller) – Special issue of selected papers from the PICES XVII workshop on “*Oceanic ecodynamics comparison in the subarctic Pacific*”;
- *Progress in Oceanography* (2009; Guest Editors: B.A. Megrey, J.S. Link and E. Moksness) – Special issue of selected papers from the ICES/PICES Theme Session on “*Comparative marine ecosystem structure and Function: Descriptors and characteristics*” at the 2007 ICES Annual Science Conference;
- *Progress in Oceanography* (2010; Guest Editors: P. Pepin, D. Mackas and H. Verheye) – selected papers from SCOR Working Group on *Zooplankton Time Series*;
- *Continental Shelf Research* (2010; Guest Editors: A. Rabinovich, B. Kagan, M. Foreman and J. Cherniawsky) – Special issue of selected papers for “*Tides in Marginal Seas - A Volume in Memory of Prof. Alexei Nekrasov*” (approved in 2008);
- *Marine Ecology Progress Series* (2010; Guest Editor: W. Sydeman) – Special issue of selected papers from PICES XVI Topic Session on “*Phenology and climate change in the North Pacific*” (special or regular issue TBD);
- *ICES Journal of Marine Science* (2011; Guest Editors: A. Hollowed, S. Kim, M. Barange and H. Loeng) – selected papers from the 2010 PICES/ICES Symposium on “*Forecasting Climate Change Impacts on Fish and Shellfish*” (approved in 2008).

PICES Scientific Report series (2009–2010)

- Proceedings of the 4th PICES Workshop on “*The Okhotsk Sea and adjacent areas*” (Editors: M. Kashiwai and G. Kantakov);
- Final report of WG 19 on *Ecosystem-based Management Science and its Application to the North Pacific* (Editors: G. Jamieson, P. Livingston and C.-I. Zhang);
- Final report for the Climate Change and Carrying Capacity Program (Editor: M. Kishi);
- A summary of the activities of the CFAME Task Team (may be merged with CCCC report);
- Final report of the Advisory Panel on Micronekton Sampling Inter-calibration Experiment (Editors: E. Pakhomov and O. Yamamura).

PICES Special Publications (2010)

- North Pacific Ecosystem Status Report.

SB-2008

Other publications (2009–2010)

- WG 19 Brochure on “*Ecosystem-based management science and its application to the North Pacific*” (2009; G. Jamieson, P. Livingston and C.-I. Zhang);
- Brochure on “*The status and trends of the North Pacific Ocean*” – summary of the second North Pacific Ecosystem Status Report for policy makers, managers, commercial stakeholders and other interested members of society
- Results from the CCCC Program distributed among several chapters of the GLOBEC Synthesis Book (2009/2010; H. Batchelder and S. Kim).

Other

- PICES Secretariat time and resources for printing and shipping a Book of Abstracts for the 3rd Argo Science Workshop, March 25–27, 2009, Hangzhou, China;
- Contract extension to rent AdHost server for hosting TCODE data and PICES NPESR chapters (US \$2340 for 1 year).

AGENDA ITEM 9

Recommendations for new and existing working groups and other subsidiary bodies

Science Board recommended:

- that the BIO Committee assume responsibilities for the existing Marine Ecosystem Model Inter-comparison Project from the CCCC Program which is ending;
- that MONITOR revise its third term of reference in order to comply with procedures accepted for the production of the next North Pacific Ecosystem Status Report;
- establishing a new PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS) under the parent FIS and POC Committees, subject to revising its terms of references (*POC Endnote 3*).
- establishing a new Working Group on *Environmental Interactions of Marine Aquaculture* (WG-EIMA (WG 24)) under the direction of FIS and MEQ (*GC Appendix B*).
- extending the lifetime of the Working Group on *Non-indigenous Aquatic Species* to October 2012 in order to complete the MAFF project that was funded for 5 years;
- extending the lifetime of the Working Group on *Evaluations of Climate Change Projections* (WG 20) for one more year to October 2010 so it can provide WG-FCCIFS with the climate projection information they request;
- having the Section on *Carbon and Climate* to expand their membership by adding two new members from Japan who will provide missing expertise in data integration. Suggested appointments are Dr. Masao Ishii and Dr. Akihiko Murata;
- forwarding the MEQ Committee proposal to form a PICES Understanding, Linking and Synthesis of Ecosystems Task Team (PULSE) to the IP-WT of FUTURE for evaluation on where best to place it.
- deferring the proposal by MEQ to form a Study Group on *Indicators of Human Well-being* until the next Science Board inter-sessional meeting when plans for the Study Group will be more fully developed;
- deferring the proposal for a FIS Working Group on *Management Strategies to Address the Implications of Climate Variability and Climate Change on Trends in Fish and Shellfish Production* until next Annual Meeting so that POC/WG 20 could be involved.

AGENDA ITEM 10

PICES XVIII theme and description, draft schedule of scientific sessions and workshops

Science Board agreed that the theme for PICES-2009, to be held in Jeju, Korea, from October 23 to November 1, 2009, should be “*Understanding ecosystem dynamics and pursuing ecosystem approaches to management*” (*SB Endnote 4*). The following sessions and workshops, in order of Committee/Program, were recommended to be convened.

¾-day Science Board Symposium

Understanding ecosystem dynamics and pursuing ecosystem approaches to management

1-day BIO Contributed Paper Session

¾-day BIO Workshop

Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses

½-day BIO Workshop

Integrating marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in the North Pacific [after ICES agreed to co-sponsor the workshop, it was renamed to *Integrating marine mammal populations and rates of prey consumption in models and forecasts of climate change-ecosystem change in the North Pacific and North Atlantic Oceans*]

½-day BIO Workshop

Standardizing methods for estimating jellyfish concentration and development of an international monitoring network

2-day BIO Workshop

Marine ecosystem model inter-comparisons (II)

1-day FIS Topic Session

Ecosystem-based approaches for the assessment of fisheries under data-limited situations

½-day FIS/BIO Topic Session

Early life stages of marine resources as indicators of climate variability and ecosystem resilience

1-day FIS Contributed Paper Session

1-day FIS Workshop

Understanding fisheries bycatch, fishing technology, marine ecosystems and new technology for ecosystem based management [renamed to *Understanding the links between fishing technology, bycatch, marine ecosystems and ecosystem-based management*]

½-day MEQ Topic Session

Mitigation of harmful algal blooms

½-day MEQ Topic Session

The role of submerged aquatic vegetation in the context of climate change

1-day MEQ/FIS Topic Session

Marine spatial planning in support of integrated management – tools, methods and approaches

½-day MEQ Workshop

Review of selected harmful algae in the PICES region: V. Cyst forming HAB species and a 1-day laboratory demonstration

1-day MEQ/FIS Workshop

Advanced aquaculture strategies and technologies and interactions between aquaculture activity and environment [renamed as *Interactions between aquaculture and marine eco-systems*] and ½-day field trip

1-day MONITOR Topic Session

State of the art of real-time monitoring and its implication for the FUTURE oceanographic study

SB-2008

1½-day POC/ FUTURE Topic Session

Future marine ecosystem predictions from an earth system science perspective [renamed as Outlooks and forecasts of marine ecosystems from an earth system science perspective: Challenges and opportunities]

1-day POC/BIO Topic Session

Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific

1-day POC Contributed Paper Session

1-day POC Workshop

Exploring the predictability and mechanisms of Pacific low frequency variability beyond inter-annual time scales

1-day POC/BIO Workshop

Mesoscale eddies and their roles in North Pacific ecosystems

1½-day POC/BIO Workshop

Carbon data synthesis

AGENDA ITEM 11

Selection of PICES 2010 theme and description

Science Board agreed in principle with the proposed theme for PICES-2010 in the U.S.A. in 2009, entitled “*North Pacific Ecosystems Today, and Challenges in Understanding and Forecasting Change*” (see *SB Endnote 5* for a description).

AGENDA ITEM 12

High Priority activities

In addition to the implementation of PICES future integrative scientific program, FUTURE, the second initiative identified as a high priority project by Science Board was production of the a North Pacific Ecosystem Status Report (NPESR). Dr. McKinnell apprised Science Board of the status of the report. BIO Chairman, Dr. Michael Dagg, who volunteered to co-edit the report with Dr. McKinnell, will make two separate one-week visits to the PICES Secretariat to collaborate (He has separate funding for involvement in the project from the North Pacific Research Board). MONITOR Chairman, Dr. Hiroya Sugisaki proposed that the Technical Committee assist in reviewing the report outline, draft regional chapters, and draft synthesis. The revision of MONITOR’s third term of reference will reflect these tasks (see *MONITOR Endnote 4*). Dr. McKinnell agreed to address any MONITOR matters pertaining to the regional chapters. MONITOR will have an opportunity to review the draft chapters prior to the next annual meeting, and MONITOR was invited by the editors to participate in a NPESR workshop scheduled for April 2009 to review the draft synthesis as it is being developed. Dr. Sinjae Yoo proposed that PICES organize a summer school on “*Satellite oceanography*” from August 24 to 27, 2009 in Seoul (*SB Endnote 6*) as part of its capacity building activities, and Science Board endorsed it.

AGENDA ITEM 13

Next inter-sessional Science Board meeting

Science Board identified a need to have an inter-sessional workshop on the FUTURE Implementation Plan before the next Annual Meeting. It was agreed that an inter-sessional Science Board meeting would be scheduled after the workshop.

AGENDA ITEM 14

Other business

CCCC Program Co-Chairman, Dr. Harold P. Batchelder proposed that PICES change its practice of naming PICES Annual Meetings from the Roman numeral system to a more modern one "PICES-2009." It received nearly unanimous support from Science Board. For consistency, a similar approach will be used for inter-sessional meetings of Science Board.(ISB-2009).

CCCC Program Co-Chairman, Dr. Michio Kishi, announced that he would be stepping down as a member of the BIO Committee.

Best Presentation and Poster Awards

Dr. Emanuele di Lorenzo (U.S.A.) received the Best Presentation Award at the Science Board Symposium for his paper on *North Pacific decadal variability in the future*. Names of the other Award recipients can be found in their respective Committee and Program reports.

SB Endnote 1**Science Board participation list**Members

Harold P. Batchelder (Co-chairman, CCCC-IP)
 Michael J. Dagg (Chairman, BIO)
 Michael G. Foreman (Chairman, POC)
 Glen Jamieson (Chairman, MEQ)
 Michio J. Kishi (Co-chairman, CCCC-IP)
 Gordon H. Kruse (Chairman, FIS)
 Bernard Megrey (Chairman, TCODE)
 John E. Stein (Chairman, Science Board)
 Mikhail Stepanenko (representative of Russia)
 Hiroya Sugisaki (Chairman, MONITOR)
 Fangli Qiao (Science Board, representative of China)
 Sinjae Yoo (Vice-Chairman, Science Board, representative of Korea)

Invited Observers

Patricio Bernal (General Secretary, Intergovernmental Oceanographic Commission, UNESCO)
 Adolf Kellermann (Head, ICES Science Programme, ICES)
 James Overland (Co-Chairman, IP-WT)
 Hiroaki Saito (Co-Chairman, IP-WT)

PICES Secretariat

Skip McKinnell (Deputy Executive Secretary)

SB Endnote 2**Science Board meeting agenda****Sunday, October 26, 2008 (12:30 – 14:00)**

1. Welcome and adoption of agenda
2. Review of procedures for Science Board Symposium and Session awards, FISP Open Forum, and Closing Session
3. Relations with specific international programs/organizations
4. Report of the FUTURE Implementation Writing Team
5. Implementation of Science Board recommendations and Governing Council decisions from PICES XVI and the 2007 inter-sessional SB/GC meeting
6. Status of Action items from the 2008 inter-sessional SB meeting

Tuesday, October 28, 2008 (18:00 – 20:00)

Discussion of FUTURE Implementation Plan prior to Committee meetings and Open Forum

SB-2008

Thursday, October 30, 2008 (17:00 – 18:30)

FISP Open Forum

Saturday, November 1, 2008 (9:00 – 18:00)

7. Report of elections of new Committee Chairmen
8. Reports from Scientific and Technical Committees
9. Recommendations for new working groups and other subsidiary bodies
10. PICES 18 (Jeju) theme and description, draft schedule of scientific sessions and workshops
11. Selection of PICES 2010 (USA) theme and description
12. High priority activities
13. Next inter-sessional Science Board meeting
14. Other business

SB Endnote 3

Standing List of International and Regional Organizations and Programs

PICES is expanding its relationships with international scientific organizations of regional and global scale, and with regional scientific and monitoring efforts in the North Pacific that are aligned with the PICES ecosystem research focus. These regional programs may involve several PICES member countries and cover international areas of high ecological importance. Annually, the Science Board examines and revises the *Standing List of International and Regional Organizations and Programs*. Additionally, it selects a subset of organizations and programs that are considered to have the highest priority (marked by *) for PICES with respect to scientific cooperation and facilitation in the coming year.

This list will be used, in part, to assist the Executive Secretary and Science Board in decisions regarding travel to meetings of other international organizations.

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
CLIVAR*	Climate Variability and Predictability Program
CoML*	Census of Marine Life
ESSAS*	Ecosystem Studies of Sub-Arctic Seas
EVOSTC	<i>Exxon Valdez</i> Oil Spill Trustee Council (EVOSTC)
FAO	Food and Agriculture Organization
GCOS*	Global Climate Observing System
GEM*	Gulf of Alaska Ecosystem Monitoring and Research Program of <i>Exxon Valdez</i> Oil Spill Trustee Council (EVOS)
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
SCOR*	Scientific Committee on Oceanic Research
SOLAS*	Surface Ocean Low Atmosphere Study
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program
START	South Asian Regional Committee for the System for Analysis, Research and Training
UNEP	United Nations Environment Program
WCRP	World Climate Research Program
WESTPAC*	Cooperative Study of the Western Pacific, IOC Sub Committee for the Western Pacific
WMO	World Meteorological Organization

SB Endnote 4

Theme for PICES XVIII (Jeju, Korea)

Understanding ecosystem dynamics and pursuing ecosystem approaches to management

PICES undertakes a new science program, FUTURE, to understand the responses of marine ecosystems in the North Pacific to climate change and human activities, having the major questions: 1) how does ecosystem structure and function determine an ecosystem's response to natural and anthropogenic forcing; 2) how do physical and chemical processes respond to natural and anthropogenic forcing and how are ecosystems likely to respond to these changes in abiotic processes; 3) how do human activities impact coastal marine ecosystems and their interactions with offshore and terrestrial systems. We have only a limited ability to forecast how marine ecosystems will be affected by the changing global climate. Consequently, we still have limited knowledge on the assessment and management of marine ecosystems. Under this situation, it is necessary to

SB-2008

improve our understanding of ecosystem structure and function, ecosystem stability and resilience, and to understand and quantify the impacts of human activities and climate on marine ecosystems. It is urgent that we develop and adopt a comprehensive ecosystem-based approach which will be required to manage depleted and deteriorated marine ecosystems. To this end, breakthroughs have to be made in many areas, including evaluation of ecosystem status. We encourage submissions that describe indicators of atmospheric and oceanographic variability, habitat quality, biodiversity, productivity, sustainability, carrying capacity and socioeconomic benefits on geographic scales ranging from marine ranching systems to large marine ecosystems.

SB Endnote 5

Theme for PICES-2010 (U.S.A.)

North Pacific ecosystems today, and challenges in understanding and forecasting change

Climate change and the increase in coastal and watershed development are two of the most important threats to the marine ecosystems of the North Pacific, and the potential for non-linear interactions between these two stressors is high. Our understanding of the sensitivity and adaptability of natural and managed ecosystems to climate change is limited and confounded by the interaction of climate change with other stressors such as fishing and pollution. In addition, while inter-annual and decadal variability is likely to dominate climate forcing in the North Pacific, over the longer term the influence of global warming will likely contribute significantly to climate conditions in the North Pacific. It is imperative that we improve our understanding of marine ecosystems of the North Pacific, identify the contribution of climate change to overall change, and strengthen our ability to forecast how these ecosystems will adjust to continued stresses from climate change and other human activities.

PICES 2010 will focus on 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 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 these ecosystem characteristics can be separately quantified so that the knowledge and information from this symposium will contribute to the next report of the Intergovernmental Panel on Climate Change scheduled for 2013.

SB Endnote 6

**Draft proposal for a third PICES summer school on
*Satellite oceanography***

Purpose: Remote sensing is being used as an important tool in many areas in oceanography, broadening the spatio-temporal scales of observation in the ocean. In this course, principles and applications in the three major areas (optical, infra-red, and microwave) of satellite oceanography will be introduced to students who have little experience in the field. In addition to lectures and seminars, hands-on training of image-processing will be provided.

Date: 24-27 (Monday ~ Thursday) August, 2009

Venue: Seoul National University

Lecture & Workshop: Bd. 25-1/1st floor International Conference Room

Hands-on Exercise: Bd. 25-1/2nd floor Room 210 (SEES Computer Room)

Students: maximum 30

Lecturers: up to 10 (including 5 foreign lecturers)

Organizing committee: TBD

Request for financial support from PICES: travel costs for five non-Korean students and one foreign lecturer.

Tentative Syllabus I

Day	Time	Type	Title	Lecturer
Monday Optical RS	09:00-09:15	Address	Welcome Address I	PICES Rep.
	09:15-09:30	Address	Welcome Address II	RIO
	09:30-11:00	Lecture	Introduction of satellites and sensors for oceanography -Basic processing for sensor calibration, geometric correction, geophysical calibration	Hae-Yong Shin
	11:00-12:30	Lecture	-Radiometric Calibration and validation of satellite sensors	
	12:30-13:30		Lunch	
	13:30-15:30	Exercise	Introduction of Terascan Software	Kota Prasad
	15:30-17:30	Exercise	Terascan MODIS module for Ocean Color	Kota Prasad
Tuesday Optical RS	09:00-10:30	Lecture	Introduction of Optical Remote Sensing	Kota Prasad
	10:30-12:00	Lecture	Case I & II Algorithms for Chlorophyll-a and Validation	
	12:00-13:30		Lunch	
	13:30-16:00	Exercise	How to use Terascan MODIS module for Ocean Color	Kota Prasad
Wednesday Infrared RS	09:00-10:30	Lecture	Introduction of Infrared remote sensing	Hae-Yong Shin
	10:30-12:00	Lecture	SST Retrievals from IR data	
	12:00-13:00		Lunch	
	13:00-15:30	Lecture	Terascan MODIS module for SST Estimation	Hae-Yong Shin
Thursday Infrared RS	09:00-10:30	Lecture	Application studies using satellite SST data I	
	10:30-12:00	Lecture	Application studies using satellite SST data II	
	12:00-13:00		Lunch	
	13:00-15:30	Lecture	Terascan MODIS module for SST Estimation [continued] Some examples of environmental variable retrieval process using MODIS module	Hae-Yong Shin

REPORT OF THE BIOLOGICAL OCEANOGRAPHY COMMITTEE

The meeting of the Biological Oceanography Committee (BIO) took place October 29, 2008. The Chairman of the Committee, Dr. Michael J. Dagg, called the meeting to order and welcomed the participants (*BIO Endnote 1*). The draft agenda was reviewed and approved, but it was noted that several new workshops and topic sessions had been proposed in the last 24 hours and that these would be discussed at the appropriate place in the agenda (*BIO Endnote 2*).

AGENDA ITEM 3

Reports from subsidiary bodies

A report summarizing the status of the Advisory Panel on the *Micronekton Sampling Gear Intercalibration Experiment* (MIE-AP) sample analysis, data analysis, publications and final report preparation was given by Dr. Orio Yamamura (see the MIE-AP report elsewhere in this Annual Report). The Chairman stressed the importance of receiving the final report before PICES-2009, and requested that the MIE-AP Co-Chairmen send him a schedule for completion of the Advisory Panel activities.

A report summarizing the Advisory Panel on *Marine Birds and Mammals* (MBM-AP) meeting of October 26 was given by Dr. Hidehiro Kato (see the MBM-AP report elsewhere in this Annual Report). Concerns on the lack of breadth in membership countries were discussed. A proposal for a ½-day BIO/FIS/FUTURE topic session at PICES-2009, titled “*Krill distribution, abundance and patch dynamics in the North Pacific as revealed by hydroacoustics*” was presented, but later withdrawn. A proposal for a 1-day BIO workshop titled “*Integrating marine mammal populations and rates of prey consumption in models of climate change – Ecosystem change in the North Pacific*” was presented for later discussion. Dr. Kato provided a brief report on his attendance at the IWC annual meeting (*MBM-AP Endnote 4*) and BIO endorsed his attendance as a PICES representative again at this coming year’s meeting. Revised MBM-AP Terms of Reference were discussed and approved (*MBM-AP Endnote 2*).

A report summarizing the activity of the Section on *Carbon and Climate* (CC-S) was given by Dr. James R. Christian (see the CC-S report elsewhere in this Annual Report). A data synthesis workshop was proposed for PICES-2009 for later discussion. Two new Japanese members were endorsed by BIO for addition to CC-S. A joint POC/BIO topic session titled “*Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific*” was proposed for later discussion.

AGENDA ITEM 4

Working Groups

A report was given by Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22) Co-Chairman, Dr. Fei Chai (the WG 22 report can be found elsewhere in this Annual Report), A 1-day workshop titled “*Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses*” was proposed for PICES-2009, and later discussed.

Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim* (WG 23) Co-Chairman, Dr. William Peterson (the WG 23 report can be found elsewhere in this Annual Report) announced that a 2-day workshop titled “*Krill biology and ecology in the world’s ocean*” will be held at the final GLOBEC Open Science Meeting in Victoria in June 2009.

BIO-2008

AGENDA ITEM 5

Summaries of topic sessions and workshops held at PICES-2008

The topic sessions and workshops sponsored by BIO at PICES-2008 are listed below. For session or workshop summaries, see the Session Summaries section in this Annual Report:

- BIO Contributed Paper Session. Friday, October 31, 1-day. Co-convenors: Michael J. Dagg (U.S.A.), Michio J. Kishi (Japan).
- S9 (BIO) “*End-to-end foodwebs: Impacts of a changing ocean*”. Tuesday, October 28, ½-day and Thursday October 30, 1 day. Co-convenors: Hiroaki Saito (Japan), Sinjae Yoo (Korea) and George Hunt (U.S.A.).
- S2 (MONITOR/TCODE/BIO) “*Linking biology, chemistry and physics in our observational systems – Present status and FUTURE needs*”. Thursday October 30, 1 day. Co-convenors: Hernan Garcia (U.S.A.), David Mackas (Canada), S. Allen Macklin (U.S.A.), Jeffrey J. Napp (U.S.A.), Young-Jae Ro (Korea) and Toru Suzuki (Japan).
- W2 (BIO) “*Oceanic ecodynamics comparison in the subarctic Pacific*” (Sunday, October 26, 1 day). Co-convenors Charles B. Miller (U.S.A.) and Atsushi Yamaguchi (Japan).

AGENDA ITEMS 6 AND 7

Symposia and meetings and financial requests

(a) Completed

- ICES Annual Science Conference September 22–26, 2008. Halifax, NS, Canada, was attended by Angelica Peña who co-convened an ICES/PICES theme session titled “*Coupled physical and biological models: Validation, parameterization and application*” (see *BIO Endnote 3* for a report).
- A workshop titled “*The Okhotsk Sea and adjacent areas*” was held at the Tokyo University of Agriculture, Okhotsk Campus in Abashiri, Japan from August 27–29, 2008. Co-convenors were Prof. Makoto Kashiwai and Dr. Gennady Kantakov (see *BIO Endnote 4* for a report).
- PICES International Summer School on “*Ecosystem-based management and ecosystem approach*” Yasunori Sakurai, Masahide Kaeriyama, Shin-ichi Ito, Michio J. Kishi (see *BIO Endnote 5* for a report).
- A report on the session titled “*The effects of ocean acidification on fisheries and ecosystems*” and held at the International Symposium on “*Oceans in a high CO₂ world – IP*”, Monaco, October 6–8, 2008 (*CC-S Endnote 4*).

(b) Future

Proposed BIO topic sessions for PICES-2009

- A 1-day joint FIS/BIO topic session titled “*Early life stages of marine resources as indicators of climate variability and ecosystem resilience*” (see *FIS Endnote 5*).
- A 1-day joint POC/BIO topic session titled “*Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific*” (see *POC Endnote 4(3)*) was proposed by CC-S. Travel request for 1 person.
- BIO paper session – Co-convenors Michael Dagg (U.S.A.) and Sinjae Yoo (Korea).

A joint POC/BIO topic session titled “*Mesoscale eddies and their roles in North Pacific ecosystems*” (see *POC Endnote 4(4)*).

proposed BIO sponsored workshops for PICES-2009

- A 1-day BIO workshop titled “*Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses*” (see *WG 22 Endnote 4*). Travel request is for 2 invited speakers.
- A ½-day BIO workshop on “*Integrating marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in the North Pacific*” (see *MBM-AP Endnote 5*). Travel request is for 1 scientist.
- A ½-day BIO workshop on “*Standardizing methods for estimating jellyfish concentration, and development of an international monitoring network*” (*BIO Endnote 6*). Travel request is for 1 scientist.

- A 2-day BIO workshop on “*Marine ecosystem model intercomparisons (II)*” (*BIO Endnote 7*) co-sponsored by ESSAS.
- A 2-day carbon data synthesis workshop (*BIO Endnote 8*) proposed by CC-S. (1.5 days for the workshop and a ½ day for the business meeting). Travel support is requested for Dr. Robert Key (U.S.A.).

Other workshops/meetings of interest

- Dr. William Peterson described a Workshop on “*Krill biology and ecology in the world’s oceans*”, that will be held at the GLOBEC Open Science meeting in Victoria in June 2009 (see the WG 23 report elsewhere in this Annual Report). Chairs: Angus Atkinson (UK), Jaime Gómez-Guitérrez (Mexico), Bettina Meyer (Germany) and William Peterson (U.S.A.). Travel support is requested for 2 PICES participants.
- The 5th International Zooplankton Production Symposium will be held in March or April 2011, at Pucón, Chile, with Dr. Rubén Escribano as local organizer and Dr. Steve Hay (UK) as ICES convenor, together with convenors appointed by PICES and IMBER. BIO recommends that PICES co-sponsor the meeting, and recommends either Dr. David Mackas or Julie Kiester be appointed as the PICES co-convenor. Dr. Kiester (first choice) has not been contacted yet: Dr. Mackas has agreed to do this if she is unavailable.
- A Joint PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS) is proposed (see *POC Endnote 3*). Co-Chairs of the proposed WG will meet on June 21, 2009, one day prior to the GLOBEC Open Science meeting in Victoria British Columbia, Canada, to:
 - discuss frameworks and methodologies for forecasting the impacts of climate change on the growth, distribution and abundance of marine life, with particular emphasis on commercial fish and shellfish;
 - review the results of designated case studies to test methods;
 - plan for an inter-sessional meeting in early 2010 where scientists can present, discuss and publish forecasts of climate change impacts on the world’s commercial fish and shellfish resources;
 - establish techniques for estimating and communicating uncertainty in forecasts;
 - evaluate strategies for research and management under climate change scenarios, given the limitations of our forecasts.
- WGFCCIFS will report by September 2009 for the attention of the ICES Climate Change Steering Group, ICES Oceanography Committee, and PICES’ FIS, BIO and POC Committees. Members plan to organize an inter-sessional meeting in early 2010 to provide a venue for discussion and publication of results. See *BIO Endnote 9* for supporting information.
- A proposal for an ESSAS Open Science Meeting was put forward by Dr. George Hunt. BIO supports the request for the PICES Secretariat to assist with coordination and organization of the meeting. Travel funds may be requested next year for this meeting, scheduled for spring 2011.

Other meetings of interest include:

- The final GLOBEC Open Science meeting – June 2009 Victoria, Canada
- The Expo 2012 Organizing Committee (Yeosu, Korea) has expressed interest in hosting the 2nd International Symposium on “*Effects of climate changes on the world’s oceans*” in the early spring of 2012.

AGENDA ITEM 8

Relationships with other international programs and organizations

No presentations were made.

AGENDA ITEM 9

Publications

- An IFEP-AP special issue on SEEDS II, guest edited by Drs. Atsushi Tsuda, Mark Wells, Mitsuo Uematsu and Hiroaki Saito, will be published in *Deep-Sea Research II*. As of early October 2008, there are 19

BIO-2008

manuscripts and the editing for 15 manuscripts has been completed. It is anticipated that editing of all manuscripts will be completed by the end of November and the papers will be sent to the chief editor of DSR II for publication in 2009.

- Selected papers on krill from the 4th International Zooplankton Symposium will be published as a special issue of *Deep-Sea Research II*, guest edited by Drs. William Peterson and So Kawaguchi: As of late October 2008, 18 papers have been accepted.
- Selected papers from PICES-2008 Workshop on “*Oceanic ecodynamics comparison in the sub-Arctic Pacific*” (W2) is proposed for publication in *Deep-Sea Research II*. This volume will have eleven papers, for publication. Drs. Atsushi Yamaguchi and Charles Miller will be the guest editors. Review and revision processes should be complete by summer of 2009, with manuscripts ready to transfer to the journal for final evaluation.
- A series of 23/24 selected papers from the SCOR Working Group on Zooplankton Time Series will be published in the journal *Progress in Oceanography*. PICES was represented by Dr. William Peterson, and Dr. David Mackas was a WG member supported by SCOR.
- Selected papers based on the topic session on “*Phenology and climate change in the North Pacific*” at PICES XVI in Victoria, Canada are now slated for publication in *Marine Ecology Progress Series* (MEPS). Originally, a special volume was to be published in *Deep-Sea Research II* but only 4 papers were submitted which was insufficient for a special volume in this journal. MEPS is interested in the topic and additional potential contributions have been solicited. Papers are due by mid-December 2008. Additional contributors will be solicited. If fewer than 4 papers are accepted, each paper will be published as a stand-alone article. If more than 4 papers are accepted, there will be a special theme section in MEPS devoted to this topic.

AGENDA ITEM 10

BIO Action Plan update

The current version of our Action Plan will be modified according to what was recommended at the BIO Committee meeting at PICES-2008. This will then be posted on the PICES web page shortly after the Dalian meeting is completed

AGENDA ITEM 11

FUTURE update

Committee members discussed the draft FUTURE Implementation Plan and a list of issues was developed to be presented at the FISP Open Forum held October 30 at PICES-2009. Written comments will also be presented to the FISP Writing Team.

AGENDA ITEM 12

North Pacific Ecosystem Status Report II

Dr. Dagg will co-edit the NPESR II with Dr. Skip McKinnell.

AGENDA ITEM 13

Other items

There was discussion about the proposal to allocate more time to committee meetings and move the meetings to a time earlier in the week. It was agreed that more time will be necessary as FUTURE is implemented and BIO activities will be linked to them. No consensus was achieved about the timing of the meeting.

BIO Endnote 1

BIO participation list

Members

David L. Mackas (Canada)
 Song Sun (China)
 Michio J. Kishi (Japan)
 Atsushi Yamaguchi (Japan)
 Young-Shil Kang (Korea)
 Sinjae Yoo (Korea)
 Alexei Orlov (Russia)
 Michael J. Dagg (U.S.A., Chairman)
 William Peterson (U.S.A.)

Observers

Evgeny Barabaushchikov (Russia)
 Harold (Hal) Batchelder (U.S.A.)
 Fei Chai (U.S.A.)
 Seok-Gwam Choi (Korea)
 George Hunt (U.S.A.)
 Oleg Katugin (Russia)
 Hidehiro Kato (Japan)
 Tom Okey (Canada)
 William Sydeman (U.S.A.)
 Harumi Yamada (Japan)
 Orio Yamamura (Japan)

BIO meeting agenda

1. Welcome and Introductions
 - Round of introductions
 - Circulate a sign up sheet
2. Agenda additions and changes – approval of agenda
3. Reports from subsidiary bodies: summarizing activities during past year, summarizing activity at this year’s PICES meeting, and summarizing goals for next year. These goals will be put into the BIO Action Plan.
 - MIE-AP - report to be provided orally by (probably) Orio Yamamura because Evgeny Pakhomov will not attend.
 - MBM-AP: Bill Sydeman will be at the meeting and should give a report, also Kato-san on IWC (probably written). MBM ToR approval
 - CC-S
4. Working Groups:
 - WG-22: Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean. Shigenobu Takeda (Japan) and Fei Chai (USA).
 - WG-23: Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim. William Peterson (USA) and Song Sun (China).
 - Discuss establishment of a group to develop appropriate standards for sampling giant jellyfish - Presentation to be made by Young-Shil Kang.
5. Summaries of topic sessions and workshops held during PICES-2008, Dalian. These will be short written summaries prepared by session conveners and provided to the PICES Secretariat.
 - BIO Contributed Paper Session.
 - S9 (BIO) End-to-end foodwebs: Impacts of a changing ocean.
 - S2 (MONITOR/TCODE/BIO) Linking biology, chemistry and physics in our observational systems – present status and FUTURE needs.
 - W2 (BIO) Oceanic ecodynamics comparison in the subarctic Pacific
6. Symposia and meetings
 - (a) completed meetings – reports or comments on:
 - ESSAS-PICES Workshops Sept 15-19, 2008. Halifax, NS Canada;
 - ICES/PICES meeting, Sept 22-26, 2008. Halifax, NS, Canada three theme sessions, one relevant to BIO: “*Coupled physical and biological models: parameterization, validation, and applications*”, report from Angelica Peña representing PICES;
 - Okhotsk workshop;
 - PICES/CREAMS summer school;

BIO-2008

- “*The effects of ocean acidification on fisheries and ecosystems*” at the International Symposium on “*The Ocean in a High CO₂ World – IP*”. Monaco, Oct. 6-8. Report from CC-S?
- Others?
- (b) future meetings
 - final GLOBEC meeting – June 2009 Victoria – BIO role??
 - possible BIO theme sessions* for PICES 2009
 - FIS/BIO (1day) for Jeju Is. Korea in 2009. *Early life stages of marine resources as indicators of climate variability and ecosystem resilience* Co-convenors: Suam Kim (Korea), Richard Brodeur (USA), Douglas Hay (Canada) Yoshiro Watanabe (Japan) and ____ from BIO?
 - BIO paper session – we should have 1-2 other co - conveners from Asian side of BIO
 - Possible BIO session on “The Effects of Ocean Acidification on Marine Organisms” to be presented by Angelica Peña.
 - Possible BIO sponsored workshops for PICES 2009
 - Others
- 8. Relationships with other international programs and organizations
- 7. Financial requests

Requests for travel or support of outside workshops must have a clear PICES connection such as participation by a BIO committee member or direct contribution by a PICES BIO committee member, and be linked in some fashion to the BIO Action Plan. Possible travel requests for BIO to consider include:

 - Invited speakers to BIO theme sessions in PICES 2008
 - Travel associated with new BIO Working Groups
 - Travel associated with BIO approved Workshops
 - Travel associated with BIO and non-PICES international programs or organizations
 - Summarize all funding requests and prioritize for presentation to SB
- 9. Publications for upcoming year
 - status of IFEP special volume on SEEDS II – information provided by Takeda: 12 manuscripts under review, final deadline for submission in mid-October, expecting 18 papers, hope to publish in 2008
 - About 15 papers on krill from the 4th International Zooplankton Symposium will be published in a special volume of *Deep-Sea Research II*, edited by W. Peterson and S. Kawaguchi.
 - Special volume of Plankton and Benthos Research to be published based on papers from the Topic Session titled “*The human dimensions of jellyfish blooms*” held at the Yokohama PICES XV meeting. Edited by Hitoshi Iizumi and Haruto Ishii, with expected publication date in early 2008. (Ric Brodeur may give a short report) OECOS Special Volume 4
 - Other publications to be recommended to Science Board
- 10. BIO Action Plan update
 - We will discuss and approve the Action Plan for the coming year. Review in the Context of FUTURE.
- 11. FUTURE update
 - update for information purposes, the status of the Implementation Plan.
- 12. North Pacific Ecosystem Status Report II.
 - BIO contributions and participants
- 13. Other items
- 14. Meeting adjourns

BIO Endnote 3**Report on the ICES/PICES Theme Session, “*Coupled physical and biological models: Validation, parameterization and application*” at ICES ASC in Halifax, Canada**

The ICES/PICES Theme Session, “Coupled physical and biological models: Validation, parameterization and application” (1.5 days) was held during the ICES Annual Science Conference, September 22-26, Halifax, N.S., Canada. Co-conveners were Guoqi Han (Canada), Andre Visser (Denmark), Andreas Moll (Germany) and Angelica Peña (PICES, Canada).

This theme session was initiated by ICES Working Groups on *Modeling Physical and Biological Interactions* and co-sponsored by PICES. Its aim was to present recent advances related to development, validation, parameterization and application of both physical–biological models (PBMs) and individual-based models (IBMs), and their coupling, with a particular emphasis on their validation on various temporal and spatial scales. There were 18 oral and 5 poster presentations in this session. The presentations were of high quality, well attended and stimulated interesting questions and discussions.

Contributions covered a wide range of aspects in the context of PBMs, IBMs, and their coupling and applications to ecosystem studies and fisheries management. There was a group of presentations on validation and application of coupled physical–biogeochemical models to understand ecosystem dynamics. These studies demonstrated the time- and space-dependent influences of various processes, such as tidal dynamics, mixing, Ekman pumping, nutrient loading, and climatic variability. Another group of presentations was related to coupling PBMs and IBMs, and applications to feeding success, survival and growth, and recruitment of early life stages. These papers examined the effect of time of spawning, ocean circulation, and food availability on population dynamics. Various other aspects were also considered, including ecosystem models for sea-ice influenced seas, parameterization of biological processes in the benthic layer, and the coupling of such a benthic layer model to a large-scale hydrodynamic model. A few other issues were raised during the session discussion, including the effectiveness of assimilating oceanographic data into coupled physical and biological models and the capability of resolving fronts in these models.

BIO Endnote 4**Report of the 4th PICES Workshop on the Okhotsk Sea and Adjacent Waters**
(draft/081009)

Co-Conveners:

Makoto B. KASHIWAI and Gennady A. KANTAKOV

Foreword

These proceedings are outcomes from the workshop on the Okhotsk Sea and Adjacent Waters held in Abashiri in August 2008. The Workshop was proposed by the Biological Oceanography Committee (BIO) to Science Board. At PICES XVI in Victoria, at the recommendation of Science Board based on BIO proposal, Governing Council approved a proposal of holding the 4th PICES Workshop on "The Okhotsk Sea and adjacent waters" from 27-29 August, 2008, at Abashiri Campus of Tokyo University of Agriculture, in Abashiri, Japan.

The papers to be presented at Workshop were called for under topics including followings;

- Basin oceanography and climate of the Sea of Okhotsk;
- Low-trophic response to the variability of the Sea of Okhotsk climate;
- Response of nekton, macro benthos, mammals, sea birds to the Sea of Okhotsk climate variability;
- Impacts of anthropogenic challenges by oil/gas industries, fisheries and other human activities to the Sea of Okhotsk ecosystem, and impacts of violent climate disasters to human activities;
- Potential use of and evidences by new technology, methods and tools for Sea of Okhotsk Research in FUTURE;

BIO-2008

The co-conveners and participants of the workshop are hoping these proceedings can contribute and stimulate future research in marine science on the Okhotsk Sea.

1. Outline of the Workshop

The fourth PICES Workshop on the Okhotsk Sea and Adjacent Waters was held at the Abashiri Campus of Tokyo University of Agriculture in Abashiri, the southernmost city in the rim of Okhotsk Sea on August 27-29, 2008. Co-conveners were Prof. Makoto KASHIWAI (Tokyo University of Agriculture) and Dr. Gennady KANTAKOV (Sakhalin Fisheries and Oceanographic Research Institute). The participants were 64 scientists (Japan 45; Russia 17; Canada 1; PICES 1) and 8 auditing students.

The Workshop was opened by welcome addresses by the Dean of Faculty of Bioindustry, Tokyo University of Agriculture, Prof. Michinari YOKOHAMA, and the Director of Abashiri Construction and Development Department Office, Hokkaido Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism, Mr. Koji KAMADA. The co-conveners made explanation of workshop objectives, structure and outputs.

The goal of the workshop was to develop the Okhotsk Sea component of PICES / FUTURE Program. Under this intention this Workshop was; to bring together a team of international scientists having interest in the Okhotsk Sea and adjacent areas and marine ecosystems embraced by them, under concerns on increasing impacts of climate changes; to review and exchange 'What is known'; and to identify key scientific questions and necessary approaches.

The scientific sessions were held with three plenary sessions in the first day and two parallel sessions in the second day. The structure of sessions was as follows:

1. Plenary Sessions:
 - PS1: Climate / Ocean dynamics
 - PS2: Amur River / Geochemical Cycle
 - PS3: Primary production / Zooplankton / Marine mammals
2. Session A:
 - A1: Current Dynamics
 - A2: Sea-ice, watermass and fresh water processes / Coastal lagoons
 - A3: New technology
3. Session B:
 - B1: Biological processes / Disturbance by oil and gas development
 - B2: Walleye pollock

There were presentations of 46 papers, including presentation by Dr. Skip McKINNELL, Deputy Executive Secretary of PICES, on the status and trends of FUTURE Implementation planning. The session reports including brief summary of presentations and proposed scientific questions and approaches are shown in next section.

The third day was the plenary session for development of session reports and identification of proposals on FUTURE program. After the announcements for the preparation of workshop proceedings, the co-conveners provided closing remarks.

BIO Endnote 5

**Report of the PICES International Summer School on
“Ecosystem Based Management and Ecosystem Approach”**

by Yasunori Sakurai, Masahide Kaeriyama, Shin-ichi Ito, Michio J. Kishi

The PICES International Summer School on “Ecosystem Based Management and Ecosystem Approach” was held from August 23–26, 2008 at the Faculty of Fisheries Sciences, Hokkaido University, Hakodate, Japan. Fifty people, including participants from all PICES member countries, attended the summer school. On Day 1 four lecturers gave talks on EBM. On Day 2 afternoon, students were divided into six groups and discussions were held following talks on each theme. On Day 3 evening, each group gave a Power Point presentation. The presentation was very fruitful and some of the groups will present posters at PICES-2008I in Dalian, China.

The Advisory Panel for the *CREAMS/PICES Program in East Asian Marginal Seas* (CREAMS-AP) was established in 2005. A goal of CREAMS-AP is to “develop a CREAMS/PICES Capacity Building Program that will provide on-site training through international research at educational laboratories, training camps, inter-calibration centers and to organize summer schools and winter schools for students and young scientists”. The first PICES Summer School on “*Ocean circulation and ecosystem modeling*” was held in August 2006, in Busan, Korea.

The PICES summer school in Hakodate focused on “*Ecosystem-based management (Ecosystem approach to management: EAM) and ecosystem approach*”. Ecosystem-based management is an integrated approach for the management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need.

The 2002 World Summit on Sustainable Development (WSSD) recognized that the management needs for the oceans have changed, needing integration of ocean management activities across sectors and responding to the necessity of conservation objectives for collective ocean use. Among other defined specific temporal targets relevant to oceans management by 2012, the WSSD expects to implement “Ecosystem-based management (EAM)”. We believe that ecosystem management and ecosystem science are parallel concepts that require continued interaction to achieve marine resource sustainability.

BIO Endnote 6

½-day BIO workshop on Standardizing methods for estimating jellyfish concentration, and development of an international monitoring network at PICES-2009

Some jellyfish make massive blooms in the North Pacific coastal and oceanic waters, damaging fisheries and causing large social and economic problems. To date, there have been discussions about bloom mechanisms, distribution, and biological and ecological characteristics of the jellyfish species. However, there are limitations in understanding the dynamics of these massive blooms and providing scientific information to management. One major limitation is standards for sampling and a lack of monitoring. The goals of this workshop are: 1) to understand the problems and develop techniques for estimating concentrations of jellyfishes; 2) to evaluate the status of national/regional monitoring systems for jellyfishes; 3) to emphasize why standard methods and international monitoring are needed; and 4) to develop an implementation plan and schedule for improving abundance and distribution information on jellyfish blooms.

Suggested Co-Convenors: Hideki Akiyama (Japan), Richard D. Brodeur (U.S.A.) and Young-Shil Kang (Korea)

BIO-2008

BIO Endnote 7

2-day BIO workshop on “*Marine ecosystem model intercomparisons (II)*” (co-sponsored by ESSAS) at PICES-2009

The objective of the Marine Ecosystem Model Inter-comparison Project (MEMIP) is to compare the performance of various lower trophic level marine ecosystem simulation models at predicting the abundance and distribution of zooplankton functional groups. Models with high performance and broad generality will be priority candidates for examining the state of marine ecosystem’s response to future global climate change. This workshop will be technical, “hands-on”, and focus on beginning to parameterize, execute and calibrate various 1-D versions of biogeochemical lower trophic level (LTL) marine ecosystem models. Multiple ecosystem models will be configured to three Pacific Ocean “location testbeds”. The 1-D physical forcing for each site will be fixed (*e.g.*, to enforce a common physical environment) so that differences observed among simulations at a single site are due only to differences in ecosystem models. The three testbeds will be selected based on the availability of data sets suitable for this exercise—data for multiple years, good seasonal coverage, and breadth of state variables spanning inorganic nutrients, chlorophyll (or preferably phytoplankton carbon or nitrogen), and zooplankton biomass measures are needed. We plan to apply LTL models to Oyashio locations such as stations along Japan’s A line, the middle shelf of the eastern Bering Sea (*i.e.*, at mooring M2), and a shelf station on the Newport line to represent the California Current upwelling system. The models will be used to identify mechanisms that are important controls on the level and variability of secondary production and to bound the levels of uncertainty in model predictions by calculating ensemble statistics. Comparisons of identical ecosystem model formulations (*e.g.*, not tuned to each specific location) at multiple locations will provide information on the spatial-temporal robustness of particular model structures and parameterizations.

Suggested Co-Convenors: Harold P. Batchelder (U.S.A.), Shin-ichi Ito (Japan) and Bernard A. Megrey (U.S.A.)

BIO Endnote 8

POC/BIO carbon data synthesis workshop at PICES-2009

This workshop will be a major step forward in the implementation of the North Pacific carbon data synthesis. Investigators who submit data to the synthesis 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 processes, and will lead directly to value-added data products and collective publications.

Co-Convenors: Masao Ishii (Japan) and Robert M. Key (U.S.A.)

BIO Endnote 9**Supporting information on proposed ICES/PICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* (WGFCCIFS)**

PRIORITY:	The work of the FCCIFS Workign Group is essential to ensure that ICES and PICES will be able to provide guidance on the potential impacts of climate change on marine ecosystems and the response of commercial fish and shellfish resources to these changes.
SCIENTIFIC JUSTIFICATION AND RELATION TO ACTION PLAN:	<p>The work done within ICES and PICES on Climate Change and fisheries has been diverse and has included: a) guidance on methods for selection of IPCC scenarios for use in projections; b) techniques for downscaling IPCC scenarios to local regions, c) development of coupled ecosystem models for use in evaluating climate induced shifts in environmental conditions, d) literature documenting relationships between climate forcing and marine fish and shellfish distribution and production, and e) stock assessment techniques for evaluating management strategies to mitigate the impacts of change. A challenge facing ICES and PICES is the need to integrate all of this research to provide stakeholders with quantitative estimates of the potential impact of climate change on marine life throughout the world. This challenge calls for the establishment of an interdisciplinary research team composed of experts from around the world who will focus attention on the development of common and standardized frameworks for forecasting climate change impacts on marine life with particular emphasis on commercially important fish and shellfish. ICES and PICES should act now to ensure that our research communities develop the capabilities to provide quantitative contributions to the next IPCC reports and to provide guidance for management under climate change scenarios.</p> <p>Several case studies will be identified by the Steering Group based on their potential for contributing to methodological development and the opportunity for comparison of marine species and community responses to climate forcing in different ecosystems. Members of the working group will be responsible for encouraging the development of regional interdisciplinary teams responsible for the production of forecasts. Members of the working group will provide guidance to the regional teams by providing a framework for the development of the forecasts and communication of new advances in analytical tools. The culmination of the working group's effort will be presentation and discussion of results at an intersessional meeting and publication of results in a peer reviewed journal by 2011. The timing for the publication is critical because the future IPCC AR5 report is slated for release in 2013 and the IPCC only allows references to published papers.</p>
RESOURCE REQUIREMENTS:	No specific resource requirements beyond the need for members to prepare for and participate in the meeting.
PARTICIPANTS:	These would include climatologists, oceanographers, ecologists, stock assessment scientists, ecosystem modellers, fisheries managers and economists. Participation is sought from members of PICES and ICES as well as scientists from the southern hemisphere.
SECRETARIAT FACILITIES:	This group is likely to have high demand on the computing resources of the Secretariat, but no additional software/hardware is anticipated beyond that which is currently available.
FINANCIAL:	ICES invitational travel for 4 invited scientists, PICES invitational travel for 4 scientists.
LINKAGES TO ADVISORY COMMITTEES:	An obvious very close link with the ICES Climate Change steering committee and the PICES FUTURE Scientific Steering Committee.
LINKAGES TO OTHER COMMITTEES OR GROUPS:	Methodological issues are within the mandate of this Group but for the purpose of this meeting this issue is not on the agenda. Fish stock assessment methods for

BIO-2008

	forecasting and conducting management strategy evaluations will be discussed, as will various ecosystem modelling approaches. Techniques for selecting and downscaling climate change scenarios for use in forecasts will also be discussed. Knowledge of the mechanisms underlying commercial and other species and community responses to shifts in oceanography will be critical to the formation of forecasts.
LINKAGES TO OTHER ORGANIZATIONS:	ICES and PICES will seek widened participation for this group including contact with relevant academic and intergovernmental organisations including fisheries managers and FAO for this meeting.
SECRETARIAT MARGINAL COST SHARE:	ICES 50%, PICES 50%.

REPORT OF THE FISHERY SCIENCE COMMITTEE

The meeting of the Fishery Science Committee (FIS) was held from 16:00–19:30 on October 29, 2008. Chairman, Dr. Gordon Kruse, called the meeting to order and welcomed the participants. The meeting was attended by 11 FIS members plus 19 observers (*FIS Endnote 1*). All PICES member countries were represented, except for China. Ms. Pat Livingston served as rapporteur.

The Chairman reviewed the original agenda (*FIS Endnote 2*) and no changes were made although it was recognized that the discussion on FUTURE should take place before making recommendations on new working groups to ensure that FIS Committee contributions to the new PICES scientific program are complementary.

AGENDA ITEM 3

Proposal to establish FIS Vice-Chairman

Members discussed a proposal for a FIS Vice-Chairman. It was noted that virtually all other PICES committees have vice-chairmen and that the FIS workload has increased in recent years. It was pointed out that a native English-speaking vice-chairman is particularly important if the chairman is a non-native English speaker. All parties present supported the idea of a vice-chairman.

AGENDA ITEM 4

Election of officers

The PICES Executive Secretary, Dr. Alexander Bychkov, reminded members of the rules for election for Committee Chairmen and Vice-Chairmen. Chairman, Gordon Kruse, announced that he was not seeking a second 3-year term. A letter was received from the Russian delegation, which nominated Dr. Mikhail Stepanenko as FIS Chairman. No other nominations were proposed. Dr. Stepanenko accepted the nomination and was unanimously elected to be the next FIS Chairman. Dr. Stepanenko nominated Dr. Kruse as Vice-Chairman. No other nominations were presented. Dr. Kruse was elected to be the FIS vice-chairman. The 3-year terms of both officers begin immediately following the PICES Annual Meeting in Dalian, China.

AGENDA ITEM 5

2008 FIS Best Oral Presentation and Poster awards

Volunteers were sought for judging FIS awards to be given during PICES XVII. Dr. Kruse acted as the awards committee for FIS Best Oral Presentation and Drs. Anne Hollowed and Laura Richards were responsible for judging the FIS Best Poster. Selections were chosen from topic sessions S4 and S11 and the FIS Contributed Paper session. Anastasia Khrustaleva (Russian Federal Research Institute of Fisheries and Oceanography (VNIRO), Moscow) received the FIS Best Presentation award for her paper on “*Integrated method for sockeye salmon stock differentiation in the West Pacific and the Sea of Okhotsk*” (FIS Paper Session). The FIS Best Poster award was given to Chiyuki Sassa (Seikai National Fisheries Research Institute, FRA, Japan) for the poster (co-authored with Keisuke Yamamoto, Youichi Tsukamoto and Muneharu Tokimura) on “*Distribution and biomass of *Benthoosema pterotum* (Pisces: Myctophidae) in the shelf region of the East China Sea: Mechanisms of population maintenance*” (FIS Paper Session).

FIS-2008

AGENDA ITEM 6

FIS Chairman's report: Implementation of PICES XVI decisions

PICES XVII sessions

At PICES XVII, FIS sponsored:

- 1-day FIS Topic Session on “*Institutions and ecosystem-based approaches for sustainable fisheries under fluctuating marine resources*” (S4),
- 1-day MEQ/FIS Topic Session on “*Mariculture technology and husbandry for alternate and developing culture species*” (S5),
- ½-day FIS Topic Session on “*Effects of fisheries bycatch and discards on marine ecosystems and methods to mitigate effects*” (S11),
- 1-day FIS Contributed Paper Session,
- 1½-day CCCC/POC/FIS Workshop on “*Climate scenarios for ecosystem modeling (II)*” (W4).

Summaries of these sessions and workshops can be found in the Session Summaries chapter in this Annual Report.

International symposia

During the past year, FIS was very active in international symposia.

- Symposium on “*Effects of climate change on the world's oceans*” (co-sponsored by ICES, PICES, IOC, GLOBEC, SCOR and WCRP) from May 19–23, 2008, in Gijón, Spain. The PICES co-convenor was Dr. William Peterson (PICES), and Scientific Steering Committee members included Drs. Akihiko Yatsu (Japan) and Michael Foreman (Canada). Invited talks by PICES members included FIS Chairman, Dr. Gordon Kruse.
- Symposium on “*Linking herring biology, ecology, and status of populations in a changing environment*” (co-sponsored by ICES, PICES and GLOBEC), from August 26–29, 2008 in Galway, Ireland. PICES members, Drs. Brenda Norcross (U.S.A.) and Yoshiro Watanabe (Japan), were members of the Scientific Steering Committee.
- ICES/PICES Workshop on “*Environmental interactions of mariculture*”, from April 14–18, 2008 in Victoria, Canada. An ICES publication of this workshop is available at: <http://www.ices.dk/reports/MCC/2008/WGEIM08.pdf>.

Upcoming meetings of interest to FIS members include:

- an ICES/PICES/GLOBEC Workshop on “*Changes in distribution and abundance of clupeiform small pelagic fish in relation to climate variability and global change*” to be held during November 3–7, 2008 in Hamburg, Germany. The co-conveners are: Drs. Jürgen Alheit, Jin Yeong Kim, and Gerd Kraus.
- An International Symposium on “*Rebuilding depleted fish stocks: Biology, ecology, social science and management strategies*” (co-sponsored by ICES, PICES, and UNCOVER), will take place November 3–6, 2009 in Warnemünde, Germany. Co-conveners are Drs. Cornelius Hammer (Germany), Olav Kjesbu (Norway), Peter Shelton (Canada), Gordon Kruse (U.S.A.). Information is available at: www.uncover.edu.
- An International Symposium on “*Biology and management of exploited crab populations under climate change*” will be held in Anchorage, Alaska, from March 10–13, 2009. The Steering Committee Chairman is Dr. Kruse, and further information is available at: <http://seagrant.uaf.edu/conferences/2009/wakefield-crab/index.html>.

Publication

- PICES Scientific Report No. 34 on *Forecasting Climate Impacts on Future Production of Commercially Exploited Fish and Shellfish* edited by Anne B. Hollowed, Richard J. Beamish, Thomas A. Okey and Michael J. Schirripa. This report provides a summary of workshops held in Seattle, U.S.A. in July 2007, in Victoria, Canada in October 2007, and in Gijón, Spain in May 2008.

AGENDA ITEM 7

Status reports of FIS-sponsored groups*Working Group on Ecosystem-based Management Science and its Application to the North Pacific (WG 19)*

WG 19 Co-Chair, Ms. Patricia Livingston, provided a report of the Working Group meeting, final report and follow-on recommendations. WG 19's final report and brochure are both targeted for completion by the end of 2008. The Working Group proposed: (1) a task team (PICES Understanding, Linking and Synthesis of Ecosystems, PULSE) to FUTURE that will carry on ecosystem-based management activities; (2) a study group on "Indicators of Human Well-Being: Benefits and Health" to advise development of future North Pacific Ecosystem Status Reports, and (3) a 1-day MEQ/FIS Topic Session for PICES-2009, titled "*Marine spatial planning in support of integrated management – tools, methods, and approaches*". FIS action on proposal (1) is described under Agenda Items 9 and 10, and on (3) under Agenda Item 9.

Within this portion of the agenda, Dr. Jake Rice presented information on the need to identify vulnerable marine ecosystems of the North Pacific by 2010. FAO expert consultation and Convention on Biological Diversity (CBD) expert workshops were held independently to develop criteria. The results were similar but not identical. It was proposed that PICES could be the scientific credible body to evaluate how well the criteria would work. Dr. Stepanenko mentioned that there will be a new Northwestern Pacific bottom fisheries management organization and the relationship between this organization and PICES would be similar to ICES and NPAFC. A working group could be formed next year. However, Dr. Rice mentioned that CBD will make its recommendations by 2010 so waiting until next year will not be helpful. Japanese FIS members said that they are not prepared to take action or make decisions this year, owing to the short notice of this issue. Therefore, FIS declined to take action regarding potential PICES involvement in this issue.

Dr. Hollowed provided a report of workshop W4 on "*Climate scenarios for ecosystem modeling*" sponsored by CCCC/POC/FIS. A written summary was provided and can be found in the Session Summaries chapter of the PICES 2008 Annual Report. The workshop discussion revolved around how to provide the climate scenarios for modeling of ecosystem effects. The proposal for a PICES/ICES working group on "Forecasting Climate Change Impacts on Fish and Shellfish" was introduced. As this is a global issue, the proposed co-chairs would include both ICES and PICES members. The issues are well defined and several working group meetings are proposed; some would be virtual meetings. The proposal included a symposium to be held in early 2010 with the proceedings to be published in peer-reviewed literature by 2011. This time-critical deadline was chosen in light of the timetable for developing the 2013 IPCC report. In addition to a 2010 symposium, the proposal also included a request for a working group meeting at the GLOBEC Open Science Meeting in June 22–26, 2009 in Victoria, Canada. It was noted that the proposed working group was already approved by ICES. FIS actions on the proposed new working group are reported under Agenda Item 10.

Workshop on "Environmental interactions of mariculture"

Drs. Kevin Amos, Katsuyuki Abo, and Ingrid Burgetz summarized the activities of the workshop on "*Environmental interactions of mariculture*" held April 14–18, 2008 in Victoria, Canada. With respect to marine aquaculture sustainability, North America and Asia perspectives are quite different. The balance between the needs to sustain an important established industry (western North Pacific emphasis), while sustaining marine ecosystems (eastern North Pacific emphasis) is a key consideration to PICES activities in the area of mariculture. Examples of potential beneficial or adverse interactions were presented. It is anticipated that with the growth in global seafood consumption, aquaculture is projected to increase. A working group proposal on "Environmental Interactions of Marine Aquaculture" (WG-EIMA) was presented at an *ad hoc* meeting of proposed Chairs and other interested parties at PICES XVII (*FIS Endnote 3*). Suggested working group members are looking for opportunities to collaborate and share knowledge with other working groups, including WG 19, and HAB-S and others in PICES' next integrated science program, FUTURE. Expected outcomes of the working group were presented. Consistent with the FUTURE Science Plan, there was some emphasis to provide information and results of WG-EIMA available to a wide variety of audiences, including policy makers. Also, a workshop on marine aquaculture was proposed to be held in Korea (perhaps in Busan).

FIS-2008

just prior to PICES-2009. Convenors would be Dr. Lim (Korea) and others to be named. The workshop would include a tour of aquaculture facilities along with presentation of scientific papers. The ability of the working group to complete the proposed Terms of Reference in 3 years was discussed. Proponents have tried to narrow their themes and mentioned that they could narrow further, if necessary. Lack of participation of Chinese members in the aquaculture session at the present PICES Annual Meeting, and whether Chinese participation in the proposed working group would occur, was questioned. The first working group meeting is proposed to be held at PICES-2009 in Jeju, Korea, if approved.

AGENDA ITEM 8

Relations with other international programs and organizations

Dr. Adolf Kellermann, Head of the ICES Science Program, presented an overview of the new (2008) ICES Science Plan and restructuring of the science and advisory systems of ICES. The process started in 2006 with a bottom-up approach from the working groups and top-down perspective from the delegates, clients and member countries. An ICES Strategic Plan was developed in 2007. Its focus is medium-term strategic issues in a 5- to 10-year period. It has 16 research topics in three thematic areas. It draws upon a shared pool of expert groups that report both to the advisory process and to the science program. The 8 existing Science Committees will be disbanded at the end of the year. The new Science Committee will have representatives from each of the member countries and thus will be quite large. The Science Committee will have the power to establish intermediate bodies between expert groups and the Science Committee. Thematic areas include: (1) understanding ecosystem functioning, (2) understanding interactions of human activities with ecosystems, and (3) development of options for sustainable use of ecosystems. Some of the proposed activities are new to ICES so there will be a need to engage the academic community to assist in those. There will be a need for strategic partnering. Climate change is an issue that will require partnering and PICES would be a likely partner.

Dr. Kellermann invited PICES to co-convene joint ICES/PICES theme session on “*Climate impact on marine ecosystems and fish populations on centennial and millennial scales*” during the ICES Annual Science Conference in Berlin in 2009. A PICES co-convenor is requested. Several other co-sponsored symposia in 2009/2010 were mentioned and PICES was offered the opportunity to become a co-convenor for some of them.

Dr. George Hunt presented a report on ESSAS. There is a working group on climate interactions and gadoid–crustacean interactions. Two PICES workshops had ESSAS collaborations this year. Two upcoming ESSAS activities will occur in Seattle, U.S.A. and PICES participation is welcomed. Two activities at the GLOBEC Open Science Meeting in June 2009 in Victoria, Canada, were mentioned that would be of interest to PICES. An ESSAS Open Science meeting in 2011 has been proposed. The PICES Secretariat was requested to provide administrative support for the 2011 meeting (*i.e.*, host a website for the symposium, handle abstract submission and registration). ESSAS also seeks funding in the form of travel support. The linkages between ESSAS and FUTURE were discussed.

FIS actions on proposals for PICES co-sponsorship of upcoming symposia with international organizations are provided under Agenda Item 11.

AGENDA ITEM 9

Proposals for FIS Topic Sessions and Workshops for PICES-2009

The following Topic Sessions were proposed and discussed:

1. *Ecosystem-based approaches for the assessment of fisheries under data-limited situations* (1-day, FIS). (FIS Endnote 4)
2. *Early life stages of marine resources as indicators of climate variability and ecosystem resilience* (1 day, FIS/BIO/FUTURE). (FIS Endnote 5)

3. *Marine spatial planning in support of integrated management – tools, methods and approaches* (1 day, MEQ/FIS). (*FIS Endnote 6*)
4. *Oceanographic and demographic processes affecting reproductive biology of exploited marine stocks* (½ or 1 day, FIS)
5. *Future marine ecosystem predictions from an earth system science perspective* (1 day, POC/FIS/FUTURE). (see *POC Endnote 4*)

After discussion, FIS members agreed to the following Topic Session priorities. Top priority was given to the Topic Session on ecosystem-based approaches (1). The Committee recommended that proposed Topic Sessions on early life history (2) and reproductive biology (4) could be merged into a 1-day session, with ½-day devoted to each topic. Third priority was given to a full-day MEQ/FIS Topic Session on marine spatial planning (3). Finally, lowest priority was given to the POC/FIS/FUTURE Topic Session on future marine ecosystem predictions (5). There was some discussion that a related ICES project on ecosystem-based approaches was recently completed, and someone could be requested as an invited speaker from that project.

FIS considered two workshops:

1. *Marine aquaculture* [later renamed as “*Interactions between aquaculture and marine eco-systems*”] (1 day, MEQ/FIS), with a request for an invited speaker);
2. *Understanding fisheries bycatch, fishing technology, marine ecosystems and new technology for ecosystem based management* [later renamed to *Understanding the links between fishing technology, bycatch, marine ecosystems and ecosystem-based management*] (1 day, FIS).

After discussion, FIS members agreed to support both workshops, with mariculture as the top priority and bycatch as second priority.

AGENDA ITEM 10

Proposals for new FIS Working Groups and Study Groups

FIS received proposals for the following three Working Groups:

1. WG-FCCIFS: *Forecasting Climate Change Impacts on Fish and Shellfish* (co-sponsored by PICES/ICES);
2. WG-EIMA: *Environmental Interactions of Marine Aquaculture*;
3. WG-PCRFM: *Pacific Cod Research and Fisheries Management*.

The proposals for WG-FCCIFS and WG-EIMA were introduced earlier in the agenda during reports from FIS-sanctioned groups (Agenda Item 7).

Dr. Alexei Orlov presented a proposal for a Working Group on “Pacific Cod Research and Fisheries Management” (*FIS Endnote 8*). This Working Group would look at stock structure and management of cod in different regions of the North Pacific. The question was asked about a potential conflict between the proposed AFS publication and the requirement for a PICES scientific report. Because one is peer reviewed and the other is not, it was thought not to be a problem. Suggestions were to hold a workshop first, before a working group is formed. Also, some FIS members suggested that, whereas cod was important, the proposed Working Group is too specific and other cod-like fish should be included. Questions were also raised about the lack of Chinese membership on the proposed Working Group, but it was explained that cod do not extend into Chinese waters. However, subsequent discussion outside the FIS meeting indicated that Pacific cod do extend into Chinese waters. In any case, FIS did not endorse this proposed Working Group at this time. Instead, FIS recommends developing a proposal for a workshop at PICES-2010 to be considered at next year’s FIS business meeting. This workshop proposal could include other gadoids.

FIS recommended approval of the PICES/ICES Working Group on “Forecasting Climate Change Impacts on Fish and Shellfish” (WG-FCCIFS). It was approved last year by FIS, but the proposal was deferred by Science Board until 2008 in order to involve PICES Working Group on *Evaluations of Climate Change Projections*.

FIS-2008

FIS noted that this proposed Working Group is in line with FUTURE goals. A question was raised about the relationship between this Working Group and a possible task team of FUTURE. It was premature for a definitive answer, but the Working Group could possibly evolve into a task team. However, FIS urges that this work needs to proceed and cannot wait for FUTURE to be finalized. Dr. Hollowed recommended a meeting of the proposed Working Group to take place immediately prior to PICES-2009 in Korea.

FIS also recommends approval of the Working Group on “Environmental Interactions of Marine Aquaculture” (WG-EIMA). Previously, FIS was supportive of efforts in this area. The group that developed this proposal was very responsive to previous comments and suggestions by FIS and other PICES committees (see *MEQ Endnote 3* for the meeting report of the proposed Working Group).

Finally, WG-19 has proposed a Task Team called PULSE (PICES Understanding, Linking and Synthesis of Ecosystems). FIS briefly discussed this proposal and was very supportive of PULSE, feeling that efforts in this area should be part of FUTURE. However, until the FUTURE Implementation Plan is further developed, FIS felt it may be premature to adopt a new task team.

AGENDA ITEM 11

Proposals for new meetings with PICES as co-sponsor

PICES was approached to co-sponsor (with NASCO, ICES and NPAFC) a symposium on the marine mortality of salmon in spring 2011. Previously, a proposed date of spring 2010 precluded PICES involvement. It was noted that the NPAFC has not yet agreed to co-sponsor this symposium. Thus, FIS felt that it was premature for FIS to discuss possible PICES co-sponsorship at this time.

FIS discussed a proposal to co-sponsor an international symposium, titled “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*”. PICES and ICES are invited to co-sponsor this symposium, which is part of the Lowell Wakefield Symposium series. Typical sponsors include Alaska Sea Grant, NMFS, Alaska Department of Fish and Game, and the North Pacific Fishery Management Council. Questions were asked about the international nature of the attendees and how the funding support would be used. Could the financial support go to support travel for PICES members from Asian countries? It was explained that Lowell Wakefield Symposia are international symposia with a range of international participation depending on the meeting topic. Two representative examples may be a 2003 symposium on fisheries management on data-limited situations, which included 39 foreign participants from 13 countries and a 1998 symposium on ecosystem considerations in fisheries management, held in conjunction with the American Fisheries Society Annual Meeting, which had 32 foreign participants from 12 countries. Questions were asked about whether funds could be provided with specific earmarks for PICES foreign travel support only. It was explained that 100% of unrestricted funding could be put to work to the symposium, whereas funding with specific spending constraints would need to go through a different process from which overhead would be collected. However, it was suggested that details could be worked out with Alaska Sea Grant, should PICES wish to support this symposium and steering committee members could help prioritize foreign travel by PICES member scientists. Finally, it was pointed out that FAO may about to provide a similar progress report, and it was agreed that inclusion of FAO as a co-sponsor is preferred. There was some concern expressed that this event appeared to be a regionally generated event as opposed to an international one. So, FIS did not endorse support for this symposium.

FIS considered ICES’ offers for PICES to co-sponsor several sessions and symposia. An ICES/PICES theme session on “*Climate impact on marine ecosystems and fish populations on centennial and millennial scales*” was proposed to be held during the ICES Annual Science Conference in Berlin in 2009. FIS recommends PICES co-sponsorship of this session, and will nominate a PICES scientist to be a co-convenor if approved.

An ICES Symposium on “*Carrying capacity: What does it mean in a changing ocean?*” will be held in 2010 in Lisbon, Portugal and PICES is invited to be a co-convenor. FIS recommends PICES support for this symposium by providing a co-convenor.

A Cephalopod International Advisory Council (CIAC) symposium will be held on “*The effects of environmental variability on cephalopod populations*” from September 3–11, 2009, in Vigo, Spain. FIS rates this as a lower priority, and recommends naming a PICES co-convenor only if funding is available.

Concerning the ESSAS Open Science Meeting, The PICES Secretariat did not find any problem with the administrative support requested but financial support could not be committed so far in advance of the 2011 meeting, because its budget is unknown. The question is whether PICES can co-sponsor this event by supporting one or two scientists. Therefore, FIS deferred decision until next year.

A 2010 inter-sessional meeting of the proposed joint PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* was approved by FIS. Publication of the meeting proceedings would occur in 2011.

Finally, a workshop, as part of the GLOBEC Open Science Meeting to be held in Victoria, Canada, in June 2009, for the PICES/ICES working group on *Forecasting Climate Change Impacts on Fish and Shellfish* climate, was also supported.

AGENDA ITEM 12

High priority projects and activities with financial/policy implications

This item was moved forward in the agenda. The key features of the Future Integrative Science Plan (FISP, FUTURE) were reviewed very briefly so as to provide guidance for FIS priority setting concerning topic sessions, workshop, working groups and symposia. Dr. Kruse reminded FIS that FUTURE asks three key questions for setting priorities for research activities: system resilience to natural and anthropogenic forcing, ecosystem response to those, and evaluating how human activities affect coastal ecosystems and how societies are affected by ecosystem changes.

FIS discussed how well the decisions that FIS makes on working groups, topic sessions, and workshops should match with FUTURE goals. It was pointed out that FIS activities are not constrained totally by FUTURE, and other bottom-up activities not totally related to FUTURE could be approved. However, FIS agreed that, in particular, high-priority, long-term activities, such as working groups, should be relevant to FUTURE. Aside from this discussion about priority setting, no time was available for a FIS discussion of the draft FUTURE Implementation Plan or the North Pacific Ecosystem Status Report.

AGENDA ITEM 13

Other priority items with funding implications

None.

AGENDA ITEM 14

Proposed publications

The proceedings of the PICES/ICES Symposium on “*Climate change effects on fish and fisheries*” (to be held in Sendai, Japan in 2010) is proposed for publication in 2011.

AGENDA ITEM 15

Inter-sessional activities, meetings and requests for travel support

No additional requests other than already noted.

FIS-2008

AGENDA ITEM 16

Review of FIS Action Plan

Discussion on this agenda item was cancelled owing to lack of time.

AGENDA ITEM 17

Other business

Japan provided a proposal concerning a change in timing of various activities occurring during the PICES Annual Meeting. The FIS Committee supported a proposal for ½-day Committee meetings instead of the 3½-hour session, at present. FIS discussed ways to conduct its annual business meeting in shorter time. One suggestion was to conduct more business by email. It was pointed out that most FIS decisions concern proposals that arrive immediately prior to, or during, the Annual Meeting. Two options include: (1) the Chairman could summarize implementation of last year's decisions in advance by email and the FIS Committee could simply receive any last minute updates at the annual meeting, and (2) a pre-meeting deadline for all proposals could be established. Item 5 of the proposal from Japan, concerning criteria to convene workshops, was also supported by FIS.

The FIS Committee thanked Dr. Kruse for his service as Committee Chairman for the past 3 years.

FIS Endnote 1

FIS participation list

Members

Richard Beamish (Canada)
Alexander Glubokov (Russia)
Anne Hollowed (U.S.A., alternate for Libby
Logerwell)
Toyomitsu Horii (Japan)
Masahide Kaeriyama (Japan)
Jin Yeong Kim (Korea)
Gordon Kruse (U.S.A., Chairman)
Laura Richards (Canada)
Mikhail Stepanenko (Russia)
Akihiko Yatsu (Japan)
Chang-Ik Zhang (Korea)

Observers

Katsuyuki Abo (Japan)
Kevin Amos (U.S.A.)
Heui Chun An (Korea)
George Boehlert (U.S.A.)
Ingrid Burgetz (Canada)
Alexander Bychkov (PICES)
Jung Hwa Choi (Korea)
Caihong Fu (Canada)
George Hunt (ESSAS)
Yukimasa Ishida (Japan)
Adolf Kellerman (ICES)
Hyun Jeong Lim (Korea)
Tom Okey (Canada)
Samuel Pooley (U.S.A.)
Jake Rice (Canada)
Jake Schweigert (Canada)
Hiroaki Saito (Japan)
John Stein (PICES)
Tokio Wada (PICES)
Inja Yeon (Korea)

FIS Endnote 2**FIS meeting agenda**

1. Welcome of new members, introductions, and nomination of a rapporteur
2. Adoption of agenda
3. Discussion about need for a FIS Vice Chairman
4. Election of new FIS chairman (and vice chairman, if approved)
5. Volunteers for Award Committees for 2008
 - a. FIS Best Presentation Award
 - b. FIS Best Poster
6. FIS Chairman's Report: Implementation of PICES XVI decisions
7. Status reports of FIS-sanctioned groups
8. Relations with other international programs/organizations
9. Proposals for FIS topic sessions and workshops for PICES XVIII
10. Proposals for new FIS Working Groups, Study Groups and Special Projects
 - a. PICES/ICES Working Group on "Forecasting Climate Change Impacts on Fish and Shellfish" (WG-FCCIFS)
 - b. Proposed Working Group on "Environmental Interactions of Marine Aquaculture" (WG-EIMA)
 - c. Proposed Working Group on "Pacific Cod Research and Fisheries Management"
 - d. Others
11. Proposals for new meetings/workshops/conferences with PICES as co-sponsor
12. High priority projects and activities with financial/policy implications
 - a. FUTURE
 - b. North Pacific Ecosystem Status Report
13. Priority items with funding implications (meetings/workshops/conferences)
14. Proposed publications (PICES Scientific Report series and primary journals)
15. Inter-sessional activities and meetings, travel support requests
16. Review of FIS Action Plan
17. Other business

FIS Endnote 3

**Proposal for a Working Group on
Environmental Interactions of Marine Aquaculture (WG-EIMA)
 Final Draft – 9/23/08**

Recommended Co-Chairs: Katsuyuki Abo (Japan), Kevin Amos (U.S.A.), Edward Black (Canada), Ingrid Burgetz (Canada)

Mission Statement

Develop standard methods and tools to assess and compare the environmental interactions and characteristics of existing and planned marine aquaculture activities.

Strategy Statement

The working group should contain expertise corresponding to the three terms of reference (TORs) outlined below. Working sessions on environmental interaction models of marine aquaculture, risk assessment case studies and infectious diseases will be held at PICES annual general meetings (AGMs) and when possible, at other times as needed. A symposium (likely in the third year) will highlight models and information generated by all three TORs to evaluate environmental interactions associated with aquaculture. Final results will be reported as a PICES publication and, hopefully, also in the peer-reviewed literature. The working group will maintain contacts and linkages with PICES WG 21 on *Non-Indigenous Aquatic Species* and two ICES groups (Working Group on *Environmental Interactions of Marine Aquaculture* and Working Group on *Pathology and Diseases of Marine Organisms*).

Goals and Actions (Terms of Reference)

1. Evaluate approaches currently being used in the different PICES countries to assess and model the interactions of aquaculture operations with surrounding environments. This will involve conducting a comparative assessment of the methodologies, applications, and outputs of different approaches to assess finfish, shellfish, seaweed, and/or integrated multi-tropic aquaculture. Assessments of the approaches will include case studies of their application. As the possibilities for different types of aquaculture and their interactions to be assessed are so vast, it is suggested that a process be developed that prioritizes and limits the options. A possible process would:
 - a) List types of aquaculture and identify major culture technologies and related species of highest interest to member states. Select three or four important culture technologies and associated species and assess their environmental effects and associated interactions.
 - c) Review the scientific literature to ascertain if these possible interactions have been determined to be significant.
 - d) Identify methodologies used to predict the effects of these interactions and the history/uncertainty associated with these predictions.
 - e) Examine a variety of institutional decision-making models that are used to limit the effects and associated monitoring and mitigation protocols. (Katsuyuki Abo to lead)
2. Standardize, if considered appropriate, risk assessment methods used to assess environmental interactions of aquaculture and use case studies to compare results among countries in the PICES region. This will be achieved by holding a workshop in the second year to compare and discuss possible standardization of methodologies and the selection of potential case studies for assessment with a standardized approach. Much of the information for this exercise can be derived from “d)” in TOR 1 above. Case studies may then be developed. Responsibilities and functions will be similar to the ICES Working Group on *Environmental Interactions of Mariculture* (WGEIM), so holding a joint meeting with this group will be explored. (Edward Black to lead)
3. Assess methods to detect, identify, evaluate and report on infectious disease events and potential interactions between wild and farmed marine animals. If appropriate, develop a recommended standardized approach for detection/evaluation/reporting from wild and cultured populations. The focus of this activity will be on OIE-notifiable diseases and other infectious diseases of regional/economic importance. Discuss and document new and emerging infectious diseases in the PICES region, methods for their detection, and develop models to conduct risk assessments of their potential impacts on both endemic wild and farmed species. If resources are available it would be advisable to test these models by conducting risk assessments on a few (2–3) emerging pathogens. Responsibilities and functions will be similar to the ICES Working Group on *Pathology and Diseases of Marine Organisms* (WGPDMO), so a joint meeting will be explored. (Kevin Amos to lead)
- 4) As a conclusion to all the above, we propose to hold a PICES session or separate symposium in the third year to present case studies and results, and submit for publication as a PICES document, in appropriate scientific journals, and as a summary paper that examines development and application of aquaculture-environment interaction models.

Additional potential Working Group members (beyond Co-Chairs)

Canada: Simon Jones (3), Mark Higgins (3), Susan Bower (3), Jon Chamberlain (1), Nick Mandrak (2)
Graham Gillespie (2), Dario Stucchi (1)

Japan: Toyomitsu Horii (2), Tamiji Yamamoto (1), Michio Kishi (1)

Korea: Hyun Jeong Lim (2), Oh Hyun Taik (1) Myung Ae Park (3)

Russia: Valery Terekhova (3), Galina Gavrilova (2), (Modeler?)

China: TBD – one for Risk, one modeler, one Pathologist

U.S.A.: Kevin Amos (3), Jim Winton (3), Lori Gustafson, (3), Mike Kent (3), Jill Rolland (3), Jack Rensel (2), Dale Kiefer (2), Mac Rawson (2), C.S. Chen (2), Wendy Hall (3), Bill Fairgrieve (1), Michael Rust (1)

Note: Numbers in () represent term of reference most germane to this persons scientific expertise.

The draft was developed by: Michael Rust, Toyomitsu Hori, Jon Chamberlain, Graham Gillespie, Hyun Jeong Lim, Katsuyuki Abo, with edits by Glen Jamieson, Gordon Kruse, Kevin Amos, Katsuyuki Abo, and Edward Black.

FIS Endnote 4**Proposal for a 1-day FIS Topic Session at PICES-2009 on “*Ecosystem-based approaches for the assessment of fisheries under data-limited situations*”**

The World Summit on the Sustainable Development recommended implementation of the ecosystem-based management by 2010. Achievement of this goal will require holistic assessment and management of fisheries resources and their associated habitat and ecosystems. Therefore, consideration must be given to ecological interactions of target species with predators, competitors, and prey species, bycatch species, interactions between fishes and their habitat, and the effects of fishing on fish stocks and their ecosystems. The challenge associated with implementation of ecosystem-based management is the design of an approach that is capable of capturing the complexity of the system, while at the same time dealing with the varying quality and quantity of available information. The Ecological Risk Assessment for the Effects of Fishing (ERAEF) approach developed by Australia and the Marine Stewardship Council’s Fisheries Assessment Methodology provide two examples of pragmatic approaches. This session encourages contributions that: (1) describe the data and/or information requirements for the application of ecosystem-based assessments, (2) review existing and emerging ecosystem-based assessment methodologies, (3) describe indicators and reference points for these assessments, (4) identify research activities needed for developing an integrated framework for assessments, and (5) discuss indices for evaluating and assessing the ecosystem status and management.

Convenors: Chang-Ik Zhang (Korea), Pat Livingston (U.S.A.), Gordon Kruse (U.S.A.), Yukimasa Ishida (Japan), Laura Richards (Canada) and Mikhail Stepanenko (Russia)

Proposed potential keynote speaker: Keith Sainsbury or David Agnew

Selected oral and poster presentations will be considered to be published in peer-reviewed journal.

FIS Endnote 5**Proposal for a ½-day FIS/BIO/FUTURE Topic Session at PICES-2009 on “*Early life stages of marine resources as indicators of climate variability and ecosystem resilience*”**

As management strategies become more ecosystem-based and climate-driven, there is a need for more information on the role of species interactions and oceanographic variability in regulating fisheries resources. The early life stage of fish and invertebrates has been shown to be critical in determining year class success and subsequent recruitment to the fisheries. This session will examine changes in the abundance, distribution, and ecological relationships of early life stages (eggs to juveniles) of important fish and invertebrate species in relation to climate fluctuations. Studies examining these stages in relation to adult recruitment and their use as indicators of ecosystem stress or variability are encouraged. Examples of the uses of ichthyoplankton or juvenile surveys in the assessment or management of stocks and in forecasting future trends in fisheries are highly encouraged. The convenors especially invite papers that examine the role of early life stage work relative to ecosystem structure and vulnerability of ecosystems to climate change, with particular reference to the processes of recruitment.

Convenors: Suam Kim (Korea), Richard Brodeur (U.S.A.), Douglas Hay (Canada), Yoshiro Watanabe (Japan), Gordon Kruse (U.S.A.), and Vladimir Radchenko (Russia)

Potential invited speakers: Brian McKenzie (Denmark), Ian Perry (Canada), Samuel McClatchie (U.S.A.), Carl van der Lingen (South Africa), others?

FIS Endnote 6

Proposal for a 1-day MEQ/FIS Topic Session at PICES-2009 on *“Marine spatial planning in support of integrated management – tools, methods, and approaches”*

Marine spatial planning is receiving support from a growing number of PICES member countries as a means to develop a strategic approach to offshore ocean usage and resolve spatial conflict issues. While the concepts of integrated management (IM) and supporting marine spatial planning (MSP) are now often referred to at the policy level, there is generally only a vague and patchy understanding of how they might be practically implemented. The most obvious elements of MSP include marine protected or spatially regulated areas designed to meet one or more objectives of IM. This requires identifying and mapping marine features and processes, along with human activities and associated pressures and impacts. The session aims to explore the latest thinking and developments in MSP. Contributions are therefore invited on practical examples of MSP approaches or on any of its sub-components, including:

1. Role of MSP in achieving IM objectives - success stories and problem areas to avoid in practical implementation of MSP;
2. Criteria for identifying, mapping and assessing (based on observations and/or predictions) cumulative impacts of multiple human activities, including theoretical developments on community sensitivity, resilience and other features of ecological significance eg. Mapping of human activities / impacts using spatially-resolved data or model predictions;
3. Criteria and guidelines used to design and locate MPAs to meet cross-sectoral IM objectives, i.e. not just fisheries or nature conservation objectives; included in this are theoretical considerations on interconnectivity amongst these areas; and
4. We are particularly interested in practical examples of marine planning or management systems or processes that bring together any combination of the above.

Convenors: Glen Jamieson (Canada), Chang-Ik Zhang (Korea) and Stuart Rogers (UK)

Proposed invited speaker: Fanny Douvère (IOC, UNESCO, France)

FIS Endnote 7

Proposal for a 1-day FIS Workshop at PICES-2009 on *“Understanding the links between fishing technology, bycatch, marine ecosystems and ecosystem based management”*

Bycatch and discards pose significant problems for sustainable use of living marine resources that are targeted in commercial fisheries. To minimize unintended impacts on the environment, commercial fisheries should strive to increase selectivity by reducing the bycatch and discards of non-target species, as well as undersized commercial species. Research is exploring the effects of fishing gears on ecosystems and developing new technology to minimize unintended impacts. This topic session will focus on bycatch, fishing technology, and gear effects on ecosystems and on recent methodologies to reduce these effects. Particular emphasis will be placed on studies that have changed commercial fishing practices.

Convenors – Heui Chun An (Korea), Patricia Livingston (U.S.A.) and one other.

FIS Endnote 8

Draft PICES proposal to form a Working Group on *Pacific Cod Research and Fisheries Management (PCRFM)*

Proposed Parent Committee: FIS

Acronym: WG-PCRFM

Suggested Co-Chairmen: Woo-Seok Gwak (Korea), Alexei Orlov (Russia), Grant Thompson (U.S.A.)

Background/Rationale

The Pacific cod is one of the most important commercial fish species caught in the North Pacific. Its geographic range spans the Yellow Sea and the northwest Pacific Ocean to the northern Bering Sea and along the northeast Pacific Ocean as far south as California. Within this region, Pacific cod primarily occupy coastal waters of most of PICES member states (Canada, USA, Russia, Japan, and Republic of Korea). In spite of its great commercial importance, the population structure of Pacific cod is not entirely clear. Moreover, present stock status, fluctuations in abundance, and causes of these fluctuations have been poorly studied across its range. In some regions cod stocks are at a low levels, prompting the need for stock recovery measures. Meanwhile, most countries fishing for cod are applying different assessment techniques and different methods to explore population structure. By bringing together experts from various fields of genetics, stock assessment, and fishery management, the overall goal of this working group is to develop the scientific basis for the development of rational harvest strategies of Pacific cod stocks throughout their entire range.

Proposed Terms of Reference

1. Assess the current methods applied by PICES member states to the study of the population structure of Pacific cod. Develop a uniform technique for genetic studies of the Pacific cod and recommend it for application by all PICES member states with a view of attaining comparable results.
2. Compare Pacific cod stock assessment techniques currently in use in PICES member states and evaluate comparability of the results obtained through the use of different methods. Generate advice, if needed, for Pacific cod stock assessments so that they could be further applied to improve the quality of research.
3. Estimate the interannual dynamics of Pacific cod abundance in various parts of the North Pacific and examine contrasting patterns in an attempt to identify potential causative factors.
4. Analyze the present status of Pacific cod stocks in various parts of its range; identify areas where poor stock condition warrant rehabilitation efforts.
5. Review the Pacific cod culturing techniques currently applied in Japan and Republic of Korea, and assess their efficiency for stock enhancement. Evaluate their applicability to Pacific cod stock recovery programs in the other parts of the range.
6. Identify research needs on Pacific cod in the PICES region. Review ongoing and define new research initiatives on Pacific cod. Identify potential high priority Pacific cod research projects that could be done cooperatively by PICES member countries.

Suggested outputs

1. A symposium (most likely after termination of working group activity) summarizing the results of studies on the population structure, stock condition and fishery management of Pacific cod in PICES member countries.
2. Either a PICES Scientific Report or a collection of peer-reviewed papers describing the major outcome of the Pacific cod research conducted by the working group
3. Working group members, in addition to some other fishery scientists, will contribute to a book with a working title "Pacific cod: population structure, stock assessment and fisheries management" to be published by the American Fisheries Society involving scientists from PICES member states harvesting Pacific cod stocks.

Potential Working Group members

Canada: (TBD)

Japan: Yoji Narimatsu, Tetsuya Takatsu, Masaki Ito, Nobuhiro Tezuka, Tetsuhiro Funamoto

Korea: Woo-Seok Gwak, Yeong Hye Kim, Sukgeun Jung

Russia: Andrei Stroganov, Andrei Savin, Kim Sen Tok, Andrei Vinnikov, Pavel Kalchugin, Yuri Poltev, Alexei Orlov

U.S.A. Michael Canino, Brenda Norcross, Lorenz Hauser, Olav Ormseth, Stew Grant, Dan Nichol

REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

The meeting of the Physical Oceanography and Climate Committee (POC) was held from 16:00–19:30 hours on October 29, 2008. The Chairman, Dr. Michael G. Foreman, called the meeting to order and welcomed members and observers (*POC Endnote 1*). Dr. Ichiro Yasuda served as rapporteur. The Chairman welcomed Drs. Dake Chen and Zanggui Wang as new members of the Committee. Several changes were made to the draft agenda in order to accommodate cancellations and additions to the presentations associated with international organizations and programs (Agenda Item 6). The new draft agenda was adopted (*POC Endnote 2*).

AGENDA ITEM 4

Completion of PICES XVI decisions

1. Dr. Foreman gave a presentation at the PICES CFAME Task Team inter-sessional workshop on “*Linking and visualizing climate-forcing mechanisms and marine ecosystem changes: A comparative approach*” and meeting in Honolulu, U.S.A. on April 15–18, 2008, with travel support from PICES.
2. Dr. Foreman co-chaired a session and gave a presentation at the ICES/PICES/IOC Symposium on the “*Effects of climate change on the World’s oceans*”, May 19–23, 2008 in Gijón, Spain.
3. PICES provided partial support for a PICES/CREAMS Summer School on “*Biomass-based management*” at Hokkaido University, Japan in August 23–26, 2008.
4. WG 20 members, Drs. Enrique Curchitser and Foreman, gave presentations at an ESSAS/PICES workshop at the ESSAS Annual Meeting from September 15–19, 2008 in Halifax, Canada.
5. Dr. Angelica Peña gave a presentation in and co-chaired a session on “*Coupled physical and biological models: Parameterization, validation, and applications*” at the ICES Annual Science Meeting in Halifax, September 15–19, 2008.
6. A 1-day CCCC/POC Topic Session on “*Marine system forecast models: Moving forward to the future*” was approved by Science Board for PICES XVII.
7. A 1-day POC Contributed Paper Session was approved by Science Board for PICES XVII.
8. A ¾-day POC Topic Session on “*Coastal upwelling processes and their ecological effects*” proposed for PICES XVII was approved by Science Board.
9. A 1½-day CCCC/POC/FIS workshop on “*Climate scenarios for ecosystem modeling (II)*” was approved by Science Board for PICES XVII.
10. Though approval was granted to provide partial financial support for a CC-S member to attend the International Symposium on “*The ocean in a high CO₂ world*” in Monaco from October 6–8, 2008, the attendee did not need it.

AGENDA ITEM 5

Reports of existing subsidiary bodies and plans for new ones

Section on *Carbon and Climate*

Dr. James Christian, Co-Chairman of the Section on *Carbon and Climate* (CC-S), briefly reported on its annual meeting and requests to be forwarded to Science Board. These included an expansion of the Section to include two new members from Japan, and requests for both a workshop and Topic Session at PICES-2009. A draft Implementation Plan for data synthesis was approved at its annual meeting. The full CC-S annual report, including the full text of the Implementation Plan, is found elsewhere in the PICES 2008 Annual Report.

POC-2008

Advisory Panel on *CREAMS/PICES Program in East Asian Marginal Seas* (CREAMS-AP)

Dr. Yuri Zuenko gave a brief report on the activities of the Advisory Panel in the past year, including its annual meeting at PICES XVII on October 28, an earlier one in Seoul on July 5, a summer school on August 24–25, and plans for the next year including a summer school on “Satellite oceanography”. A full report can be found elsewhere in the PICES 2008 Annual Report.

Working Group on *Evaluation of Climate Change Projections* (WG 20)

Dr. Foreman gave a brief report on the activities of WG 20 over the last year. (The full report is contained in the summary of the WG 20 business meeting found elsewhere in the PICES 2008 Annual Report.) Highlights included: (1) participation at a CFAME Task Team inter-sessional workshop on “*Linking and visualizing climate-forcing mechanisms and marine ecosystem changes: A comparative approach*” in Honolulu in April, (2) participation in the ICES/PICES/IOC Symposium on the “*Effects of global warming on the World’s oceans*” in Gijón, Spain in May, (3) participation in an ESSAS/PICES workshop at the ESSAS Annual Meeting in Halifax, Canada in September, (4) a successful workshop with CFAME and the proposed new ICES/PICES Working Group on *Forecasting Climate Change Impacts of Fish and Shellfish*, (5) a business meeting on October 25 that proposed extending the lifetime of WG 20 for another year, to 2010, proposed a Topic Session for PICES-2009, and discussed the draft implementation plan for FUTURE.

Proposed new ICES/PICES (FIS/POC) Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*

Dr. Foreman presented the background and Terms of Reference (see *POC Endnote 3*) for a proposed new ICES/PICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*. It was resolved that POC would support the creation of this group.

AGENDA ITEM 6

Relations with other international organizations

The following six brief presentations were given.

1. Dr. Dake Chen reviewed the Argo program and requested that PICES take responsibility to construct and supply (*i.e.*, print and mail) a volume of abstracts for the Third Argo Science Workshop to be held in Hangzhou, China, March 25–26, 2009. In return, Argo will ensure that PICES assistance is given full exposure and credit in all advertisements for this meeting, at the meeting itself and on any subsequent reports that emerge.
2. Dr. Dongxiao Wang, member of the Pacific CLIVAR panel, gave a brief summary of WCRP/CLIVAR activities, and described two programs that may be relevant to PICES: i) SPICE (Southwest Pacific Ocean Circulation and Climate Experiment; mainly Australia and New Zealand) and ii) PACSWIN (Pacific Source Water Investigation). Initial investigation will focus on Indonesian seas.
3. Dr. Ken Drinkwater, Co-Chairman of the ESSAS Steering Committee, gave a brief summary of activities for the past year and those planned for 2009/10. He requested travel support for one WG 20/POC member to attend the next ESSAS workshop in Seattle, U.S.A. in June 2009.
4. Ms. Sandy Shan, Secretary of the Pacific Arctic Group (PAG), gave a brief description of her organization and expressed the possibility of future cooperation with PICES. PAG is an independent discussion/information sharing forum for border nations around the Pacific Arctic region whose membership comprises many of the same countries as PICES. Regions of interest overlap in Bering Sea.

AGENDA ITEM 7
POC Action Plan

The Chairman reported that he made minor updates to the POC Action Plan and anticipated more when the FUTURE Implementation Plan was ratified. The Committee agreed that this issue will be reviewed at PICES-2009.

AGENDA ITEM 8
Discussion of the draft FUTURE Implementation Plan

This item was moved to the end of the meeting as it was expected to consume as much time as was available. The Chairman gave a brief summary of the latest draft that was posted on the PICES web page and reviewed issues that he felt were relevant to POC and WG 20. After considerable discussion, the following Committee comments were presented at the FUTURE Open Forum the following evening.

1. There is too much emphasis on forecasting with uncertainties. The Committee is more comfortable with “outlooks” than “forecasts”, though the former term needs to be defined. It was agreed that it is more than a scenario, *i.e.*, it has some reasonable probability of happening.
2. The Plan needs to identify opportunities for forecasting; not just what clients want but what is predictable. First, it should be determined what can be done now (the low hanging fruit), and then what needs more work (understanding) before it could be forecast.
3. We do not want to interfere with existing operational activities in PICES member countries, such as the forecasts given by Japanese and American fisheries agencies.
4. Many forecasts could be quite site-specific and not international. In such cases, what is the role of PICES?
5. The Plan needs more emphasis on “Understanding”. This has to come before the outlook/forecasts. Even though the acronym is FUTURE, we should really think of it as UFTURE.
6. The IPCC AR5 can be considered as a client for the long time scale outlooks/forecasts.
7. We will learn by issuing outlooks/forecasts.
8. The links to the Committees needs to be more explicit. It was suggested that the Committee Vice-Chairs should be members of the FUTURE Steering Committee.

AGENDA ITEM 9
Planning for PICES-2009

Including a POC Paper Session, four Topic Sessions were proposed. See *POC Endnote 4 and WG 20 Endnote 4*. The Committee also approved the request for a CC-S workshop (with invited speaker Dr. Robert Key) and a combined WG 20 workshop and business meeting with no invited speakers.

No possible invited speakers for the Science Board Symposium were put forward.

AGENDA ITEM 10
PICES-2010 theme

The theme suggested by the U.S.A. for PICES-2010 was not available for the Committee meeting and thus was not discussed.

POC-2008

AGENDA ITEM 11

Items with financial implications

Inter-sessional travel requests

After considerable discussions, the Committee agreed to forward the following list of ranked requests for financial support to Science Board:

1. One foreign guest lecturer and 5 non-Korean students for a CREAMS/PICES Summer School on “*Satellite oceanography*”, August 2009, in Seoul, Korea;
2. The PICES Secretariat to prepare and supply (*i.e.*, print and mail) books of abstracts for the third Argo Science Workshop (ASW-3) March 25–26, 2009 in Hangzhou, China;
3. One WG 20 member to attend the ESSAS Annual Meeting June 15–21, 2009 in Seattle, U.S.A.;
4. Some travel support for a CREAM/PICES workshop for the Asian marginal seas contribution to NPESR, February 18–20, 2009 in Seoul, Korea.

Proposed publications for 2009 and beyond

1. CC-S has a special section in the *Journal of Oceanography* scheduled for publication in 2009 with papers arising from their Topic Session on “*Decadal changes in carbon biogeochemistry in the North Pacific*” at PICES XVI in Victoria, Canada.
2. At the inter-sessional Science Board meeting in Seattle, U.S.A., PICES agreed to co-sponsor a special issue on “*Tides in marginal seas – A volume in memory of Prof. Alexei Nekrasov*” in *Progress in Oceanography*. Editors will be Drs. Alexander Rabinovich, Boris Kagan, Michael Foreman, and Josef Cherniawsky. Since that time, the journal has switched to *Continental Shelf Research*. Manuscripts are to be submitted by December 15.

PICES-2009 travel support requests

For PICES-2009, travel support will be requested for 1 invited speaker for each of the four Topic Sessions that POC has agreed to co-sponsor. (At the Science Board meeting, two of those Topic Sessions (*WG 20 Endnote 4* and proposal 3 in *POC Endnote 4*) were switched to workshops and another (proposal 1) was merged with one proposed by CCCC.)

AGENDA ITEM 12

POC Best Presentation and Poster awards

Drs. Ichiro Yasuda, Steven Bograd, and Elena Ustinova acted as judges for the best early career presentation and best poster in the POC Paper Session and POC Topic Session (S6) on “*Coastal upwelling processes and their ecological effects*”. The Best Presentation award was given to Chuanyu Liu (Institute of Oceanology, China) for his presentation (co-authored by Fan Wang) on “*An N-shape thermal front in the western South Yellow Sea in winter*”. The Best Poster award was given to Masatoshi Sato (Tokai University, Japan) for his poster (co-authored by Tokihiro Kono) on “*The 1000 km-scale variability of the dynamic height revealed by Argo CTD data at 40°N in the North Pacific*”.

AGENDA ITEM 13

Other business

No other business was raised.

AGENDA ITEM 14

Adoption of report and recommendations to Science Board

The preceding report has been circulated and approved by all Committee members. All recommendations were brought forward by Dr. Foreman at the Science Board meeting on November 1, 2008.

POC Endnote 1**POC participation list**Members

Steven Bograd (U.S.A.)
 Kyung-Il Chang (Korea)
 Dake Chen (China)
 James Christian (Canada)
 Michael Foreman (Canada, Chairman)
 Shin-ichi Ito (Japan)
 Hee-Dong Jeong (Korea)
 James Overland (U.S.A.)
 Elena Ustinova (Russia)
 Ichiro Yasuda (Japan, Vice-Chairman)
 Yury I. Zuenko (Russia)

Observers

Kenneth Drinkwater (ESSAS)
 Vadim Navrotsky (Russia)
 Hiroaki Saito (Japan)
 Sandy Shan (PAG)
 Dongxiao Wang (CLIVAR)

POC Endnote 2**POC meeting agenda (revised)**

1. Welcome, introductions, opening remarks
2. Changes to, adoption of, agenda and appointment of rapporteur.
3. Welcome new representatives, Drs. Dake Chen and Zhanggui Wang from China
4. Completion of PICES XVI decisions:
 - i) CFAME inter-sessional meeting, Honolulu, April 15–18, 2008
 - ii) ICES/PICES/IOC Symposium on “*Effects of Climate Change on the World’s Oceans*”, May 19-23 2008, Gijón (Spain)
 - iii) PICES/CREAMS summer school “*Biomass-based management*”, August 23–26, Hokkaido University, Hakodate
 - iv) ESSAS annual science meeting, September 15–19, 2008, Halifax, Canada
 - v) ICES annual science meeting September 22–26, 2008, Halifax: co-convener for theme session on coupled modeling
 - vi) Monaco symposium, “*The ocean in a high CO₂ world*”, October 2008
 - vii) CCCC/POC Topic Session “*Marine system forecast models: Moving forward to the FUTURE*” at PICES XVII
 - viii) POC Topic Session “*Coastal upwelling processes and their ecological effects*” at PICES XVII
 - ix) POC Contributed Paper Session at PICES XVII
 - x) POC/CCCC/FIS workshop “*Climate scenarios for ecosystem modeling (II)*” at PICES XVII
5. Reports of existing and plans for new subsidiary bodies
 - i) Progress report of the Section on Carbon and Climate (Christian/Saino)
 - ii) Progress report of the Advisory Panel on CREAMS/PICES Program in East Asian Marginal Seas (Sakurai/Kim)
 - iii) Progress report of WG 20 on Evaluation of Climate Change Projections (Foreman/Yamanaka)
 - iv) Proposed new ICES/PICES WG on Forecasting Climate Change Impacts on Fish and Shellfish
6. Relations with other international organizations/programs:
 - Argo (Dake Chen)
 - WCRP/CLIVAR (Dongxiao Wang)
 - ESSAS (Ken Drinkwater)
 - PAG (Sandy Shan)
7. Discussion of the POC Action Plan
8. Discussion of FUTURE Implementation Plan: Roles for POC and respective member countries

POC-2008

9. Planning for PICES-2009 (“*Understanding ecosystem dynamics, and pursuing ecosystem approaches to management*”) in Jeju Island, Korea
 - Topic/Paper Sessions
 - Workshops for WG 20, CC-S
 - Invited speakers for the Science Board Symposium
10. Theme for PICES-2010 in USA (TBA)
11. Items with financial implications
 - Proposed inter-sessional meetings for 2009 and beyond
 - Proposed publications for 2009 and beyond
 - Travel support requests
 - Other items
12. 2008 POC Best Presentation and Poster award (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 new PICES/ICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish (WG-FCCIFS)*

Proposed Parent Committees

ICES approved the formation of WG-FCCIFS as a permanent working group. FIS will serve as the parent committee for WG-FCCIFS with support from POC. The activities of WG-FCCIFS may be integrated into the PICES FUTURE program as a task team. WG-FCCIFS will report to the ICES Climate Change Steering Group, ICES Oceanography Committee, and the PICES FIS and POC Committees.

Suggested Co-Chairmen

Anne Hollowed (U.S.A.), Manuel Barange (United Kingdom), Suam Kim (Korea), Harald Loeng (Norway). [Suggested Working Group members: James Overland – U.S.A. (ESSAS, PICES POC) , Shin-ichi Ito – Japan (ESSAS, PICES POC), Michael Foreman – Canada (PICES POC), Sang-Wook Yeh – Korea, Thomas Okey – Canada (PEW Trust), Richard Beamish – Canada (NPAFC, PICES FIS), Daniel Duplisea – Canada (ICES), Jason Holt – United Kingdom (QUESTFISH, ICES), Keith Brander – Denmark (ICES, IPCC ecosystem writing team), Jürgen Alheit – Germany (ICES, GLOBEC SPACC)]

Rationale

The work of the FCCIFS Working Group is essential to ensure that ICES and PICES will be able to provide guidance on the potential impacts of climate change on marine ecosystems and the response of commercial fish and shellfish resources to these changes.

The work done within ICES and PICES on climate change and fisheries has been diverse and has included: a) guidance on methods for selection of IPCC scenarios for use in projections; b) techniques for downscaling IPCC scenarios to local regions, c) development of coupled ecosystem models for use in evaluating climate-induced shifts in environmental conditions, d) literature documenting relationships between climate forcing and marine fish and shellfish distribution and production, and e) stock assessment techniques for evaluating management strategies to mitigate the impacts of change. A challenge facing ICES and PICES is the need to integrate all of this research to provide stakeholders with quantitative estimates of the potential impact of climate change on marine life throughout the world. This challenge calls for the establishment of an interdisciplinary research team composed of experts from around the world who will focus attention on the development of common and standardized frameworks for forecasting climate change impacts on marine life

with particular emphasis on commercially important fish and shellfish. ICES and PICES should act now to ensure that our research communities develop the capabilities to provide quantitative contributions to the next IPCC reports and to provide guidance for management under climate change scenarios.

Several case studies will be identified by the Steering Group based on their potential for contributing to methodological development and the opportunity for comparison of marine species and community responses to climate forcing in different ecosystems. Members of the Working Group will be responsible for encouraging the development of regional interdisciplinary teams responsible for the production of forecasts. Members of the working group will provide guidance to the regional teams by providing a framework for the development of the forecasts and communication of new advances in analytical tools. The culmination of the Working Group's effort will be presentation and discussion of results at an inter-sessional meeting and publication of results in a peer reviewed journal by 2011. The timing for the publication is critical because the future IPCC AR5 report is slated for release in 2013 and the IPCC only allows references to published papers.

Proposed Terms of Reference

We recommend that WG-FCCIFS be established to promote and coordinate research on the potential impacts of climate change on marine fish and shellfish around the world.

The working group will:

1. Promote research on climate change impacts on fish and shellfish by scientists in ICES and PICES member nations through coordinated communication, exchange of methodology, and organization of meetings to provide a venue for discussion and publication of results.
2. Develop frameworks and methodologies for forecasting the impacts of climate change on the growth, distribution and abundance of marine life with particular emphasis on commercial fish and shellfish;
3. Review the results of designated case studies to test methods;
4. Hold an inter-sessional symposium in early 2010 where scientists can present, discuss and publish forecasts of climate change impacts on the world's commercial fish and shellfish resources;
5. Establish techniques for estimating and communicating uncertainty in forecasts;
6. Evaluate strategies for research and management under climate change scenarios, given the limitations of our forecasts;
7. Produce publications that could be considered for the Fifth Assessment Report of the Intergovernmental Panel on Climate Change in 2013;
8. Publish a final report summarizing work.

The Working Group will utilize web technology to hold several virtual working group meetings. They will hold an inter-sessional Working Group meeting on June 21, 2009, one day prior to the GLOBEC Open Science meeting in Victoria, Canada. At that meeting members will review the results of designated case studies and discuss the symposium for 2010. The WG-FCCIFS will report by September 2009 for the attention of the ICES Climate Change Steering Group, ICES Oceanography Committee, and the PICES FIS and POC Committees. The WG-FCCIFS will provide the several case studies that will contribute to the PICES FUTURE program.

Working Group members will seek widened participation for this group, including contact with relevant academic and intergovernmental organizations such as fisheries managers, the North Pacific Anadromous Fish Commission, the Intergovernmental Oceanographic Commission, and FAO for the inter-symposium in 2010.

POC Endnote 4

(1.) Proposal for a 1-day POC Paper Session

Papers are invited on all aspects of physical oceanography and climate in the North Pacific and its marginal seas.

Co-convenors: Michael Foreman (Canada) and Ichiro Yasuda (U.S.A.)

No invited speakers.

**(2.) Proposal for a 1-day POC/FUTURE Topic Session at PICES-2009 on
“Future marine ecosystem predictions from an earth system science perspective”**

[later renamed to “Outlooks and forecasts of marine ecosystems from an earth system science perspective:
Challenges and opportunities”]

The prediction of marine ecosystem responses to future climate scenarios is one of the most urgent themes to be conducted in FUTURE. However, the marine ecosystem is part of the earth system and its prediction needs integrated knowledge from physical, chemical, and biological perspectives. Earth system science (ESS) is an interdisciplinary approach that integrates anthropology, atmospheric science, biology, oceanography, geophysics, policy to provide predictions of ecosystem response to climate change. The earth system is complex with nonlinear feedbacks, thresholds responses, and, in some cases, irreversible change. Understanding the mechanisms controlling these system properties is critical to correctly forecast future states of nature in a changing climate. Moreover, conducting large-scale experiments on the earth system is impossible. Therefore, regional marine ecosystem models should include earth system science links that are essential for producing better predictions of marine ecosystem response to future climate scenarios. This session will focus on multidisciplinary coupled models designed to forecast marine ecosystems. Presentations that focus on both long-term and short-term predictions, and that link two or more disciplines (such as physical oceanography, climate, ecosystem dynamics, marine resource management, or socio-economic systems) are welcome.

Co-sponsors: POC/FUTURE

Co-Convenors: Shin-ichi Ito (Japan), Anne B. Hollowed (U.S.A.), Michael G. Foreman (Canada)

Invited speaker: Manuel Barange (GLOBEC IPO, UK)

**(3.) Proposal for a 1-day POC/BIO Topic Session at PICES-2009 on
“Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific”**

Accumulation of anthropogenic carbon and associated changes in ocean chemistry ("ocean acidification") affect all of the world's oceans. Anthropogenic CO₂ has multiple feedbacks to ocean chemistry and biology, such as reduction of calcification, shifts in phytoplankton species composition, and dissolution of particulate or sedimentary carbonates. The carbon system can also be affected by other anthropogenic factors such as changes in river flow and aeolian dust deposition. Carbon and nutrient biogeochemistry will be affected both directly and indirectly by ocean acidification. This session invites papers that address the biogeochemistry of anthropogenic carbon (processes controlling its distribution, processes by which it alters ocean chemistry), other anthropogenic impacts on carbon and nutrient cycles, acidification impacts on marine biota, and feedbacks among these.

Co-sponsors: POC/BIO

Co-Convenors: Toshiro Saino and James Christian

Possible invited speakers: Richard Zeebe (U.S.A.), Yoshihisa Shirayama (Japan) Ken Caldeira (U.S.A.)

**(4.) Proposal for a 1-day POC/BIO Topic Session at PICES-2009 on
“Mesoscale eddies and their roles in North Pacific ecosystems”
[later changed to a workshop]**

Mesoscale eddies move through the ocean carrying physical, biological, and chemical anomalies. They translate over space scales of hundreds to thousands of kilometers and exist for periods lasting from months to years. Eddies found throughout the North Pacific Ocean in association with strong boundary currents like the Kuroshio and Oyashio, and also with North Pacific eastern boundary currents like the California Current and Alaskan Stream. They are also prevalent in marginal seas. Generation and evolution of eddies are thought to be related to the shear instability of jets and boundary currents like the Kuroshio and the Alaskan Gyre, and topographic features in the California Current System.

Mesoscale eddies affect the structure of marine plankton in various ways. Horizontal advection and vertical mixing by eddies contribute to the generation of high chlorophyll concentration off the coast. They draw shelf water containing nutrients and planktons into the deep offshore waters. Mesoscale eddies are also important for survival of larvae. Eddy pumping also plays a role in episodic nutrient injections into the photic zone resulting in enhanced primary production inside the eddy for cyclonic eddies. For anticyclonic eddies, ageostrophic upwelling and divergent Ekman pumping due to winds over the eddies yield upwelling within the eddy.

This session will address:

- Dynamical characteristics of mesoscale eddies in different parts of PICES domain, focusing on their similarity and difference;
- Influences of eddies in constituting the dominant physical forcing on the ecosystems;
- Expected future eddy activities and their possible impacts on North Pacific ecosystems.

Co-sponsors: POC/BIO

Co-Convenors: Kyung-Il Chang (Korea), Shin-ichi Ito (Japan), Vyacheslav Lobanov (Russia), William Crawford (Canada), Michael Dagg (U.S.A.)

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

The meeting of the Marine Environmental Quality Committee (MEQ) was held from 16:00–19:50 hours on October 29, 2008 in Dalian, China. The Chairman, Dr. Glen S. Jamieson, called the meeting to order and welcomed the participants and observers (*MEQ Endnote 1*). Representation was present from all member countries, with eight of 16 Committee members present. The Committee reviewed the draft agenda (*MEQ Endnote 2*), and it was adopted. Dr. Steve Rumrill served as rapporteur.

AGENDA ITEM 3

Implementation of PICES XVI decisions

There were no pressing issues pending for the Committee from last year's Annual Meeting (PICES XVI) in Victoria, Canada. The Chairman briefly summarized the report of the inter-sessional Science Board meeting (April 2008, Seattle, U.S.A.).

AGENDA ITEM 3

Membership and chairmanship of MEQ

There continues to be an overall issue of having full participation in MEQ by all PICES member countries. At this meeting, only 50% of MEQ members were in attendance.

AGENDA ITEMS 3, 4 AND 5

Progress reports of MEQ subsidiary bodies

Section on Ecology of Harmful Algal Blooms in the North Pacific (HAB-S)

Dr. Vera Trainer, HAB-S Co-Chairman, reported on the results of their workshop and laboratory demonstrations (W1) on “*Review of selected harmful algae in the PICES Region: IV. Karenia and Prorocentrum*”; MEQ Topic Session (S3) on “*Species succession and long-term data set analysis pertaining to harmful algal blooms*”, and the HAB-S business meeting convened at PICES XVII. Summaries of the workshop and session can be found in the *Session Summaries* chapter of the PICES 2008 Annual Report.

Several new focus people have been suggested as primary contacts for HAE-DAT entry for their countries. This is necessary due to changes in key people responsible for HAB data in these countries: Akira Ishikawa (Japan) and Weol-Ae Lin (Korea). It was requested that the respective PICES member countries consider appointing these new people to become HAB-S members (or at least be added to the HAB-S e-mail list).

Dr. Trainer indicated that the goal to combine the summaries of Reviews of Important Harmful Algae in a PICES special report is withdrawn, and plans now are to publish them on the web (possibly jointly with IOC), to be completed in approximately 2010–2011. See the full HAB-S report elsewhere in the Annual Report.

Working Group on Ecosystem-based Management Science and its Application to the North Pacific (WG 19)

Dr. Glen Jamieson, WG 19 Co-Chairman, reported on the activities of the Working Group, both at this meeting and at the inter-sessional meeting held February 21–22, 2008 in Seattle, U.S.A. WG 19 held its final meeting on October 26, 2008, in Dalian, China, under the co-chairmanship of Drs. Jamieson, Chang-Ik Zhang, and Ms. Patricia Livingston. The list of participants and the meeting agenda can be found in the complete report of the WG 19 (*WG 19 Endnotes 1 and 2*) elsewhere in the PICES 2008 Annual Report.

MEQ-2008

Discussion primarily involved of the completeness of the final report and the recommendations of the Working Group. Status of the brochure was also discussed. The Working Group went over the different sections of the report and developed a work plan to complete the report by the end of 2008.

WG 19 debated on the format and wording of a brochure. A figure depicting the differences between single sector management, ecosystem-based fishery management and multisector integrated management was suggested, and the Working Group agreed that the term EBM was to be consistently used throughout the brochure, although some mention could be made of the other terms that are in use. There was support for translating the brochure into each of the languages of PICES member countries and making those available on the PICES website. The Working Group also suggested obtaining the perspectives and recommendations of the Study Group on *Communication* about this brochure. Members were tasked with looking at the various brochure sections and providing edited text.

WG 19 discussed the relationship of a new expert group, PULSE (see *WG 19 Endnote 3*), to other potential expert groups of FUTURE and nominated more members. The proposed Study Group on *Indicators of Human Well-being: Benefits and Health* was also discussed (see WG 19 report, Agenda Item 4). The Working Group recommended that the convenors of the S12 Topic Session on “*Connecting the human and natural dimensions of marine ecosystems and methods to mitigate the effects*” bring up this proposed group in the discussion part of their session.

WG 19 received information of the development of a Regional Fisheries Management Organization (RFMO) devoted to international waters in the North Pacific, and a joint Convention on Biological Diversity-International Union for Conservation of Nature (CBD-IUCN) effort that are both considering looking at the application of criteria for designating vulnerable marine ecosystems (VMEs) in North Pacific international waters (see WG 19 report, Agenda Item 5 for further details). The Working Group did not have any comment about a possible PICES role but did agree that species do not recognize national borders and that effective EBM must ultimately extend to international waters. The proposed designation of VMEs in international waters would be a necessary step in the long-term achievement of EBM in the entire North Pacific.

MEQ believes that PICES has the scientific expertise and capacity to evaluate the appropriateness of criteria relevant to determination of VMEs in the North Pacific and to evaluate the adequacy of the information available to apply the criteria. The Committee recommended that this background and observation be presented to Science Board for their consideration of PICES holding a proposed meeting to address the criteria in spring 2009.

Working Group on *Non-indigenous Aquatic Species* (WG 21)

Ms. Darlene Smith, WG 21 Chairman, reported on the third meeting of the Working Group. As part of the initiative funded by Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan, WG 21 held a 4-day Rapid Assessment Survey (RAS) in Dalian on September 20–23, 2008 immediately prior to their Working Group meeting to assess the presence of non-indigenous species. This RAS was led by Dr. Thomas Therriault, with Dr. Lijun Wang (National Marine Environmental Monitoring Center, SOA) as the local organizer. Results of the survey were presented at the Working Group meeting by Dr. Toshio Furota (*WG 21 Endnote 3*).

WG 21 then met on October 24–25, 2008, with 14 WG participants and 9 observers. Given the refocusing of WG 21's work on the two MAFF-funded projects (see WG 21 report elsewhere in the PICES 2008 Annual Report), WG 21 reviewed its current terms of reference and proposed revisions to them to reflect content and duration of the activities under these projects. Progress and details of the MAFF-funded Non-indigenous Species Data Base being developed by Drs. Henry Lee II and Deborah Reusser was described and discussed. It involves the development and population of a database of marine/estuarine species that can be queried for distributional, ecological, and physiological data at different taxonomic levels and spatial distributions.

Judith Pederson presented information on the 6th International Conference on “Marine bioinvasions” to be held August 24-29, 2009 in Portland, Oregon, U.S.A. The conference is entitled “*Marine bioinvaders: Agents of change in a changing world*”. The conference organizers are seeking financial support from PICES, and PICES support was recommended by the MEQ if an active WG 21 member would be appointed to the conference’s science committee. Dr. Thomas Therriault volunteered to serve as this member. Dr. Yoon Lee (Korea) is already a member of the conference’s science committee.

AGENDA ITEM 6

New PICES integrative science program, FUTURE

The Committee, again, had a good discussion of the next integrative science program of PICES and, overall, endorsed the direction as outlined in the latest draft of FUTURE. Members also found that the direction of FUTURE is well aligned with the objectives of MEQ. MEQ, however, stressed the importance of having existing Committees better linked to FUTURE than they were to CCCC, and that members of every Committee should be on FUTURE’s guiding committee; and expressed some concerns about the impact such a large ambitious program might have on PICES’ capacity to do other activities, stressing the need for integration and the need for a clear initial focus.

AGENDA ITEM 8

2008 MEQ Best Presentation and Poster awards

The MEQ Best Presentation award was given to Shang Chen (First Institute of Oceanography, Qingdao, China) for the paper (co-authored by Jian Liu, Tao Xia and Qixiang Wang) entitled “*Change of ecosystem services of the Yellow River Delta Wetland, China*” presented at the MEQ Topic Session (S12) on “*Connecting the human and natural dimensions of marine ecosystems and marine management in the PICES context*”.

The MEQ Best Poster award was given to Yubo Liang (National Marine Environmental Monitoring Center, SOA, Dalian, China for the paper (co-authored by Dongmei Li, Sa Sliu, Xingbo Wang, Tao Song, Xing Miao, Guanhua Chen and Guize Liu) entitled “*Spatial distribution of *Perkinsus olsenii* in the Manila clam *Ruditapes philippinarum* along Chinese coast*” from the MEQ/FIS Topic Session (S5) on “*Mariculture technology and husbandry for alternate and developing culture species*”.

AGENDA ITEM 7

Proposals for new subsidiary bodies

a. Proposal for a Working Group on *Environmental Interactions of Marine Aquaculture (EIMA)*

Proposed Working Group chairs and other interested parties met on October 28 and 29, 2008 in Dalian, China. This meeting was attended by members from Canada, Japan, Korea, Russia and the United States of America. As these were *ad hoc* meetings, there was no formal agenda. Discussions are summarised in *MEQ Endnote 3*, which includes the proposed Terms of Reference. The report was also given to FIS. MEQ supported the proposal presented for the Working Group and recommended its establishment. The Committee noted that the issue of marine aquaculture continues to be of great interest to all PICES member countries.

The summary of MEQ/FIS Topic Session (S5) on “*Mariculture technology and husbandry for alternate and developing culture species*” can be found in the Session Summaries chapter of the PICES 2008 Annual Report.

b. Proposal for a Study Group on *Indicators of Human Well-Being: Benefits and Health*

WG 19 proposed (see WG 19 report elsewhere in the PICES 2008 Annual Report) that because socio-economic issues seem to be integral to the activities of so many Working Groups, establishment of a Study Group on *Indicators of Human Well-Being: Benefits and Health* under Science Board is recommended.

MEQ-2008

MEQ also considered advice on the structure and content of future North Pacific Ecosystem Status Reports, and specifically the inclusion of EBM-related topics in status reports. An incremental version of NPESR is being recommended by Science Board, and the Committee agreed that enhanced information on pollution and socio-economics should be considered for inclusion. The Committee discussed the need to identify key pressures in each region, and how indicators on status and trends describing human well-being should be determined, and concluded that further review on these topics is needed. The Committee recommends the establishment of a PICES Study Group on “*Indicators of Human Well-Being: Benefits and Health*” to assist in this effort. Terms of Reference suggested by WG 19 are provided in *MEQ Endnote 4*. Criteria for nomination of membership, if the Study Group is approved, are suggested to be qualified social scientists, primarily those with strong economics background, with understanding of natural science, particularly marine science, who are working on questions relating to marine ecosystem approaches and management issues (*MEQ Endnote 4*).

AGENDA ITEM 9

Proposals for Topic Sessions and workshops at PICES-2009

The Committee proposes that the following Topic Sessions and workshops to be convened at PICES-2009:

- a ½-day MEQ Topic Session on “*Mitigation of harmful algal blooms*” (*HAB-S Endnote 5*);
- a ½-day MEQ Topic Session on “*The role of submerged aquatic vegetation in the context of climate change*” (*MEQ Endnote 5*);
- a 1-day MEQ/FIS Topic Session on “*Marine spatial planning in support of integrated management – tools, methods, and approaches*” (*MEQ Endnote 6*);
- a ½-day MEQ workshop on “*Cyst forming HAB species*” [later renamed to “*Review of selected harmful algae in the PICES region: V. cyst forming HAB species*”] preceded by a 1-day laboratory demonstration (*HAB-S Endnote 4*);
- a 1-day MEQ/FIS Workshop on “*Advanced aquaculture strategies and technologies and interactions between aquaculture activity and environment*” [later renamed as “*Interactions between aquaculture and marine eco-systems*”].

AGENDA ITEM 10

Theme for PICES-2010

No suggestions were presented.

AGENDA ITEM 11

Relations with other international programs and organizations

- MEQ recommended that PICES co-sponsor, with ICES and FAO, the Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*” in consideration of it being an international topic and of substantial interest to PICES;
- presentation was made by Dr. Ruduolf Wu, representing GESAMP (Group of Experts on Scientific Aspects of Marine Environmental Protection), on potential areas for collaboration with PICES.

AGENDA ITEM 12

Items with financial implications

Proposed inter-sessional meetings

The following inter-sessional meetings were endorsed by MEQ:

- 6th International Conference on “*Marine bioinvasions*” (co-sponsored by ICES, PICES, U.S. National Sea Grant College Program, Pacific States Marine Fisheries Commission and Portland State University), August 24–27, 2009, Portland, U.S.A.;
- 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*” (primary sponsor: Alaska Sea Grant; co-sponsored by PICES), spring or fall 2010, Anchorage, U.S.A.

Proposed publications

The following publications, discussed at last year’s PICES Annual Meeting, are still proposed but are now expected to be published in 2008–2009:

- a final report of Working Group on *Ecosystem-based Management Science and its Application to the North Pacific* (WG 19) in the PICES Scientific Report series (2009);
- a WG 19 brochure on ecosystem-based management (2009) in a format similar to the FERRRS Advisory Report brochure.

Travel requests

- Invited speakers (up to \$10,000) from the Pacific and early career scientists from PICES member countries to attend the 6th International Conference on “*Marine bioinvasions*”, August 24–27, 2009, Portland, U.S.A.;
- 2 non-American PICES members to co-convene the 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*”, spring or fall, 2010, Anchorage, U.S.A.;
- 1 invited speaker for the MEQ Workshop on “*Review of selected harmful algae in the PICES region: V. Cyst forming HAB species*” at PICES-2009;
- 1 invited speaker for the MEQ/FIS Workshop on “*Interactions between aquaculture activity and environment*” at PICES-2009.

MEQ Endnote 1

MEQ participation list

Members

Chuanlin Huo (China)
 Glen Jamieson (Canada, Chairman)
 Hak-Gyoon Kim (Korea)
 Kunio Kohata (Japan)
 Olga Lukyanova (Russia)
 Steve Rumrill (U.S.A.)
 Darlene Smith (Canada)
 Yasunori Watanabe (Japan)

Observers

Katsuyuki Abo (Japan)
 Kevin Amos (U.S.A.)

Ingrid Burgetz (Canada)
 David Fluharty (U.S.A.)
 Graham Gillespie (Canada)
 Yoichiro Ishibashi (Japan)
 Masaa Katoh (Japan)
 Du Niu (China)
 Jeung Sook Park (NOWPAP)
 Jake Rice (Canada)
 Peter Ross (Canada)
 Tatyana Semenova (Russia)
 Gongke Tan (China)
 Tom Therriault (Canada)
 Vera Trainer (U.S.A.)
 Mark Wells (U.S.A.)
 Ruduolf Wu (GESAMP)

MEQ Endnote 2

MEQ meeting agenda

1. Welcome and introductions.
2. Approval of agenda.
3. Progress report of the MEQ Section on *Ecology of harmful algal blooms in the North Pacific and HAB activities related to "Development of the prevention system for harmful organism's expansion in the Pacific Rim"* supported by a special fund from the Government of Japan" [Trainer]
4. Progress report of MEQ/FIS WG 19 on *Ecosystem-based management science and its application to the North Pacific* [Jamieson]
5. Progress report of MEQ WG 21 on *Non-indigenous Aquatic Species and NIS activities related to "Development of the prevention system for harmful organism's expansion in the Pacific Rim"* supported by a special fund from the Government of Japan" [Smith and Radashevsky]
6. Discussion on the next major PICES scientific program, FUTURE: Roles for MEQ and respective member countries, i.e. MEQ Strategic/Action Plan [Jamieson]
 - a) Task Team on "*PICES Understanding, Linking and Synthesis of Ecosystems*" (PULSE) (Jamieson)
 - b) Support from MEQ for the Identification of Ecologically and Biologically Sensitive Areas in international waters in the North Pacific (Rice)
7. Proposals for new subsidiary bodies (e.g., Working Groups, etc.; requires Terms of Reference and list of potential members)
 - a) WG on *Environmental interactions of mariculture (WGEIMA)* (Amos and Burgetz)
 - b) SG on *Indicators of Human Well-being: Benefits and Health (SGHWB)* (Jamieson)
8. 2008 MEQ Best Presentation and Poster awards
9. Proposals for Topic Sessions and workshops at PICES-2009 in Korea (Jeju Island)
10. Suggestions for the theme for PICES-2010 in the USA.
11. Relations with other international organizations/programs
12. Items with financial implications
 - a) Proposed inter-sessional meetings for 2009 and beyond
 - b) Proposed publications for 2008 and beyond
 - c) Travel support requests
13. Other business

Note: I would like to remind everyone that Science Board will not be considering unfinished proposals for topic sessions, working groups, or meetings. The minimum requirements for topic sessions at PICES 18 (Jeju Is., Korea), which have to be discussed at our meeting, are:

1. Title
2. Duration
3. Convenors (the names listed have agreed to do this)
4. Description of session

MEQ Endnote 3

**Meeting report for proposed Working Group on
Environmental Interactions of Marine Aquaculture (EIMA)
October 28, 2008**

Meeting summary

1. Introductions and Context. Each meeting participant provided some background as to their personal and their countries' interest in marine aquaculture, and how this may fit within the context of the proposed working group and the terms of reference that were developed in April 2008. Broad descriptions of the type of marine aquaculture and challenges were provided, primarily by Japan and Russia. This was due primarily to limits in the available time and was provided as part of general context and background as to the areas of interest in marine aquaculture science, rather than as part of country-specific reporting. A summary of the information shared is provided as an Annex (EIMA Meeting Annex 2).
2. Discussion on Proposed Terms of Reference: The remainder of the meeting on October 28 focused on the four activities being proposed to the MEQ and FIS committees. The following refinements were made to the terms of reference that were presented at the end of *Session 5: Mariculture technology and husbandry for alternate and developing culture species*.
 - a. Term of Reference 1: *Inventory* and evaluate current approaches of PICES members to assess and model aquaculture- environment interactions.
Although the first proposed activity under this TOR was to list types of aquaculture and culture technologies, it was felt that expanding the overall TOR to include an inventory provided additional clarity as well as the possibility of a useful additional deliverable.
 - b. Term of Reference 2: For clarification, included wording to specify the application of scientific methods for risk assessment methodologies and their application in PICES member countries.
 - c. Term of Reference 3: no substantive changes or additions.
 - d. Term of Reference 4: The importance of linking to other existing PICES working groups was added to this activity. As there is an abundance of expertise in oceanographic modeling which will be critical to include as part of the first term of reference in relation to aquaculture activities, there is the possibility of linking to activities already underway. Additionally, there are linkages to WG-21 (*Non-indigenous species*) and WG-19 (*Ecosystem Based Management Science*) and the FUTURE Science program.
3. As part of a general discussion regarding next steps, the possibility of putting in a request for a session or workshop at the next PICES meeting was considered, as was the utility of site tours of marine aquaculture facilities.
4. On October 29, a brief meeting was convened to discuss the proposal developed by Hyun-Jeong Lim (Republic of Korea) for a workshop "*Advanced aquaculture strategies and technologies and its effects (interactions between aquaculture activity and environment)*". The participants at this impromptu meeting concluded that the proposal that had been developed was of interest to the group and would be useful in advance of the PICES XVIII meeting in Korea next year.

EIMA Meeting Annex 1**EIMA meeting participants**

Katsuyuki Abo (Japan)
Kevin Amos (U.S.A.)
Ingrid Burgetz (Canada)
Marsha Gear (U.S.A.)
Toyomitsu Horii (Japan)
Hyun-Jeong Lim (Korea)
Olga Lukyanova (Russia)

EIMA Meeting Annex 2

Context, opportunities and interests in marine aquaculture science

Some information was shared as part of the introductory discussion on the type of marine aquaculture that is currently being practiced in some regions as well as the future directions for the industry in these regions. Although the information that was shared was not meant as a complete overview of the industry within any given country, it does provide useful information on the background and areas of interest that could be built on as part of any future EIMA working group.

As such, the information captured below may be considered for use as a starting point for any future country-specific descriptions. **The information is not meant to be comprehensive nor did each representative at the meeting provide background information of this sort.**

Japan

Marine aquaculture in Japan is primarily comprised of small, hereditary, family businesses located in areas with very low water exchange and in close proximity to other aquaculture activities (e.g., very intensive). Increasingly, there is a shift to open ocean farming of higher-value fish (e.g., tuna), which will require both a shift in practices from small family businesses and a concurrent application of environmental models to guide placement of new activities.

For both the current and future marine aquaculture activities require the identification of good indicators that can be used to monitor the environment and provide a baseline for environmental improvements. There is also a need for the identification of the factors that are most important prior to application of models for expansion into new areas.

Another area of interest is the use of marine aquaculture for stock enhancement activities, although it was recognized that this area of activity requires different approaches and models than for

Russia

Marine aquaculture production is being undertaken along the coastal areas of the Japan Sea. Currently, there is interest in the development of aquaculture in this region beyond the limited production that is currently taking place.

In the coming years, aquaculture research studies will be focusing on efficient technologies for growing invertebrates and salmons, disease challenges, ecological aspects (carrying capacity for different trophic groupings) and risk assessment for mariculture activities.

United States of America

Under the new aquaculture program at the NOAA Fisheries Service, there is increased interest in scientific information related to the interactions between aquaculture activities and the environment. As well, there are research programs and projects focusing on disease challenges, enhancement activities and on-land aquaculture are being funded.

DRAFT 6 – 10/28/08

**DRAFT PICES Action Plan to form a Working Group on
Environmental Interactions of Marine Aquaculture - EIMA**

Recommended Co-Chairs: Ingrid Burgetz (Canada), Katsuyuki Abo (Japan), Kevin Amos (U.S.A.)

Mission statement

Develop standard methods and tools to assess and compare the environmental interactions and characteristics of existing and planned marine aquaculture activities in PICES member countries.

Strategy statement

The working group should contain expertise corresponding to the three terms of reference (TORs) outlined below. Working sessions on environmental interaction models of marine aquaculture, risk assessment case studies and infectious diseases will be held at PICES annual general meetings (AGMs) and when possible, at other times as needed. A symposium (likely in the third year) will highlight models and information generated by all three TORs to evaluate environmental interactions associated with aquaculture. Final results will be reported as a PICES publication and, hopefully, also in the peer-reviewed literature. The working group will maintain contacts and linkages with PICES working groups 19 (*Ecosystem Based Management Science*) and 21 (*Non-indigenous Species*), and two ICES groups (Working group on Environmental Interactions of Marine Aquaculture and Working Group on Pathology and Diseases of Marine Organisms).

Terms of Reference

1. Evaluate approaches currently being used in the different PICES countries to assess and model the interactions of aquaculture operations with surrounding environments. This will involve conducting a comparative assessment of the methodologies, applications, and outputs of different approaches to assess finfish, shellfish, seaweed, and/or integrated multi-tropic aquaculture. Assessments of the approaches will include case studies of their application. As the possibilities for different types of aquaculture and their interactions to be assessed are so vast, it is suggested that a process be developed that prioritize and limits the options. A possible process would:
 - a) List types of aquaculture and identify major culture technologies and related species of highest interest to member states. Select three or four important culture technologies and associated species and assess their environmental effects and associated interactions.
 - b) Review the scientific literature to ascertain if these possible interactions have been determined to be significant.
 - c) Identify methodologies used to predict the effects of these interactions and the history/uncertainty associated with these predictions.
 - d) Examine a variety of institutional decision-making models that are used to limit the effects and associated monitoring and mitigation protocols. (Katsuyuki Abo to lead.)

2. Review and assess current, risk assessment methods used to assess environmental interactions of aquaculture and determine what, if anything, should be changed for application in PICES countries to reflect ecosystem-specific aspects. Following the review and assessment, identify appropriate use case studies to compare results among countries in the PICES region. This will be achieved by holding a workshop in the second year to compare and discuss possible standardization of methodologies and the selection of potential case studies for assessment with a standardized approach. Much of the information for this exercise can be derived from “c)” in TOR 1 above. Case studies may then be developed. Responsibilities and functions will be similar to the ICES Working Group on Environmental Interactions of Mariculture (WGEIM), so holding a joint meeting with this group will be explored. (Edward Black to lead)

3. Assess methods to detect, identify, evaluate and report on infectious disease events and potential interactions between wild and farmed marine animals. If appropriate, develop a recommended standardized approach for

MEQ-2008

detection/evaluation/reporting from wild and cultured populations. The focus of this activity will be on OIE-notifiable diseases and other infectious diseases of regional/economic importance. Discuss and document new and emerging infectious diseases in the PICES region, methods for their detection, and develop models to conduct risk assessments of their potential impacts on both endemic wild and farmed species. If resources are available it would be advisable to test these models by conducting risk assessments on a few (2-3) emerging pathogens. Responsibilities and functions will be similar to the ICES Working Group on Pathology and Diseases of Marine Organisms (WGPDMO), so a joint meeting will be explored. (Kevin Amos to lead)

4. As a conclusion to all the above, we propose to hold a PICES session or separate symposium in the third year to present case studies and results, and submit for publication as a PICES document, in appropriate scientific journals, and as a summary paper that examines development and application of aquaculture-environment interaction models.

Additional potential Working Group members (beyond Co-Chairs)

Canada – Simon Jones (3), Mark Higgins (3), Stewart Johnson (3), Jon Chamberlain (1), Nick Mandrak (2)
Graham Gillespie (2), Dario Stucchi (1) Edward Black (2)
Japan – Toyomitsu Horii (2), Tatamiji Yamamoto (1), Michio Kishi (1) (Pathologist?)
Korea – Hyun Jeong Lim (2), Oh Hyun Taik (1) Myung Ae Park (3)
Russia – Valery E. Terekhova (3), Galina S.Gavrilova (2), (Modeler?)
China – TBD – one for Risk, one Modeler, one Pathologist
U.S.A. – Kevin Amos (3), Jim Winton (3), Lori Gustafson, (3), Mike Kent (3), Jill Rolland (3), Jack Rensel (2), Dale Kiefer (2), Mac Rawson (2), C.S. Chen (2), Wendy Hall (3), Bill Fairgrieve (1), Michael Rust

NOTE: Numbers in () represent term of reference most germane to this persons scientific expertise.

MEQ Endnote 4

Proposed Terms of Reference for a new Study Group on “Indicators of Human Well-Being: Benefits and Health”

1. Identify potential indicators of human-well being and human impacts in relation to PICES marine ecosystem status and trends. Evaluate the Millennium Ecosystem Report Indicators for their appropriateness
2. How might these measures be quantified and standardized across member countries? Are the data available to quantify these?
3. How can these measures be used in ecosystem models and management strategy evaluation frameworks?
4. Identify longer-term issues that might be covered by a working group on this topic (governance structures for implementation, *etc.*).

Suggested Co-Chairs: Makino Mitsutaku (Japan) and David Fluharty (U.S.A.)

Suggested members:

Shang Chen (China)
Keith Criddle (U.S.A.)
Dohoon Kim (Korea)
Olga Lukyanova (Russia)
Ian Perry (Canada)
Chang Seung (U.S.A.)
TBD (Japan)

MEQ Endnote 5

Proposal for a ½-day MEQ Topic Session at PICES-2009 on
“The role of submerged aquatic vegetation in the context of climate change”

This session is to focus on the practical measures utilizing submerged aquatic vegetation (SAV) such as seaweeds and sea grasses in coping with climate change in coastal regions. We would like to discuss immediate and practical SAV measures that mitigate and adapt against global warming and sea level rise. Participants will present work highlighting their ideas on such practical measures against climate change and global warming as well as on other pertinent subjects.

Convenors: Fred Short (U.S.A.), and (2 TBD) and Ik-Kyo Chung (Korea)

MEQ Endnote 6

Proposal for a 1-day MEQ/FIS Topic Session on
“Marine spatial planning in support of integrated management – tools, methods, and approaches”

Marine spatial planning is receiving support from a growing number of PICES member countries as a means to develop a strategic approach to offshore ocean usage and resolve spatial conflict issues. While the concepts of integrated management (IM) and supporting marine spatial planning (MSP) are now often referred to at the policy level, there is generally only a vague and patchy understanding of how they might be practically implemented. The most obvious elements of MSP include marine protected or spatially regulated areas designed to meet one or more objectives of IM. This requires identifying and mapping marine features and processes, along with human activities and associated pressures and impacts. The session aims to explore the latest thinking and developments in MSP. Contributions are therefore invited on practical examples of MSP approaches or on any of its sub-components, including:

1. Role of MSP in achieving IM objectives - success stories and problem areas to avoid in practical implementation of MSP;
2. Criteria for identifying, mapping and assessing (based on observations and/or predictions) cumulative impacts of multiple human activities, including theoretical developments on community sensitivity, resilience and other features of ecological significance eg. Mapping of human activities / impacts using spatially-resolved data or model predictions;
3. Criteria and guidelines used to design and locate MPAs to meet cross-sectoral IM objectives, i.e. not just fisheries or nature conservation objectives; included in this are theoretical considerations on interconnectivity amongst these areas; and

We are particularly interested in practical examples of marine planning or management systems or processes that bring together any combination of the above.

Convenors: Glen Jamieson, (Canada), Chang-Ik Zhang (Korea) and Stuart Rogers (UK)

Proposed Invited Speaker: Fanny Douvère, Intergovernmental Oceanographic Commission, UNESCO, Paris, France

REPORT OF TECHNICAL COMMITTEE ON DATA EXCHANGE

The meeting of the Technical Committee on Data Exchange (hereafter TCODE) was held from 16:00–19:30 hours on October 29, 2008. The Chairman, Dr. Bernard A. Megrey and Co-chairman Dr. Kyu-Kui Jung, called the meeting to order and welcomed the participants. The meeting was attended by 7 TCODE members and 1 observer representing PICES member countries and international organizations (*TCODE Endnote 1*). Mr. S. Allen Macklin served as the rapporteur. The Committee reviewed the provisional agenda and adopted it without changes and additions (*TCODE Endnote 2*).

AGENDA ITEM 3

Review progress on items in the 2007/2008 work plan

a) Support of HAB-S work

Mr. Robin Brown reported that work on the HAE-DAT database is proceeding slowly. A prototype is about to be released and the interface looks good. He will remind TCODE members when it becomes available. This project supports the FUTURE program as well as collaborations between ICES and PICES. It may be combined with other databases such as taxonomic, ASFA extractions, and expertise contacts. Mr. Brown will solicit information for a metadatabase link to the HAB database for the PICES MDF (Metadata Federation).

b) Organization of scientific and e-poster sessions at PICES XVII

A 1-day MONITOR/TCODE/BIO Topic Session (S2) on “*Linking biology, chemistry, and physics in our observational systems – present status and FUTURE needs*” took place on October 30. This session was organized and convened by Drs. Hernan E. Garcia (TCODE-U.S.A.), David L. Mackas (MONITOR-Canada), S. Allen Macklin (TCODE-U.S.A.), Jeffrey M. Napp (MONITOR-U.S.A.), Young-Jae Ro (MONITOR-Korea) and Toru Suzuki (TCODE-Japan). There was a good selection of submissions (18 oral, 21 posters and some oral presentations had to be turned into posters. Three submissions were sent to a different session. TCODE invited Professors Yasuhiro Yamanaka and Fei Chai to be the keynote speakers. The meeting schedule and meeting report can be found in the Session Summaries chapter of this Annual Report. Best presentation was awarded to early career scientist Hoa Ma (Third Institute of Oceanography, China) on his paper (co-authored by Mingduan Yin, Liqi Chen, Jianhua He, Wen Yu, and Shi Zeng) “*Upper ocean export of particulate organic carbon in the Bering Sea estimated from thorium-234*”. Best poster was awarded to In-Seong Han (NFRDI, Korea) on his paper (co-authored by Young-Sang Suh, Lee-Hynn Jang and Ki-Tack Seong) “*Ship of opportunity monitoring for short-term variability of the thermohaline front across the Jeju Strait*”.

c) Cooperation with ICES Working Group on Data and Information Management (WGDIM)

TCODE was invited to give a presentation at the 2008 ICES Annual Science Conference held from September 22–26 in Halifax, Canada in Session R: “*Environmental and fisheries data management, access, and integration*” which was convened by Christopher Zimmermann (Germany), Helge Sagen (Norway), and Peter H. Wiebe (U.S.A.). Dr. Megrey gave a presentation titled “*Pacific-wide marine metadata discovery, management and delivery: The PICES Metadata Federation*”. He also discussed TCODE activities at the ICES Working Group on *Data and Information Management* (WGDIM) spring meeting. The ICES WGDIM has similar data functions as TCODE but they also manage data. There appear to be many areas of mutual interest and possible collaborations. However, compared to PICES, it is more difficult to get compliance and agreement within WGDIM because there are 23 member countries in ICES.

TCODE-2008

Dr. Megrey also met WGDIM leadership and there was interest in establishing a cooperative project. A proposal for a joint topic session at the 2010 ICES ASC meeting was prepared (*TCODE Endnote 3*). Dr. Megrey also suggested that TCODE and WGDIM sponsor a joint session at PICES-2009 in Portland, U.S.A.. TCODE will request that Dr. Georgiy Moiseenko be supported by PICES to go to next ICES ASC in September 2009 and the next WGDIM meeting in May 2009.

d) PICES Metadata Federation Project

The PICES TCODE GeoNetwork based portal was discussed. Dr. Igor Schevchenko described a TINRO effort to create data catalogs for internal use. They explored different technologies for their creation and are using the AdHost service and NSDI-based technology. They have templates for metadata creation, z-servers were setup and maintained, and documentation is available on how to do this. TINRO also explored GeoNetwork (open source) cataloging and map services. Nodes have been created on AdHost, TINRO and VNIRO servers. Future work will involve migrating PICES METFED data, refine administrative and harvest policies, promote the project among PICES, and increase the visibility of the PICES catalog and map services. The GeoNetwork application is more flexible and more powerful than NSDI technology. A complete manual is available for the GeoNetwork Community. Dr. Megrey reported that there is good PICES country representation on the NSDI Clearinghouse server. The server is also being used to help assist in the preparation of the second North Pacific Ecosystem Status Report and some files from the PICES Digital Library have been transferred.

A request was made to continue the AdHost contract. Dr. Megrey will submit a request for \$2340 for another year. After the coming year, this expense should be moved from an annual TCODE recommendation to a line item in the Secretariat budget. Backup services are not yet provided. The AdHost cost is high at \$1800/yr. Other providers are available at \$50/month. TINRO may be able to provide backup at no cost. Dr. Schevchenko will explore this.

On last year's Action Plan was the proposal to test the PICES clearinghouse nodes' performance and to run an experiment on accessing clearinghouses from different locations using different national representatives. No progress has been made. Now that PICES MDF has migrated to the AdHost server, this test should be performed on the AdHost server and the activity will be placed on next year's work plan.

Mr. Brown reported on metadata recording in Canada. It has not happened yet because of ongoing internal work on Canadian metadata, bilingual requirements, *etc.* In the near term, these will become available for the PICES MDF, even while Canada is still figuring out how to serve it themselves.

There have been updates to the PICES Technical Report. Two addenda have been created: Addendum 1: Instructions for Isite for Windows and Addendum 2: Instructions for Isite for Windows AdHost.

A short update on the status of China joining the PICES MDF was given. Originally, China could not open a server port due to security. This was part of the motive for renting the AdHost server. China successfully became an AdHost registered node over the summer.

A meeting of the PICES MDF members was held prior to the TCODE meeting. Mr. Allen Macklin reported on the outcome of that meeting (*TCODE Endnote 4*). Highlights include plans to import additional metadata from KODC, MIRC and NMDIS using templates, importing Canadian DFO metadata, publicizing the PICES Metadata Federation through TCODE representatives, teaching a module at the PICES Summer School on *Satellite Oceanography* in 2009, writing an article for *PICES Press*, creating a PICES Projects web page, and advertising the portal at the PICES 18th Annual Meeting, October 2009.

AGENDA ITEM 4

Coordination of activities with MONITOR

There was no report on the MONITOR Action Plan. However, there is mention of merging TCODE, MODEL Task Team and MONITOR into one committee.

AGENDA ITEM 5

Report on PICES representation at the 7th NOWPAP DINRAC Focal Points Meeting

Dr. Toru Suzuki, who represented TCODE at the meeting of the Northwest Pacific Action Plan – Data and Information Network Regional Activity Center (NOWPAP – DINRAC) on May 13–14, in Beijing, China provided a report. NOWPAP–DINRAC, Beijing, now serves as the NOWPAP Clearinghouse. At this meeting, Dr. Suzuki discussed the PICES activities of TCODE and MDF. DINRAC is running an Oracle metadatabase, however, major bugs and expenses remain. A question was asked if there is metadata redundancy between NOWPAP and PICES. PICES GeoNetwork can harvest NOWPAP metadata and serve it through a NOWPAP instance of GeoNetwork. TCODE should propose to NOWPAP that we harvest their metadata. This item will appear on next year's work plan.

AGENDA ITEM 6

The 20th Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XX)

To improve relations between TCODE and IODE, TCODE plans to send a representative to the IODE-XX meeting to be held in Tianjin, China from May 4–8, 2009. Mr. Ruguang Yin, China's TCODE member, will be asked to attend. No travel support will be required as Mr. Yin lives in Tainjin. The TCODE Chairman will explore the meeting agenda to see what TCODE activities Mr. Yin might present.

AGENDA ITEM 7

Annual Country Reports

Members submitted their reports and these have been placed on the TCODE web page.

AGENDA ITEM 8

PICES future integrative scientific program

TCODE is pleased to support PICES' future integrative scientific program, FUTURE. However, several questions were raised: Where does TCODE fit and what roles would TCODE play? How do MONITOR and TCODE cooperate on developing the necessary observation delivery system? TCODE should not be responsible for delivering data for assessments, outlooks or forecasts. If TCODE's role is to expand beyond its current responsibilities, then there must be additional resources supplied by PICES. TCODE will accept and catalog metadata used to support FUTURE and facilitate production of that metadata. Dr. Megrey and Mr. Brown will participate in the FISP Open Forum on October 30 and Dr. Megrey will represent TCODE concerns at the Science Board meeting.

TCODE-2008

AGENDA ITEM 9

North Pacific Ecosystem Status Report

Questions similar to those asked in Agenda Item 8 were raised on this topic. The strategy is that NPESR will be a “living” document. Thus there is an important requirement to source the data behind NPESR (tables, figures and maps). TCODE can provide advice and support (rented server, metadata generation tools, existing or proposed service available, *etc.*). If NPESR is made operational, then the steps required to produce the value-added data should be documented so that they can be duplicated in the next iteration.

AGENDA ITEM 10

Topic session proposals for PICES-2009

Several ideas for topic sessions were discussed. These included “*Data management, data systems and information technology to support ecosystem approaches to management*”, with potential talks on NEPTUNE/VENUS, ICES, PICES MDF and mapserver, FAO, and OBIS/Census of Marine Life. Mr. Brown volunteered to assist convenors with ideas for invited speakers, however no one volunteered to be an organizer and convenor. No TCODE-sponsored topic session is planned for PICES-2009.

AGENDA ITEM 11

Relations with other international programs/organizations

Discussions to strengthen relationships with IODE, ICES WGDIM, and NOWPAP took place but no firm recommendations were offered beyond activities already in place.

AGENDA ITEM 12

PICES Ocean Monitoring Service Award Nominations for 2009

The POMA award nominees were discussed and TCODE remains strongly in support of last year’s nomination.

AGENDA ITEM 13

Summary of items with financial implications

Travel support was requested for Dr. Georgiy Moiseenko to attend the next ICES Annual Science Meeting September 21–25, 2009 in Berlin, Germany and next WGDIM meeting in May 2009. A proposal to renew the contract for the rented server for another year was discussed.

AGENDA ITEM 14

Discussion and adoption of the TCODE work plan for 2008/2009

Based on the discussion of all agenda items, the Committee adopted the following work plan:

1. Continue to support HAB-S work with the HAE-DAT database (R. Brown);
2. Co-organize a 1-day scientific/e-poster Topic Session at PICES XVIII on “*Linking biology, chemistry, and physics in our observational systems – present status and FUTURE needs*” with MONITOR and BIO (H. Garcia, A. Macklin, T. Suzuki);
3. Cooperate with ICES WG on *Data and Information Management* (B. Megrey, G. Moiseenko, I. Shevchenko)
 - Give a presentation in Session R: “*Environmental and fisheries data management, access, and integration*” at the 2008 ICES Annual Science Conference held in Halifax, Canada;

- Give a presentation on “*Pacific-wide marine metadata discovery, management and delivery: The PICES Metadata Federation*”
4. Continue running the Metadata Federation Project:
- Report on the status of the PICES remote server (B. Megrey and I. Shevchenko);
 - Run the PICES clearinghouse nodes performance and experiment on accessing clearinghouses from different locations (B. Megrey to organize with national representatives);
 - Report on metadata recording in Canada (R. Brown);
 - PICES Technical Report Updates (B. Megrey);
 - Status of China joining PICES Metadata Federation;
 - Outcome of PICES Metadata Federation Status meeting (A. Macklin)

The 2009/2010 work plan was prepared (*TCODE Endnote 5*).

AGENDA ITEM 15

New business

Additional items were added at the meeting. Mr. Brown brought to TCODE’s attention that the Working Group (WG 22) on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* intends to create an iron database or metadatabase. Dr. Suzuki and Mr. Brown will coordinate with the *Carbon and Climate* Section.

Dr. Tomowo Watanabe raised the issue that the present PICES schedule does not promote effective discussion at the Science Board meeting and that workshops and symposia contributions from member countries are uneven. He proposed Committee meetings be given at least a half-day duration and the Science Board meeting should be scheduled one day after the Committee meetings. Dr. Megrey will bring these issues to the Science Board.

Several minor changes to the TCODE Action Plan were discussed and approved. The Plan was updated and posted on the TCODE website (<http://tcode.tinro.ru/pices16.html>).

TCODE Endnote 1

TCODE participation list

Members

Robin Brown (Canada)
 Kyu Kui Jung (Korea, Vice-Chairman)
 Bernard A. Megrey (U.S.A., Chairman)
 Georgiy Moiseenko (Russia)
 Igor Shevchenko (Russia)
 Toru Suzuki (Japan)
 Ling Tong (China)
 Tomowo Watanabe (Japan)

Observers

S. Allen Macklin (U.S.A.)
 Ningsheng Yang (CAFS China)

TCODE Endnote 2

TCODE meeting agenda

- 1) Welcome and introduction of members
- 2) Adoption of agenda (opportunity to add agenda items under “New business”)
- 3) Review progress on the items from the 2007/2008 work plan

TCODE-2008

- a) Continue to support HAB-S work
Responsibility – R. Brown
- b) Organize scientific and e-poster sessions at PICES XVII
Responsibility – H. Garcia, A. Macklin, T. Suzuki
 - i) S2: MONITOR/TCODE/BIO Topic Session (Oct. 30, 1 day) Linking biology, chemistry, and physics in our observational systems - present status and FUTURE needs
- c) Cooperate with ICES WG on *Data and Information Management*
Responsibility – B. Megrey, G. Moiseenko, I. Shevchenko
 - i) TCODE Presentation at 2008 ICES Session R: Environmental and fisheries data management, access, and integration
Conveners: Christopher Zimmermann (Germany), Helge Sagen (Norway), and Peter Wiebe (USA)
 - ii) ICES WGDIM ICES ASC Theme Session co-sponsored by TCODE and WGDIM
- d) PICES Metadata Federation Project
 - i) Status of PICES Remote server (B. Megrey and I. Shevchenko);
 - (1) PICES TCODE GeoNetwork based portal
 - (2) GeoNetwork Opensource. The complete manual
 - (3) PICES Metadata Federation Nodes
 - (4) Ecosystem Status Report Web Pages
 - (5) PICES Digital Library
 - (6) Should TCODE propose to extend the contract?
 - ii) Run the PICES clearinghouse nodes performance and experiment on accessing clearinghouses from different locations (B. Megrey to organize with national representatives);
 - iii) Report on metadata recording in Canada (R. Brown)
 - iv) PICES Technical Report Updates (B. Megrey)
 - (1) Addendum 1: Instructions for Isite for Windows
 - (2) Addendum 2: Instructions for Isite for Windows ADHOST
 - v) Status of China joining PICES Metadata Federation
 - vi) Outcome of PICES Metadata Federation Status meeting (A. Macklin)
- 4) Coordination of Activities with MONITOR
Responsibility – T. Royer
 - a) Monitor TC Action Plan
- 5) Report on PICES representation at the 7th NOWPAP DINRAC Focal Points Meeting, Beijing, May 13–14, 2008
Responsibility – T. Suzuki
- 6) The 20th Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XX) will be held in Tianjin, China between 4 and 8 May 2009 (Responsibility – All).
 - a) Should TCODE request to send a representative?
- 7) Annual Country Reports
- 8) Discussion of the FISP (PICES Future Integrative Scientific Program)
 - a) Where does TCODE fit and what role does TCODE have to play?
- 9) Discussion of the North Pacific Ecosystem Status Report
 - a) Where does TCODE fit and what role does TCODE have to play?
- 10) Topic session proposals for PICES-2009
- 11) Relations with other international programs/organizations
 - a) IODE
 - b) ICES WGDIM
 - c) NOWPAP
- 12) PICES Ocean Monitoring Service Award Nominations for 2009
- 13) Summary of items with financial implications:
 - a) Proposed inter-sessional meetings for 2009 and beyond
 - b) Proposed publications for 2009 and beyond
 - c) Travel support requests
 - d) Proposal to continue rented server for another year

- e) Other items
- 14) Discussion and adoption of the TCODE work plan for 2008/2009
TCODE 2009 Work Plan.doc Responsibility – B. Megrey, K.K. Jung
- 15) New business (additional items added at the meeting)

TCODE Endnote 3

**Proposal for a joint ICES WGDIM and PICES TCODE Topic Session on
“Recent advances in the democratization of marine data and information management” in the Theme
Session on Marine Integrated Data at the 2010 ICES Annual Science Conference in Nantes, France**

Theme Session Chairs: Bernard A. Megrey (PICES TCODE, U.S.A.), Neil Holdsworth (ICES DC, Denmark), Edward Vanden Berghe (OBIS, U.S.A.)

Management of data and information within the marine science community has become a very important component in the quest to provide more comprehensive and time sensitive advice to ecosystem and fisheries managers. There are significant difficulties in integrating diverse fishery, oceanographic, and other marine environmental data. In addition, the tools to enable fishery and environmental assessments needed to respond to the requirements for ecosystem-based management initiatives are still in a remedial state of development. There are a growing number of databases and data sources requiring new approaches to enable efficient access to the data.

As these challenges are not unique to the ICES world, a co-sponsored theme session with PICES is proposed as a follow up to the data management session at the 2008 ICES ASC and the 2008 session at the PICES annual meeting. Both sessions attracted a large number of contributions.

This theme session will provide the opportunity to update the community on new approaches and endeavors by inviting database specialists, distributed data specialists, visualization specialists, end-users and others to present and/or demonstrate:

- tools for re-use of data (including a live demo session), and recycling of tools (specifically open source software);
- data publication – linking reports to data;
- *de facto* standards and how to establish them as widely accepted standards;
- data availability *versus* data visibility.

TCODE Endnote 4

PICES Metadata Federation Meeting agenda and minutes

PICES Metadata Federation Meeting

Tuesday, October 28, 2008

Budapest Room, Kempinski Hotel

Dalian, People’s Republic of China

The meeting began at 2:00 p.m.

Attending: Robin Brown (Canada), Toru Suzuki (Japan), Kyu-Kui Jung (Republic of Korea), Igor Shevchenko (Russian Federation), Allen Macklin (U.S.A.), Bernard Megrey (U.S.A.) [*Absent:* Ruguang Yin (People’s Republic of China)]

1. *Current status of Federation* – Presently the Federation serves information through two Clearinghouses, NSDI (National Spatial Data Infrastructure) and Adhost. Both Clearinghouses are powered by GeoNetwork, an open-source application made available through the United Nations. The NSDI

TCODE-2008

Clearinghouse is the one originally used by PICES. It is maintained by the U.S. Department of the Interior, Federal Geographic Data Center and contains several hundred member nodes including the following PICES Metadata Federation members:

- PICES-KODC (Korea Oceanographic Data Center, inactive)
- PICES-MIRC (Japan Marine Information Research Center)
- PICES-NFRDI KODC (Korea National Fisheries Research and Development Institute)
- PICES NOAA NPEM (NOAA North Pacific Ecosystem Metadatabase, inactive due to security concerns)
- PICES TINRO (Russia Pacific Institute of Fisheries and Oceanography)

Adhost is a PICES-provided, rental server being used for several PICES projects, including the Metadata Federation. Unlike the NSDI Clearinghouse, the Adhost site is administered by the PICES Technical Committee on Data Exchange (TCODE), its GeoNetwork application is tailored for PICES use, and only PICES member nodes are registered. Adhost Federation members are:

- PICES NPEM ADHOST (NOAA North Pacific Ecosystem Metadatabase)
- PICES NMDIS ADHOST (China National Marine Data and Information Service)
- PICES TINRO ADHOST (Pacific Institute of Fisheries and Oceanography)

All PICES nodes on the NSDI Clearinghouse that have not already done so will migrate to the Adhost server during the coming year.

Canada will become the next member of the Clearinghouse. Several hundred records from the Department of Fisheries and Oceans Atlantic and Pacific archives will be uploaded to the Adhost server in the coming year.

2. *PICES rented server initiative* – At the 16th Annual PICES meeting in Victoria, B.C., Canada, in October 2007, TCODE requested that PICES rent a server to allow China's NMDIS to enter the Metadata Federation. NMDIS faced security issues that prevented establishment of its own server node. The rented server (Adhost) would be available to the PICES Metadata Federation and other PICES projects. Administration of the server is provided by TCODE.

The Adhost server supplies increased bandwidth, is not government affiliated and allows PICES control of content and function. The GeoNetwork clearinghouse served by Adhost is limited to PICES member countries and their agencies, making it a true PICES Metadata Clearinghouse. Besides hosting the Clearinghouse, Adhost also is serving the PICES digital library, the North Pacific Ecosystem Status Report and has been mentioned as a resource for PICES continuous plankton recorder information.

3. *Preparation of GeoNetwork clearinghouse software* – GeoNetwork on the Adhost server is being configured by Igor Shevchenko and his staff at TINRO under the auspices of TCODE. To the user, the GeoNetwork page appears as a search page for the PICES Metadata Federation. The search page is branded with the PICES name and logo. Searchers can stipulate any PICES member node(s) that they wish to search on, as well as temporal, spatial, keyword and free text string search criteria. News items, feature data sets and other information are highlighted in a menu bar. Mapping is possible and being developed. Multi-lingual capability is also possible and to be developed later.

GeoNetwork is open-source software, so upgrades, adaptations and modules are available from the GeoNetwork community. Presently, the PICES Adhost server is using GeoNetwork 2.1, a stable version of the software. Newer versions may be adopted in the future when they are declared stable by the community and usable by PICES Adhost administrators.

The PICES GeoNetwork application on Adhost permits batch uploads of metadata files. Metadata need not be in FGDC standard, as GeoNetwork supports other standards (DublinCore, ISO, *etc.*) and acceptance templates can be created for any metadata format to map it into the GeoNetwork format. This feature is

especially useful for federation members such as MIRC and KODC who, in the past, had to translate their metadata to FGDC format before uploading.

GeoNetwork permits the implementation of clearinghouses as elements of larger clearinghouses. This clears the way for dissolution of individual PICES nodes on the NSDI Clearinghouse. Instead the Adhost PICES federation can become a single node on the NSDI Clearinghouse, the Global Climate Change Directory, and other clearinghouses.

4. *Metadata translation* – In the NSDI system, metadata were required to be submitted in English language, FGDC format. In the PICES GeoNetwork Clearinghouse, this is no longer a firm requirement. Metadata can be imported in batch using a metadata-standard translator.

With continued development of multi-lingual instances of GeoNetwork and on-line language translators, it is foreseeable that non-English-language metadata records could be served by the PICES Metadata Federation. It was agreed that some metadata elements (title, abstract, keywords) should always have an English-language translation.

5. *Next steps* –In the coming year, the PICES Metadata Federation members will continue to test and develop its Adhost GeoNetwork clearinghouse, migrate its NSDI nodes to Adhost, increase Adhost metadata holdings and market its existence and utility. Specifically, we will pursue the following steps:
 - Support TCODE's request to PICES to renew the Adhost contract;
 - Develop specific GeoNetwork capabilities for enhanced search and discovery, batch import, metadata template generation; user tracking and survey;
 - Consider enhancements such as metadata origin tagging and display;
 - Beta test of Adhost PICES Metadata Clearinghouse by TCODE representatives;
 - Explore production of metadata-standard templates for translation to PICES GeoNetwork metadata standard;
 - Import additional metadata from KODC, MIRC and NMDIS using templates;.
 - Import Canadian DFO metadata;
 - Publicize the PICES Metadata Federation through:
 - TCODE representatives,
 - Teaching module at the PICES Summer School on *Satellite Oceanography*, summer 2009,
 - PICES Press,
 - PICES Projects web page,
 - PICES-2009 Annual Meeting, October 2009: inclusion in Science Board Chairman's review of 2008 advances; presentation at committee meetings through meeting agenda.

The meeting adjourned at 4:00 p.m.

TCODE Endnote 5

TCODE Workplan for 2009/2010

1. Continue to support HAB-S work
Responsibility - R. Brown
 - a. Harmful Algal Blooms Section
2. Cooperate with other data management groups outside PICES
 - a. ICES WG on Data and Information Management
Responsibility - B. Megrey, G. Moiseenko
 - i. Moiseenko to attend ICES Annual Science Conference, September 2009 and the next WGDIM meeting, May 2009

TCODE-2008

- b. IODE-XX
Responsibility - B. Megrey, T. Suzuki
 - i. TCODE to send a representative
IODE-XX, Beijing China May 4–8, 2009
 - c. IODE GE-BICH (Group of Experts on Biological and Chemical Data Management and Exchange Practices)
Responsibility – B. Megrey, H. Garcia
 - i. Identify representatives from PICES to participate in a network of experts on biological and chemical data, IODE GE-BICH
 - d. Develop plan to harvest metadata from the NOWPAP server (I. Shevchenko to organize with national representatives)
3. PICES Metadata Federation Project
- a. Renew Remote server contract and propose the Secretariat include the cost as line item in annual budget (B. Megrey to organize with national representatives)
 - b. Continue to administer AdHost server (B. Megrey and I. Shevchenko)
 - c. Run the AdHost server performance experiment on accessing metadata from different locations and multiple users (B. Megrey to organize with national representatives)
 - d. Report on metadata recording in Canada (R. Brown/J. Holmes)
 - e. Update and status of efforts to improve performance and functionality of the PICES GeoNetwork portal (I. Shevchenko)
PICES TCODE GeoNetwork Portal
 - f. Report on status of PICES Digital Library migration and Ecosystem Status Report web pages (B. Megrey)
 - g. Japan, Korea and Canada move their metadata records to the AdHost server (T. Suzuki, K.-K. Jung, J. Holmes, I. Shevchenko)
 - h. Update AdHost server to monitor MDB use (O. Vasik)
 - i. Promote the GeoNetwork Portal.
 - i. Request GeoNetwork resource be advertised at PICES Summer in Seoul (June 09) and Winter school in Vladivostok (Feb 09). (B. Megrey and I. Shevchenko)
 - ii. Request GeoNetwork resource be reported at next years opening session as part of PICES activities (B. Megrey)
 - iii. Plan to have a short presentation on the GeoNetwork resource be given at committee MONITOR meetings other committee's? (request at front of the agenda and delay start of TCODE) (B. Megrey, I. Shevchenko, R. Brown)
 - iv. Update PICES project pages on PICES home page (A. Macklin)
 - j. Explore GeoNetwork Portal backup options (I. Shevchenko)
 - k. Update the Technical report to reflect GeoNetwork (I. Shevchenko and B. Megrey)
4. Maintain TCODE web pages (I. Shevchenko)
5. Work to facilitate preparation of the NPESR
Responsibility – TBD
6. Assist with transfer of PICES digital library
Responsibility – TBD
7. Update of WG 22 iron database and proposed collaboration with IODE/IOC
Responsibility – R. Brown
8. Participate in FUTUE and FISP activities
Responsibility – R. Brown and B. Megrey

9. Update TCODE Action Plan
Responsibility - B. Megrey, K-K Jung
10. Coordination with Carbon and Climate Section (T. Suzuki and R. Brown)
11. Coordination of Activities with MONITOR
Responsibility - T. Royer
 - a. MONITOR TC Action Plan

REPORT OF THE TECHNICAL COMMITTEE ON MONITORING

The Technical Committee on Monitoring (hereafter MONITOR) met from 16:00–20:00 hours on October 29, 2008, under the chairmanship of Dr. Hiroya Sugisaki. Nine Committee members were present, and a total of 14 scientists from 6 PICES member countries were in attendance (*MONITOR Endnote 1*). The meeting agenda (*MONITOR Endnote 2*) was very full and certain items were resequenced to ensure business was conducted efficiently.

AGENDA ITEM 2

Best Presentation awards

MONITOR was assigned responsibility to assess the MONITOR/ESSAS Workshop (W3) on “*Status of marine ecosystems in the sub-Arctic and Arctic seas – preliminary results of IPY field monitoring in 2007 and 2008*” (W3) by Science Board Chairman, Dr. John Stein. Dr. Sugisaki thanked the volunteers in advance for their service.

The MONITOR Best Presentation Award was given to Kohei Mizobata (Tokyo University of Marine Science and Technology, Japan) for his paper (co-authored by Koji Shimada, Sei-ichi Saitoh, Toru Hirawake and Masahiro Hori) on “*Japanese IPY activities in the western Arctic Ocean and the Bering Sea*”. Hongli Fu (Ocean University of China, China) won the MONITOR Best Poster Award for his poster (co-authored by Jinping Zhao and Jie Su) on “*Study of polynya processes in the Bering Sea using a high resolution dynamic-thermodynamic sea ice model*”.

AGENDA ITEM 3

Status of FUTURE

Dr. Sugisaki briefed the Committee on the status of the new PICES scientific program, FUTURE (**F**orecasting and **U**nderstanding **T**rends, **U**ncertainty and **R**esponses of **N**orth **P**acific **M**arine **E**cosystems). Included in the presentation were the final steps in editing the implementation plan. How MONITOR will fit in with the new scientific program was discussed. Committee members agreed that monitoring activities are very important for the early stage of the FUTURE program and that MONITOR can summarize existing observing systems, identify gaps in observations, and identify monitoring programs that are important and at risk of being lost. MONITOR members were encouraged to send suggestions whenever new drafts were released for comment. Comments from MONITOR on a draft of the Science Plan can be found in *MONITOR Endnote 3*.

AGENDA ITEM 4

North Pacific Ecosystem Status Report

Dr. Sugisaki informed the Committee about editing situation for the second version of the North Pacific Ecosystem Status Report (NPESR II). Science Board designated Dr. Skip McKinnell as the chief editor of the status report. Dr. McKinnell informed MONITOR about the editing process and timeline for NPESR II. He noted that this version will be on incremental improvements, especially for material that may be compared among regions.

The role of MONITOR for NPESR editing was discussed. It will be to review the outline, draft regional chapters, and draft synthesis. Because the role of MONITOR has been changed for NPESR II, a term of reference for MONITOR would need to be revised (see term of reference 3 proposed for revision (*MONITOR Endnote 4*)).

MONITOR-2008

AGENDA ITEM 5

Progress report of the Advisory Panel on *Continuous Plankton Recorder Survey in the North Pacific (CPR-AP)* and recommendations

Dr. Sonia D. Batten presented a report of the scientific accomplishments and present status of the North Pacific Continuous Plankton Recorder (CPR) project. The project continues to produce original research as well as important monitoring results. Since its inception in 1997, seven articles from the CPR data have been published in refereed journals and 3 articles on the seabird observations along the CPR lines have been submitted or published. A key area for ecosystem status and monitoring is the observation of changing phenology of planktonic organisms in the North Pacific.

Unfortunately, the funding situation is dire and without assistance the project will likely end after collections early in 2008. In the past, the North Pacific Research Board (NPRB) has funded the east–west transects (including bird and mammal observations), and the Exxon Valdez Oil Spill Trustee Council (EVOSTC) has funded the north–south transects. EVOSTC declined a recent proposal, and NPRB has promised only half of what was formerly granted. A research proposal to the U.S. National Science Foundation (NSF) was pending at the time of PICES XVI. Dr. Charles B. Miller, Chairman of CRP-AP, reported on behalf of the Panel and agreed with Dr. Batten’s assessment of the project (the full CPR-AP report can be found elsewhere in this Annual Report). CPR-AP wholeheartedly endorsed the project as one of the premier monitoring efforts in the PICES region and recommended that MONITOR request that the Science Board approve the concept of a “North Pacific CRP consortium” that could distribute the project costs among a larger group of funding sources while still allowing each contributor to share the recognition/credit of the scientific achievements.

CPR-AP proposed to change their chair from Dr. Miller to Dr. Phillip Mundy and MONITOR supported the idea. The Advisory Panel is requesting Science Board’s and Governing Council’s endorsement of CPR as a PICES monitoring activity. Drs. Miller and Mundy will draft letter for PICES approval that Executive Secretary, Dr. Bychkov, can circulate to funding sources.

AGENDA ITEM 6

Planning for PICES-2009 annual meeting

MONITOR strongly supported the following two proposals for PICES-2009:

- Dr. Ro proposed a 1-day MONITOR Symposium on “*State of Art of Realtime Monitoring and its Implication for the FUTURE Oceanographic Study*”.
- Recommended conveners are: Drs. Youngjae Ro (Korea) Jack Barth (U.S.A.) David Mackas (Canada) Hiroya Sugisaki (Japan) Vyacheslav Lobanov (Russia), D. Chen (China).
- The description of this symposium: As the technology for the Ocean Sciences and Engineering is advanced rapidly, the realtime data production will revolutionize the field investigation and laboratory analysis in many ways which will have the impact over the entire Oceanographic paradigm in the end. This session will demonstrate the state of art technology for the ocean investigation on realtime and/or near-realtime basis and will discuss the impact on the research and educational horizons made possible by it. Each nation will demonstrate their ocean monitoring network and their application. The exhibits from ocean monitoring companies are to occur in conjunction.

AGENDA ITEM 7

Joint SGGOOS sessions with ICES

The Chairman reported that a co-convenor was requested from the MONITOR Committee for a SGGOOS theme session on an ICES/GOOS topic along the lines of “*ICES and GOOS: maintaining observing systems as the basis for research, biodiversity protection and resource management in the marine environment*” for ICES Annual Science Conference in 2009 in Berlin, Germany. The Committee recommended Dr. Sugisaki as a co-convenor of the session.

AGENDA ITEM 8

PICES Ocean Monitoring Service Award

Significant advances in marine science are often based on ocean observations. Long-term observations are particularly important for detecting and understanding ecosystem change because major shifts in ecosystem structure and function occur over long temporal periods. It is widely recognized that these fundamental activities often lack the glamour and respect that typically accompanies other types of scientific achievement even though these other achievements rely on monitoring and observation. It is unfortunate that monitoring activities are often taken for granted and are frequently targeted for budget cuts when countries experience financial constraints or hardships. With this in mind, PICES recently established a new award to recognize the sustained accomplishments of those engaged in monitoring data management, and communication. 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 and data management and communication. In January of this year the Secretariat announced the award and solicited nominations for the very first POMA. MONITOR and TCODE have the responsibility to recommend the nominees to Science Board. The nominations were considered at the inter-sessional Science Board meeting and Science Board was unanimous in its decision. It is our pleasure to announce that the T/S *Oshoro-maru* of Hokkaido University is the first recipient of the PICES Ocean Monitoring Service Award. The chairman confirmed the POMA nomination rules and announced that member countries should nominate recipients for POMA by January 2009.

AGENDA ITEM 9

Other reports

This year's reports of Advisory Panels, organizations and workshops of relevance to MONITOR were introduced as follows:

1. GOOS Scientific Steering Committee (GSSC-XI): Dr. Young Jae Ro, further communication between PICES/MONITOR and GOOS is necessary and mutually beneficial. The Committee members agreed to recommend a MONITOR member to attend the next GOOS Scientific Steering Committee meeting.
2. NEAR-GOOS activities: Dr. Lobanov reported that NEAR-GOOS is operational.
3. MONITOR/ESSAS Workshop overview (W3) and SAFARI workshop: Dr. Sei-Ichi Saitoh reported on their workshop contents and purposes.
4. CREAMS Advisory Panel: Dr. Kuh Kim reported on the status of CREAMS-AP.

AGENDA ITEM 10

Country reports

The following Committee members made short presentations on national monitoring activities relevant to PICES: Dr. Batten (Canada), Drs. Saitoh and Sugisaki (Japan), Dr. Ro (Korea), Dr. Lobanov (Russia), Drs. Jack Barth, Mundy, and Jeffrey Napp (U.S.A.).

MONITOR-2008

MONITOR Endnote 1

Participation list

Members

Jack Barth (U.S.A.)
Vyacheslav Lobanov (Russia)
David L. Mackas (Canada)
Phillip R. Mundy (U.S.A., Vice-Chairman)
Jeffrey M. Napp (U.S.A.)
Young Jae Ro (Korea)
Sei-Ichi Saitoh (Japan)
Hiroya Sugisaki (Japan, Chairman)
Young Sang Suh (Korea)

Observers

Sonia D. Batten (Canada, CPR-AP)
Hong Sun Kim (Korea, CREAMS-AP)
Charles B. Miller (U.S.A., CPR-AP)
Skip Mckinell (PICES Secretariat)
Akira Nakadate (Japan)
Zhifeng Zhang (China)

MONITOR Endnote 2

MONITOR meeting agenda

1. Welcome, introductions and sign-in
2. Best Presentation awards
3. Status of FUTURE
 - i) Briefing on the current situation of Future integrative scientific program
 - ii) Discussion how our committee corresponds to FISP, *etc.*
4. North Pacific Ecosystem Status Report current status
 - i) Briefing on Science Board decision about NPESR-II
 - ii) Discussion about MONITOR's roles with NPESR-II
 - iii) Discussion of revision of Terms of reference and Action Plan of MONITOR committee
5. Progress report of CPR-AP and recommendations
6. Proposals for PICES-2009 MONITOR workshops
7. Invitation to participate in ICES/GOOS meeting
 - i) Briefing on the SGGOOS session, plenary conference of 2009 ICES annual science conference
 - ii) Discussion of MONITOR's role at the conference
8. Report on POMA
9. Other reports
 - i) Report on GOOS Scientific Steering Committee (GSSC-XI)
 - ii) Report on NEAR-GOOS activities
 - iii) MONITOR/ESSAS Workshop overview (W3)
 - iv) Report from SAFARI workshop
 - vi) CREAMS Advisory Panel with POC
7. Country reports of relevant monitor/observation activities

MONITOR Endnote 3**MONITOR Comments on a draft Science Plan for FUTURE (version 4.2)****Forecasting**

- More emphasis on data assimilation; TCODE does not have an explicit role in the present draft.
- More emphasis on real-time dissemination of information from observation networks; Need efficient data QC and analyses, effective alarm and advisory systems for public and business sectors.

Understanding

- Emphasis appears to be on prediction; increase focus on assimilation of data and mechanistic models for better understanding.

Trends

- Increased emphasis on better integration of physical and biological observations. Are GCOOS observations on the correct time and space scales for biological predictions?
- Observation networks often rely on point estimates and gridded data, but important processes and trophic transfer often occur at “hotspots”;
- Seek a balance for observations of mean system state *versus* “events”; Allow for adaptive strategies in observation systems that enhance our understanding by increasing observation frequency and spatial resolution during events;
- Will the observation systems we rely upon today be supported tomorrow (e.g., satellite remote sensing)?

Ecosystems

- How do we measure ecosystem structure?
- Does FUTURE build on existing national and regional research plans (e.g., Gulf of Alaska Ecosystem Monitoring, GOOS, BSIERP)?

MONITOR Endnote 4**Recommended modifications to the MONITOR Terms of Reference 3**Current terms of reference

1. Identify principal monitoring needs of the PICES region, and develop approaches to meet these needs, including training and capacity building;
2. Serve as a forum for coordination and development of inter-regional and international components of the North Pacific Ocean Observing Systems, including the GLOBAL Ocean Observing System, GOOS. Facilitate method development and inter-comparison workshops to promote calibration, standardization and harmonization of data sets;
3. Serve as the senior editorial board of the North Pacific Ecosystem Status Report, reporting to Science Board; serve as senior editorial board for PICES web pages on major monitoring efforts in the North Pacific, including the annual reporting of important time series;
4. Recommend interim meetings to address monitoring needs and PICES–GOOS activities;
5. Provide annual reports to Science Board and the Secretariat on monitoring activities in relation to PICES;
6. Interact with TCODE on management issues of monitoring data.

Modified terms of reference 3

3. Contribute to the development of the North Pacific Ecosystem Status Report, advising editors and lead authors on monitoring issues, identifying the need for particular time series and their continuities, the period on which they need to be updated for the FUTURE forecast products, recommend to Science Board that they endorse the need to establish or maintain particular time series.

REPORT OF THE IMPLEMENTATION PANEL ON THE CCCC PROGRAM

The Executive Committee of the Climate Change and Carrying Capacity Program Implementation Panel (CCCC-IP/EC) met in Dalian, China from 14:00–18:00 hours on October 26, 2008. The meeting was chaired by Drs. Harold P. Batchelder and Michio J. Kishi. The Co-Chairmen welcomed the attendees, and after brief introductions (*CCCC-IP Endnote 1*), the agenda was reviewed and adopted with slight modifications (*CCCC-IP Endnote 2*). It was noted that there were no representatives from Canada or China in attendance during the meeting.

AGENDA ITEM 3

Business from PICES-2007

The minutes from PICES-2007 (Victoria, Canada) were accepted as is. No other items on-going from last year's meeting required discussion.

AGENDA ITEM 4

Review of procedures for Best Presentation awards and Closing Ceremony

Awards for CCCC Best Oral and Poster Presentations were announced at the Closing Session. CCCC was responsible for selecting the Best Oral and Best Poster presentation for one session: S7 (CCCC/POC Session titled "*Marine system forecast models: Moving forward to the FUTURE*"). Dr. Batchelder spoke earlier with three of the co-convenors of this session (Drs. Thomas Wainwright, Hao Wei, Yury Zuenko) who agreed to judge and select the Best Poster and best talk. A list of session S7 early career scientists who were eligible for this award was provided by the Secretariat. CCCC-IP/EC recognized Xunqiang Yin (First Institute of Oceanography, Qingdao, China) for his oral presentation, "*Ensemble adjustment Kalmon filter study for Argo data*" (co-authored by Fangli Qiao, Yongzeng Yang and Changshui Xia). The Best CCCC Poster was awarded to Yasumasa Miyazawa (Japan Agency for Marine Earth Science and Technology, Japan) for his poster titled "*Toward a data-assimilation system for marginal seas in the SEA-WP region*" (co-authored with Yoshikazu Sasai and Kazuo Nadaoka).

AGENDA ITEM 4

Documentation of scientific sessions

CCCC-IP/EC discussed responsibilities for documenting CCCC-sponsored Topic Sessions and Workshops at PICES-2008. Dr. Batchelder reminded the members that documentation of scientific sessions and workshops is required by the convenors. Dr. Tom Wainwright will document the CCCC/POC Topic Session (S7) on "*Marine system forecast models: Moving forward to the FUTURE*". CCCC co-sponsored two workshops associated with the Annual Meeting: W4 (CCCC/POC/FIS Workshop on *Climate scenarios for ecosystem modeling (II)*), and W5 (CCCC/ESSAS Workshop on *Marine ecosystem model inter-comparisons*). Dr. Michael Foreman, Chairman of POC, will document W4 and Dr. Bernard Megrey, Chairman of TCODE, will document W5. Session and workshop reports should be communicated directly to PICES Secretariat, or to CCCC co-chairs, who will forward them to the Secretariat.

CCCC-2008

AGENDA ITEM 5

Progress reports of Task Teams

CCCC-IP/EC received a brief oral report of CCCC MODEL Task Team activities. During their meeting MODEL participants reviewed the accomplishments of the past year, discussed production of a final MODEL report, the PICES FUTURE draft Implementation Plan, and possible proposed activities of FUTURE. A more extensive and complete written report is available in the MODEL report elsewhere in this Annual Report.

Only three CFAME members attended PICES-2008. Those attending were Drs. Akihiko Yatsu (Japan), Young-Shil Kang (Korea), and George Hunt (U.S.A.). In lieu of holding a business meeting represented by three countries, Dr. Batchelder communicated with CFAME Co-Chair Kerim Aydin (U.S.A.) prior to PICES-2008 and received email summaries on progress being made by CFAME. Thus, the Task Team did not meet at PICES-2008. A major task of CFAME is the writing of three regional summaries on the impacts of climate forcing on marine ecosystems, and an overview paper that compares these three regional ecosystems responses. CFAME held a 3-day workshop on “*Linking and visualizing climate forcing and marine ecosystem changes: A comparative approach*” in Honolulu, U.S.A. on April 15–17, 2008. Planning for the workshop was done by Drs. Aydin and Kang, who were to co-chair the workshop. Unfortunately, Dr. Kang was unable to attend the meeting, so it was chaired by Dr. Aydin. A summary of the workshop from email communications provided by Dr. Aydin can be found in *CCCC-IP Endnote 3*.

AGENDA ITEM 6

PICES FUTURE Implementation Plan

CCCC and the MODEL Task Team reviewed the second draft of the Implementation Plan: FUTURE Science Program. Comments from MODEL members are summarized in the MODEL Task Team report elsewhere in this Annual Report. Dr. Batchelder communicated a synopsis of MODEL’s comments and other CCCC comments on the Implementation Plan (henceforth IP) to Science Board and the FUTURE IP Writing Team in both oral form and written form during an informal Tuesday evening (October 28) meeting. CCCC comments and recommendations for the next draft were reiterated during the SG FISP public forum that was held on October 30. General comments on the draft IP from CCCC include:

- It is an exciting program, but the document is unclear on how it should progress from research to applications;
- General consensus in favor of the hierarchy of Status, Outlooks and Forecasts; and the progression from what we have done and can do now, to the more complex and difficult forecasts;
- There is too much introduction (duplication of science plan) and too little on the organizational structure and how the work will be accomplished;
- A general question was raised concerning whether this draft represents writings of the co-chairs only or the entire FISP Writing Team. G

AGENDA ITEM 7

Planning for PICES-2009

Although it is likely that CCCC will cease to exist and therefore, CCCC should not (cannot) sponsor topic sessions at PICES-2009, a topic session was proposed as a topic for next year’s annual meeting. CCCC agreed to take this to Science Board and seek advice on how to incorporate it into the list of proposed topics for next year. The Topic Session was titled “*Spatial and temporal dynamics of ecosystems: What we know and what we need to know to provide outlooks and forecasts*” with confirmed convenors Drs. Hiroaki Saito (Japan) and Batchelder (U.S.A.). It was agreed to request one invited speaker. Dr. Saito noted that it was possible that IMBER might be interested in co-sponsoring this session. During subsequent Science Board discussions, this topic was merged with a similar topic proposed by the POC Committee, and has moved forward as a POC/FUTURE topic titled, “*Outlooks and forecasts of marine ecosystems from an earth system science*”

perspective: Challenges and opportunities". Confirmed convenors for this are H. Saito (Japan), H. Batchelder (U.S.A.), M. Foreman (Canada) and A. Hollowed (U.S.A.). Subsequent to PICES-2008, Dr. Saito has confirmed that IMBER will co-sponsor this session. A full description of the session is provided in *POC Endnote 4(1)*.

AGENDA ITEM 8

Theme proposal for PICES-2010

CCCC-IP/EC briefly discussed the theme, "*North Pacific Ecosystems Today, and Challenges in Understanding and Forecasting Change*", that has been proposed by the U.S. delegation for PICES-2010. CCCC had no specific changes to recommend, and feels the theme is appropriate and will be interesting to the scientific community.

AGENDA ITEM 9

Review travel support requests/priorities for October 2008–October 2009

Due to the CCCC program winding down and the FUTURE program beginning, CCCC has no specific requests for travel funds for the coming year. Nevertheless, CCCC has proposed a topic session to Science Board and requests that one invited speaker be supported for that session at PICES-2009.

AGENDA ITEM 10

CCCC Synthesis Symposium Special Publication

Dr. Batchelder reported on the status of the special issue publication resulting from the CCCC synthesis symposium on "*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*". With GLOBEC and other co-sponsors, an international synthesis symposium was held in 2006, with some of the papers presented now published in a special issue of *Progress in Oceanography* (2008, Vol. 77, No. 23, pp. 83–268).

AGENDA ITEM 11

Relations to other international organizations and programs

CCCC did not identify any international programs or organizations that should be added to the PICES list of international partners.

AGENDA ITEM 12

Preparation of CCCC report to Science Board

Dr. Batchelder agreed to summarize the CCCC-IP/EC discussions and present a summary to the Science Board.

AGENDA ITEM 13

Other business

Projected CCCC publications

At PICES-2007, the CCCC Co-Chairs indicated that CCCC will develop a final report of the CCCC program which is expected to be published in the PICES Scientific Report series. Dr. Kishi will lead this, and be

CCCC-2008

assisted by Dr. Batchelder, but assistance is expected from past and present leaders within the CCCC program as well. There has been little progress on this report in the past year. It must be completed and submitted to Science Board and the Secretariat prior to PICES-2009.

CapacityBuilding

Dr. Suam Kim noted that 17 early career scientists from Korea are being funded by Korea GLOBEC to attend PICES-2008, and that similar levels of support are hoped to continue in future years.

Marine Ecosystems Model Intercomparison Project

Dr. Bernard Megrey summarized the results and recommendations from a CCCC/ESSAS workshop held on Saturday, October 25, in Dalian, China. The goal of the workshop was to provide an introduction to the topic, set some guidelines on what needs to be done, and to frame a work plan for future hands-on workshops that will compare ecosystem models at one or more sites in the North Pacific. The goal is to identify why some models work better than others, why some models may be more generally applicable, and provide measures of uncertainty associated with model predictions. A focus of the exercise will be prediction of zooplankton abundance/biomass instead of the more usual assessment using phytoplankton (and sometimes nutrient) observations only. Participants at planned future workshops will contribute data sets for validation and/or contribute and run models. Dr. Megrey and the participants agreed that the workshop at PICES-2008 was useful, and should lead to a workshop at PICES-2009. Drs. Megrey, Batchelder and Shin-ichi Ito have agreed to co-chair a workshop (if approved by Science Board and Governing Council) at PICES-2009. Dr. Megrey also noted that with CCCC concluding, a new home for MEMIP is needed. Dr. Batchelder suggested that BIO would be the logical home, and he would make this proposal to Science Board. This was agreeable to the BIO Committee and a proposal was submitted to Science Board through BIO for a 2-day workshop to conduct an intercomparison exercise at PICES-2009 (*BIO Endnote 7*).

CCCC Endnote 1

CCCC-IP/EC participation list

Members

Harold P. Batchelder (U.S.A., CCCC-IP Co-Chairman)
Suam Kim (Korea)
Michio J. Kishi (Japan, CCCC-IP Co-Chairman)
Andrei Krovnin (Russia)
Bernard A. Megrey (U.S.A.)
William T. Peterson (U.S.A.)
Thomas Wainwright (U.S.A.)

CCCC Endnote 2

CCCC-IP/EC meeting agenda

1. Welcome and opening remarks
2. Adoption of agenda
3. Business from last year's meeting (if any)
4. Documenting PICES CCCC scientific sessions and judging/selecting best oral and best posters.
5. Reports of Task Team Chairmen on activities from past year and plans for wrapping up task team activities (MODEL, CFAME)
6. PICES FUTURE Implementation Plan: discussion and comments to be forwarded to Science Board
7. Topic Session proposals for PICES-2009. Theme of meeting is "*Understanding ecosystem dynamics*"

- and pursuing ecosystem approaches to management”*
8. Theme and Topic Session proposals for PICES-2010 (U.S.A.). Tentative theme title is: “*North Pacific Ecosystems Today, and Challenges in Understanding and Forecasting Change*”
 9. CCCC travel requests for calendar year 2009
 10. Update on CCCC Synthesis Symposium Special Publication
 11. PICES-CCCC relations to other international programs. (ICES, GLOBEC, NPRB, GOOS, CoML, etc.)
 12. Preparation of CCCC report to Science Board
 13. Other business (publications; capacity building; final CCCC report for PICES; Marine Ecosystem Model Intercomparison Project)

CCCC Endnote 2

Summary report of 3-day CFAME workshop in Honolulu, U.S.A. on “*Linking and visualizing climate forcing and marine ecosystem changes: A comparative approach*”

Five CFAME Task Team members, WG 20 Chairman, Dr. Michael Foreman, and two invited scientists met in Honolulu. Three CFAME ecosystem comparative teams have been working together since May, 2007 on each of three ecosystems (the California Current, the Kuroshio/Oyashio, and the East China/Yellow Seas). Prior to the workshop, team leaders for each set of ecosystem mechanism tables (Vera Agostini, Akihiko Yatsu, and Young-Shil Kang) coordinated the review of the details of these tables, providing an explicit description of ecological processes in relation to climate variables. Prior to the meeting, this information was provided to graduate students working with CFAME member, Dr. Brenda Norcross, who produced summary drafts and figures documenting the projected changes in ecosystem components based on future scenarios forecasted by IPCC climate scenarios. Drafts were provided by these researchers in January 2008 and were circulated prior to the workshop.

At the April workshop, we reviewed draft versions of the graphic representations of ecosystem mechanisms climate/ocean scenarios. Dr. Foreman, representing the Co-chairs of WG20, provided immediate feedback as to accuracy of the physical model results which drive our biological predictions. Each ecosystem team then worked to revise text and figures during the meeting and finalize graphic representations of our current knowledge of the physical processes impacting species population dynamics (one graphic representation for each of the 3 ecosystems, with likely impacts under climate warming). One critical need to complete the three regional papers and synthesis paper was tasking out the development of some conceptual model figures to a graphics professional. This was done, although most of the graphics developed need further refinement.

After successfully completing this review at the meeting, a schedule was established to complete scientific publications (PICES Scientific Report and peer-reviewed manuscripts resulting from the past two years of CFAME work) for dissemination to the broad public as part of PICES contributions to forecasting future ecosystem states. The schedule established in April was for a PICES Scientific Report summarizing CFAME’s activities to be submitted prior to PICES-2008. The schedule has subsequently slipped. As of October 2008, the revised schedule is for the three regional manuscripts to be completed by the end of January 2009, the overview synthesis manuscript about one month later, and the final CFAME report by the inter-sessional Science Board meeting in April 2009.

REPORT OF THE MODEL TASK TEAM

The final meeting of the MODEL Task Team (hereafter MODEL) was held from 09:00–12:30 on October 26, 2008. The Co-Chairman, Dr. Thomas C. Wainwright, called the meeting to order and welcomed the participants (*MODEL Endnote 1*). Dr. Wei Hao (China), Co-Chairman of MODEL, was unable to attend. The Task Team reviewed and adopted the draft agenda (*MODEL Endnote 2*).

AGENDA ITEM 2

Review of agenda and inclusion of new items

During the meeting, participants:

- reviewed the accomplishments of MODEL over the past year;
- discussed production of the MODEL final report;
- discussed the PICES FUTURE Program draft Implementation Plan;
- discussed possible proposed activities of FUTURE.

AGENDA ITEM 3

MODEL accomplishments after PICES XVI

Dr. Harold Batchelder provided an update on the U.S. GLOBEC Program pan-regional synthesis phase. U.S. GLOBEC has had three regional programs in the Northwest Atlantic (Georges Bank), Northeast Pacific (California Current and Gulf of Alaska), and the Southern Ocean. All three programs aimed to link climate forcing to ocean physics and to ecosystem productivity. The final phase of U.S. GLOBEC is a pan-regional synthesis, with a total budget of \$7 million. For this phase, ten 3-year projects have been funded, of which two are of special interest to PICES: one led by Dr. Emanuele Di Lorenzo and others on Pacific boundary ecosystems, and one led by Dr. Batchelder and others on comparative ecology of krill. There will be a pan-regional projects meeting in February 2009, and a final U.S. GLOBEC symposium is planned to be held in the Washington, DC area in 2011.

Dr. Enrique Curchitser provided an update on the U.S. CAMEO (Comparative Analysis of Marine Ecosystem Organization) Program, which focuses on cross-system comparisons of marine ecosystem structure and function. The joint NSF/NOAA program is intended to build on GLOBEC to connect models to management. Initially planned for \$11 million per year over 5 years, the project was funded at \$2 million for 2 years. Proposals were received in June 2008, and the proposal review panel has met, but there have been no announcements of awards yet.

Dr. Bernard Megrey provided an update on ESSAS (Ecosystem Studies of Sub-Arctic Seas) activities. A meeting of ESSAS Working Group 3 (*Modeling Ecosystem Response*) was recently held in Halifax, Canada, to plan work. The first steps will be to compare subarctic systems with EcoPath models, catalogue available data products and characterize ecosystems. There is a proposal to embed NPZ and multiple fish models in ROMS, which would allow full analysis of upper/lower trophic linkages. The group also plans further development of NEMURO.SAN (a spatially explicit, multi-species fish bioenergetics and population dynamics model).

Dr. Wainwright reported on progress of the NOAA project “A software framework for integrating marine ecosystem models.” The project is embedding NEMURO code within the Earth Systems Modeling Framework (ESMF), which may make the NEMURO code easier to integrate into other U.S. climate change research efforts. The project began 2 years ago, and after delays, is now mostly finished. A prototype 3-D gridded NEMURO model ESMF component has been completed, along with a demonstration application that reproduces the Station A7 simulations run with NEMURO version 1.0. Debugging and optimizing are in progress, and the next step is to link the NEMURO ESMF component with a 3-D ROMS circulation model via

MODEL-2008

the new ESMF interface in ROMS. Initial code will be available on the MODEL web page shortly after the close of PICES-2008.

Dr. Megrey reported on the PICES Marine Ecosystem Model Inter-Comparisons Project. The initial planning workshop for the project was held on October 25. During the workshop, participants talked about the project objectives, models to include, locations, methods of skill assessments, and choice of indicator species. A general statement of the project objective and an outline of a work plan were developed. The next step will be to solicit participants (including those outside the PICES community), then potential participants will help to develop draft work plan and a proposal for a workshop session at PICES-2009. The work plan and workshop proposal will be presented to Science Board at their inter-sessional meeting in April 2009.

Following discussion, MODEL expressed continued support for the project, and particular support for the idea of a 2- or 3-day workshop at next year's PICES Annual Meeting (see Agenda Item 5c).

Dr. Michio Kishi reported on the PICES International Summer School on *Ecosystem-based management and ecosystem approach* held in Hakodate, Japan, August 23–26, 2008. This was the second PICES summer school, which consisted of 5 or 6 lectures followed by group discussions and projects. Some of the groups made posters which were displayed at the poster session at PICES-2008.

At PICES-2008, MODEL was involved with one topic session (S7) – “*Marine system forecast models: moving forward to the FUTURE*” and two workshops: (W4) “*Climate scenarios for ecosystem modeling (II)*” and (W5) “*Marine ecosystem model inter-comparisons*”. These were reviewed briefly at the meeting.

Dr. Yasuhiro Yamanaka also reported on recent developments with NEMURO applications in Japanese laboratories, particularly applications of the global high-resolution climate model.

AGENDA ITEM 4

Discussion of the MODEL final report

The Task Team reviewed an outline of the CCCC final report, and discussed the MODEL contribution to it. Dr. Wainwright agreed to draft the MODEL sections with the assistance of Dr. Megrey; this draft will then be circulated to past and present MODEL members for their review. A revised MODEL contribution will be forwarded to CCCC by January 15, 2009 for integration into the CCCC draft report.

AGENDA ITEM 5

Discussion of the PICES FUTURE scientific program draft implementation plan

a. General discussion of the implementation plan

MODEL reviewed the second draft implementation plan of the FUTURE Science Program. Comments from MODEL members are summarized below. Comments fell into three general areas: general comments, client-service orientation, and organizational structure. (NOTE: these comments do not reflect a consensus of all MODEL members, but only the collected opinions of those present at the meeting.)

- General Comments:
 - Liked product separation into “status, outlooks, and forecasts.”
 - The document has lots of introduction, but little concrete information on structure or how work will be accomplished.
- Client-service Orientation
 - What a “client” is depends on the country: some countries do not fit into client-oriented framework.
 - Countries have different structures of interactions between science and socio-economic management, and these differences are not reflected here.

- PICES is much different from ICES which is all “western” countries—the same organization model will not work.
- Countries may not agree on using joint approaches developed by this program.
- Organizational Structure and Product Production.
 - The proposed organizational structure is not product-oriented. In particular, the key-question task teams seem to be research-oriented, not product-oriented.
 - There is no identification of who does forecasts, and what are the products.
 - Task teams should not be focused on broad questions, but rather on the tasks needed to answer those questions, which may be overlapping among the key questions.
 - Modeling activities have no coordination—spread among all task teams.
 - The task team to identify clients, constituents is a short-term task—strange for a permanent task team. However, the problem of identifying what clients want would be longer-term task, requiring social scientists to develop questionnaires, interviews.

b. Proposed workshop and topic session

The Task Team discussed and recommended two FUTURE-related events at PICES-2009:

1. A multi-day workshop that will be proposed by the PICES Marine Ecosystem Model Inter-Comparison Project (see discussion above under Agenda Item 3).
2. A proposed POC/FUTURE Topic Session on “*Future marine ecosystem predictions from an earth system science perspective*” (see POC Endnote 4).

AGENDA ITEM 6

Requests for travel to future meetings

As MODEL is ending at this meeting, no requests for travel to future meetings were made.

AGENDA ITEM 7

Announcements

Dr. Sinjae Yoo announced the third CREAMS/PICES Summer School on “*Satellite oceanography*” to be held August 24–27, 2009, at Seoul National University in Korea. The school will have a maximum of 30 students. Specific topics and the schedule remain to be worked out.

During discussion of this, it was noted that the PICES summer school does not always cover modeling. Dr. Shin-ichi Ito suggested that a hands-on modeling training session might be held regularly before or after PICES meetings, as a standing PICES event. Possible topics include ocean ecosystem modeling using the NEMURO models and environmental data analysis using the open-source “R” package. MODEL decided to recommend this to Science Board (see *MODEL Task Team recommendations* below).

Dr. Manuel Barange announced the third GLOBEC Open Science Meeting, to be held in Victoria, Canada, June 26–29, 2009. The meeting theme is “*Marine ecosystems: from function to prediction*”, and will be convened by Drs. Ian Perry, Eileen Hofmann, and Barange. Sponsors include GLOBEC International, PICES, U.S. NSF, SCAR, and ICES. The 5-day meeting will include 2 days of workshops run in parallel, followed by a 3-day plenary symposium.

MODEL Task Team recommendations

1. MODEL supports the idea of a multi-day “Marine ecosystem model inter-comparison workshop” at PICES-2009, with a full proposal to be presented to Science Board at its inter-sessional meeting April 2009 in Qingdao, China.
2. MODEL recommends to Science Board that PICES hold an annual quantitative science training session in conjunction with the Annual Meeting.

MODEL-2008

MODEL Endnote 1

MODEL participation list

Members

Shin-ichi Ito (Japan)
Michio J. Kishi (Japan)
Bernard A. Megrey (U.S.A.)
Goh Onitsuka (Japan)
Jake Schweigert (Canada)
Thomas C. Wainwright (U.S.A., Co-Chairman)
Yury I. Zuenko (Russia)

Observers

Harold Batchelder (U.S.A.)
Manuel Barange (GLOBEC)
Fei Chai (U.S.A.)
Enrique Curchister (U.S.A.)
Skip McKinnell (PICES)
Hiroshi Sumata (Japan)
Yasuhiro Yamanaka (Japan)
Sinjae Yoo (Science Board Vice-Chairman)

MODEL Endnote 2

MODEL meeting agenda

1. Welcome and introduction of members. (T. Wainwright and H. Wei)
2. Review of agenda and inclusion of new items as needed. (T. Wainwright and H. Wei)
3. Review of MODEL accomplishments after PICES XVI.
 - a. Update on U.S. GLOBEC pan-regional synthesis (H. Batchelder)
 - b. Update on U.S. CAMEO programs (E. Curchitser)
 - c. Update on ESSAS activities (B. Megrey)
 - d. Status of NOAA project “Software framework for integrating marine ecosystem models” (T. Wainwright)
 - e. Report on “Marine Ecosystem Model Inter-Comparisons” project and workshop (W5) (B. Megrey)
 - f. Report on “PICES International Summer School on Ecosystem Based Management” held in Hakodate, August 2008 (M. Kishi and S. Ito)
 - g. Brief preview/review of workshops and theme sessions at PICES-2009
W4 – “*Climate scenarios for ecosystem modeling (II)*” (Y. Yamanaka)
S7 – “*Marine system forecast models: moving forward to the FUTURE*” (T. Wainwright)
4. Discussion of MODEL final report (T. Wainwright)
5. Discussion of PICES FUTURE scientific program draft implementation plan (H. Wei and T. Wainwright)
 - a. General discussion of the implementation plan
 - b. PICES-2009 (Oct. 23–Nov. 1, 2009, Jeju) - proposals for Topic Sessions and workshops
 - c. Proposals for FUTURE inter-sessional workshops and scientific work
6. Requests for travel to future meetings
7. Announcements
 - a. CREAMS/PICES Summer School on “*Satellite oceanography*” (Busan, August 2009)
 - b. Third GLOBEC Open Science Meeting (Victoria, June 2009) (M. Barange)
8. Adjournment

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* (hereafter HAB-S) met from 9:00 to 18:00 h on October 26, 2008, in Dalian, China. The HAB-S meeting was attended by members from Canada, China, Japan, Korea, Russia, and the United States of America (*HAB-S Endnote 1*). Other visiting scientists attended the meeting and are named below under their respective countries. The proposed agenda for the meeting (*HAB-S Endnote 2*) was reviewed and approved by the Section.

AGENDA ITEM 3

Future of HAB-S work

After giving a brief history of origins of HAB-S and its Terms of Reference (*HAB-S Endnote 3*), Co-Chairman, Dr. Vera Trainer, discussed the future of HAB-S work within PICES.

AGENDA ITEM 4

Country reports

Canada

Dr. Charles Trick informed the Section that Canada has no monitoring system for HAB phytoplankton species, and therefore, Canada cannot provide the necessary species information for PICES. Only harmful species for fish are reported, and these are not government sources. A total of 27 different *H. akashiwo* events have occurred in recent years, mostly on the outer coast of British Columbia. One event was responsible for causing 260 tonnes of dead salmon from aquaculture in northern British Columbia close to Alaska.

China

China's report, prepared by Dr. Jinhui Wang, was presented by Dr. Mingyuan Zhu. In 2007, 82 HAB events occurred in China, and similar to 'Red Tides', may or may not be toxic. The occurrences were 12% less than in 2006 (93 events), and affected an area of 11,610 km² (41% less than in 2006). Among them, 30 occurred in the HAB monitoring and management zone (as during 2006) or in nearby waters. Most HABs occurred in the East China Sea, also seen during 2006. This is the most eutrophicated region in China (riverine inputs are large from the Yangtze River). The HAB species consisted of non-toxic ones: *Skeletonema costatum*, *Chaetoceros* spp., *Prorocentrum triestinnum* and toxic ones: *Alexandrium* sp., *Karenia mikimoto*, *Phaeocystis* sp., *Gymnodinium* sp. Twenty-five toxic HAB events occurred, covering a total area of 1,906 km², a major decrease compared with 2006

Massive macroalgae blooms occurred from the end of May to August 2008: the area affected was 20,000 km², and the area covered was 400 km². The bloom species was identified as *Enteromorpha prolifera*, but some think *E. linza* was the dominant species. China has not experienced such a magnitude in the past, although it bloomed in 2007 in the same region. A total of 800 Kt of algae was physically removed from the Qingdao coastal area to ensure algae-free waters before the Olympic sailing events. The blooms came from the southwest Yellow Sea, floated on sea surface, kept growing and accumulated in coastal waters of Qingdao. Population dynamics (nutrient enrichment) was conducted, using mesocosm experiments (plastic bags and fishing nets), as well as in lab experiments. The control growth rate is relatively slow (3.85%); upon adding N, the growth rate increases. Released spores can germinate anywhere and attach to culture walls; a new sprout can grow to 50–70 cm in length in 10 days, and have a wet weight of approximately 0.4–0.7 g. Inorganic nutrient content was not very high; organic nutrients were not measured.

HAB-S-2008

We have no means to forecast such green tides, are not sure where they come from, why is they are now floating when normally they are an attached 'benthic' algae, what role physical and chemical environmental factors play in their development, what impact they have on the marine ecosystem, but we do know the algae are not toxic and are edible.

Japan

Dr. Shigeru Itakura stated that there were seven harmful algal event (HAE) regions in Japan. Major red tides occur in the western region of Japan. In 2007, paralytic shellfish poisoning (PSP) occurred 29 times, mostly in the northern part of Japan and 6 cases of diarrhetic shellfish poisoning (DSP) were reported. During August 2007, there was a large-scale offshore record outbreak of very toxic *Cochlodinium polykrikoides* in the Sea of Japan. The frequency of its occurrence is increasing in 2000s. In 2003 a large-scale bloom occurred along the coast of the Sea of Japan. Using microsatellite markers, genetic structures has revealed 3 populations of this species in Japanese waters. Satellite imagery cannot distinguish diatom blooms from blooms of *C. polykrikoides*, so verification is still needed from shipboard sampling. International cooperation with Korea was very useful. There were no reported cases of amnesic shellfish poisoning (ASP) in Japan.

Korea

Korea's report, prepared by Dr. Yangsoon Kang, was given by Co-Chairman, Dr. Hak-Gyoon Kim. Overall, HAB events seem to have decreased since 2004. No negative fisheries impacts of *C. polykrikoides* blooms were observed in 2008, but duration of the blooms was up to 50–60 days.

Very clean transparent waters are found offshore, and colder waters (< 20°C) caused a change in species composition in 2008 compared to 2007. It is thought that *C. polykrikoides* blooms in 2008 were dependent on benthic sources, not on offshore initiation, as in other years. In 2008, there was a long drought with no occurrence of typhoons and no heavy rains.

Russia

Dr. Tatiana Morozova reported that the target area for observations is Amurskii Bay, Sea of Japan/East Sea where DSP, ASP, PSP are monitored. Over the past 17 years (1991–2007), from a total of 42 HAB species identified, 13 are known as potentially toxic species; 41 bloom events have been recorded (but no known fisheries or human poisoning has occurred). Most HABs occur during July–August (dinoflagellates), and November (*Pseudo-nitzschia* blooms). There are no known data on fisheries damage. Russia is now using an enzyme-linked immunosorbent assay (ELISA) to screen for ASP and PSP toxins.

U.S.A.

Dr. Trainer informed the Section that HAE-DAT reporting is done by managers in U.S. West Coast states who send the information to the National HAB office in Woods Hole Oceanographic Institution. Only PSP and ASP (no DSP) testing is currently being done in U.S. No red tides have been reported. Fish-killing toxins are usually reported by private fish farmers. An Alaska phytoplankton monitoring program was started in 2008 by the University of Alaska in collaboration with shellfish growers.

AGENDA ITEM 5

Relations with international organizations and other HAB-S-related activities

IOC

Dr. Monica Lion, representing the IOC, reported that the Harmful Algal Event Databsase (HAE-DAT) was now ready for on-line input of new data. The next step was to check old data, and to invite IOC ANCA, FANSA and HANA editors to include their data. PICES focal point contacts have been invited to include new data from 2000. There were still some bugs in data products, especially maps, but everything was expected to

be resolved very soon. Data were not yet open for the general public, but the on-line website for audiences to observe products is now available at www.iode.org/haedat/.

Dr. Lion also discussed work of the IPHAB/IODE Task Team on the development of the Harmful Algal Information System (HAIS). The establishment of HAIS builds on the evolution over the past 15 years of a number of separate databases and products developed in partnership between IOC, ICES, PICES and ISSHA. In 2007, the IOC Intergovernmental Panel on HAB (IPHAB) recommended the development of such a database as a service to scientists, managers, the marine sector, education sector, politicians, and general public. The context for the Task Team was to have a voluntarily group of experts to discuss and agree on main HAIS elements and functions, following the terms of reference from IPHAB and IODE.

The outline of the HAIS Elements is:

- HA events with ICES, PICES, *et al.* (HAEDAT) [www.iode.org/haedat/],
- Biogeography with ISSHA (HABMAP) and OBIS,
- Taxonomy with IOC Taxonomic Reference List of Toxic Plankton Algae [<http://www.bi.ku.dk/ioc/>], World Registry of Marine Species (WoRMs) and EoL,
- References with ASFA (HAB-Dir) [<http://ioc.unesco.org/hab/HAB-BIB.htm>] and OceanDoc,
- Expert Directory with IODE [<http://www.OceanExpert.net>],
- Monitoring and management design with ICES (MONDAT), User interface with Encyclopedia of Life (EoL).

A draft document on HAIS was now ready, and PICES HAB-S members were invited to review it and send their comments to the Task Team (and/or Dr. Lion).

NOWPAP CEARAC

Dr. Takafumi Yoshida reported on the Northwest Pacific Action Plan's Special Monitoring and Coastal Environmental Assessment Regional Activity Centre (NOWPAP CEARAC). Thirteen regional sea programs were established under the United Nations Environment Program (UNEP).

Recent products include:

1. HAB Reference database,
2. HAB Integrated Report,
3. Homepage and *Cochlodinium* pamphlet (5 languages),
4. Booklet of Countermeasures against HABs,
5. HAB Case Studies Database and Reports.

HAB case studies are conducted in NOWPAP CEARAC member states using target sea areas where HABs frequently occur. Case study reports are then sent to NOWPAP CEARAC and updated each year, and the most effective and labor saving ways are developed to update the information.

Detection of HABs using remotely-sensed imagery

Dr. David Foley (U.S.A.) presented an overview of NOAA's CoastWatch Program which provides satellite-based oceanic data and products for near-real-time monitoring of U.S. coastal waters in support of environmental science, management, and hazard response (<http://coastwatch.pfel.noaa.gov/>). The Program would be especially relevant for providing satellite imagery for spatial extrapolation of *in situ* data related to HABs. Data sets of interest would be: *in situ* oceanographic measurements, *in situ* water quality, remotely sensed measurements, atmospheric models, and oceanic models.

PICES Seafood Safety (MAFF) Project

Dr. Trainer provided an update of the PICES Seafood Safety Project. This project began in March 2007 with funding from the Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF). With assistance from IOC,

HAB-S-2008

over 20 questionnaires were submitted to IOC member countries with Pacific coastlines. These questionnaires requested information regarding the need for training in monitoring seafood safety in each country. An initial focus will be in southeast Asia, and the criteria for country selection is: (1) fisheries loss due to HABs, (2) support from the selected country's government, and (3) ability to sustain the learnings. Based on these criteria, the Philippines was chosen as the country where the first training workshop will be held in January 2009. HAB-S requests assistance from PICES in drafting an MOU with this country.

AGENDA ITEM 6

Workshops and meetings at PICES-2009

The following recommendations were proposed for PICES XVIII:

- A 1½-day workshop on the “*Cyst forming HAB species*” co-chaired by Dr. Changkyu Lee (Korea) and Dr. Charles Trick (Canada) to include a 1-day cyst identification demonstration. The abstract for this workshop is in *HAB-S Endnote 4*.
- A 1-day HAB-S meeting, including country reports for HAB events in 2006–2007 and discussion of HAEDAT use. Countries are requested to input HAB event data to HAE-DAT for 2000–2005 directly to the online database. HAB-S wishes to have presentations from PICES modelers during the HAB Section meeting in order to strengthen our collaborations in the future.
- A ½-day topic session, “*Mitigation of harmful algal blooms*”, organized by Dr. Hak-Gyoon Kim and Dr. Mark Wells (*HAB-S Endnote 5*).

AGENDA ITEM 7

Items with financial implications and recommendations

HAB-S:

- requests travel funds for 3 scientists (2 specialists (Dr. Jack Rensel, U.S.A. and a specialist from Korea) for the Topic Session and 1 specialist for the Workshop at PICES-2009). See *HAB-S Endnote 5*.
- recommends 2 new members. This is necessary due to changes in key people responsible for HAB data in these PICES member countries, and to bring young scientists into the Section. These scientists are Dr. Akira Ishikawa (Laboratory of Biological Oceanography, Mie University, Japan) and Dr. Weol-Ae Lin (Aquaculture Environment Institute, NFRDI, Korea).

AGENDA ITEM 8

Summaries of the HAB-S Topic Session and Workshop at PICES XVII

Summaries of the HAB-S Topic Session and Workshop at PICES XVII can be found in the Session Summaries section of the PICES 2008 Annual Report.

AGENDA ITEM 9

Other business

HAB-S proposes to contact the invited speakers for past Annual Meeting HAB workshops on *Pseudo-nitzscha* and *Alexandrium*, *Dinophysis* and *Cochlodinium*, *Heterosigma*, and *Karenia* and *Prorocentrum* to determine their interest in writing Wikipedia-type pages, including complete references, for the PICES or IOC website. This goal replaces the past years' suggestion of a PICES special report on selected HAB species.

HAB-S Endnote 1**HAB-S participation list**Members

William Cochlan (U.S.A.)
 Shigeru Itakura (Japan)
 Hak-Gyoon Kim (Korea, Co-Chairman)
 Olga Lukyanova (Russia)
 Michail Simokon (Russia)
 Vera Trainer (U.S.A., Co-Chairman)
 Charles Trick (Canada)
 Yasunori Watanabe (Japan)
 Mark Wells (U.S.A.)
 Mingyan Zhu (China)

Observers

Robin Brown (Canada)
 Rongshuo Cai (China)
 David G. Foley (U.S.A.)
 Hao Guo (China)
 Ruixiang Li (China)
 Weol-Ae Lim (Korea)
 Monica Lion (IOC)
 Tatiana Morozova (Russia)
 Takafumi Yoshida (NOWPAP CEARAC)

HAB-S Endnote 2**HAB-S meeting agenda**

1. Introduction
2. Approval of agenda
3. Discussion of the future of HAB-S work within PICES
4. Country reports
5. Relations with international organizations and other HAB-S-related activities
6. Workshops and meetings at PICES-2009
7. Items with financial implications
8. Summaries of the HAB-S session and workshop at PICES XVII
9. Other business

HAB-S Endnote 3**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 (*e.g.*, cell numbers vs. toxin levels).

HAB-S-2008

- 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 metadatabase 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 Workshop and 1-day lab demonstration on “Cyst forming HAB species” at PICES-2009

Analogous to the seeds of terrestrial plants, phytoplankton cysts are the hardy resting forms that allow phytoplankton (usually flagellates) to survive during extreme environmental conditions. These cysts fall out of the water column into sediments often after large blooms, thereby forming seed beds. Characterization of the distribution of seed beds in coastal waters can assist with forecasting the intensity of HAB events. However, proper identification is often difficult as many cysts can look alike. In this workshop, we will focus on new methods for identification of cysts as well as findings on their ecology and physiology. We encourage presentations on known distributions in coastal waters (cyst mapping), and studies on their ecophysiology.

Convenors: Changkyu Lee (Korea) and Charles Trick (Canada)

Proposed invited speaker: Kazumi Matsuoka (Japan)

HAB-S Endnote 5

Proposal for a ½-day MEQ Topic Session on “Mitigation of harmful algal blooms” at PICES-2009

Mitigation includes any method that can reduce the impact or severity of HABs. These methods include both physical means, such as dispersal of clay to cause flocculation of cells from surface waters, and preventative means, such as better monitoring of coastal waters, allowing selective closures of shellfish beds (in contrast to coastwide closures). The capability for mitigation and the choice of mitigative tools depend upon the bloom-forming species, the severity of the event, and the frequency and intensity of monitoring in a region. Presentations will represent the comprehensive nature of HAB mitigation within the Pacific rim nations.

Convenors: Hak-Gyoon Kim (Korea) and Mark Wells (U.S.A.)

Proposed invited speakers: Jack Rensel (U.S.A.) and a speaker from Korea (TBD)

REPORT OF THE SECTION ON *CARBON AND CLIMATE*

The meeting of the Section on *Carbon and Climate* (CC-S) was held from 09:00–17:00 on October 26, 2007 at PICES XVII in Dalian, China. The meeting was attended by 9 members and 11 observers, with Drs. James Christian (Canada) and Toshiro Saino (Japan) acting as the meeting Co-Chairmen (*CC-S Endnote 1*). The agenda was adopted unanimously (*CC-S Endnote 2*).

AGENDA ITEM 2

Membership

A new member from China, Dr. Xiuren Ning, was introduced to the group. Dr. Liqi Chen is also a new member from China but did not attend. Appointment of additional new members from Japan was discussed. The appointment of Dr. Masao Ishii and Dr. Ahihiko Murata was recommended and subsequently approved by Governing Council. Dr. Shuichi Watanabe (Japan) has since resigned from membership in CC-S.

AGENDA ITEM 3

Journal of Oceanography special section

Results from Topic Session (S2) on “*Decadal changes in carbon biogeochemistry in the North Pacific*” convened by CC-S at PICES XVI in Victoria, Canada, are being published as a special section of the *Journal of Oceanography*. Submission deadline was August 31, 2008. To date, four manuscripts have been received and are under review. Publication is expected in early 2009.

AGENDA ITEM 3

Methods manual distribution and translation

Dr. Christian and Dr. Alex Kozyr gave an update on the distribution of the Guide to Best Practices for Ocean CO₂ Measurements, published just after the last meeting. Fifty copies have been distributed to national coordinators in Canada, China, Korea, and Russia. Drs. Kozyr (U.S.A.) and Toru Suzuki (Japan) are responsible for distribution of hardcopies in non-PICES countries. The manual is also freely available in electronic form from CDIAC.

One Standard Operating Procedure (SOP 8) has been translated into Spanish, which is now available at CDIAC. Dr. Tongsup Lee (Korea) has been coordinating translation of the guide into Korean, which is more than half completed.

AGENDA ITEM 4

Reports of collaborating organizations and agencies

Reports were given on several national and international programs relevant to the mandate of CC-S, including IOCCP (Kozyr), SOLAS (Uematsu), JP-GEOTRACES (Saino), and CarboOcean (Kozyr). Drs. Saino, Ishii, and Akira Nakadate reported on recent activities at JAMSTEC and JMA.

AGENDA ITEM 5

Report on “Oceans in a high-CO₂ world” Symposium

Dr. Ishii gave a brief report on the Second International Symposium on the “*Ocean in a high CO₂ world*”, held in Monaco on October 6–9, 2008. A number of CC-S members who could not come to Dalian met there and discussed the Implementation Plan for CO₂ data synthesis (see Agenda Item 6 and *CC-S Endnote 4*).

CC-S-2008

AGENDA ITEM 6

Data synthesis

A final version of the Implementation Plan for data synthesis was presented and extensively discussed, revised, and approved by the membership (see *CC-S Endnote 4*). It had also been previously discussed in Monaco with several members unable to attend the meeting in Dalian. The date for closure of data submission in January 2009 was left unchanged. a second level QA/QC will begin at that time. A 1½-day carbon data synthesis workshop will be held at PICES-2009. The request for meeting room space and travel support for one scientist was requested and subsequently approved. There will also likely be an “unofficial” workshop held in March 2009 in Japan.

AGENDA ITEM 7

Future activities

A Topic Session will be held at PICES-2009 (see *CC-S Endnote 3*). A detailed proposal for the session description was presented and discussed by the members. The final version was presented at the POC and BIO meetings and subsequently approved by Science Board and Governing Council.

AGENDA ITEM 8

Consideration of latest draft Science Plan for FUTURE and the CC-S role in it

Dr. Hiroaki Saito from the FUTURE Science Plan Writing Team made a brief presentation of the current status of the Science Plan. The CC-S Terms of Reference were revised at PICES XVI and the members believe that these revisions are complementary to FUTURE goals. The beginning of FUTURE is expected to overlap the renewal of CC-S at the 5-year point of its existence and further revisions to the Terms of Reference will be considered at that time.

CC-S Endnote 1

CC-S participation list

Members

Andrey Andreev (Russia)
James Christian (Canada, Co-Chairman)
Masao Ishii (Japan, appointed to membership
November 2008)
Alex Kozyr (U.S.A.)
Tongsup Lee (Korea)
Xiuren Ning (China)
Tsuneo Ono (Japan)
Toshiro Saino (Japan, Co-Chairman)
Toru Suzuki (Japan)

Observers

Alex Bychkov (PICES)
Rongshuo Cai (China)
Fei Chai (U.S.A.)
Michael Dagg (U.S.A.)
Skip McKinnell (PICES)
Akira Nakadate (Japan)
Hiroaki Saito (Japan)
Nobuo Tsurushima (Japan)
Mitsuo Uematsu (Japan)
Elena Ustinova (Russia)
Xiuhua Yan (China)

CC-S Endnote 2

CC-S meeting agenda

1. Review and adopt agenda, aims of the workshop
2. Discussion of CC-S membership, introduction of new members
3. CC-S activity report: integrated dataset, JO special volume, distribution of methods manual
4. Information exchange: IOCCP/GCP, SOLAS, JP-GEOTRACES, CarboOcean, JMA repeat hydrography activities, new JAMSTEC activities
5. Report from “Oceans in a high-CO₂ world” Symposium
6. Implementation Plan for data synthesis
7. Discussion of future activities: Publication of JO special volume, topic session for PICES-2009
8. Consideration of latest draft Science Plan for FUTURE and CC-S role in it?

CC-S Endnote 3

Proposal for a POC/BIO Topic Session at PICES-2009 on
“Anthropogenic perturbations of the carbon cycle and their impacts in the North Pacific”

Convenors: Toshiro Saino and James Christian

Accumulation of anthropogenic carbon and associated changes in ocean chemistry (“ocean acidification”) affect all of the world's oceans. Anthropogenic CO₂ has multiple feedbacks to ocean chemistry and biology, such as reduction of calcification, shifts in phytoplankton species composition, and dissolution of particulate or sedimentary carbonates. The carbon system can also be affected by other anthropogenic factors such as changes in river flow and aeolian dust deposition. Carbon and nutrient biogeochemistry will be affected both directly and indirectly by ocean acidification. This session invites papers that address the biogeochemistry of anthropogenic carbon (processes controlling its distribution, processes by which it alters ocean chemistry), other anthropogenic impacts on carbon and nutrient cycles, acidification impacts on marine biota, and feedbacks among these.

Suggested invited speakers: Richard Zeebe, University of Hawaii, U.S.A.; Yoshihisa Shirayama, Kyoto University, Japan; Ken Caldeira, Stanford University, U.S.A.

CC-S Endnote 4

The Pacific Water Column CO₂ Data Synthesis Implementation Plan for 2008–2009

Overall goals

- To bring together research groups that measure water-column CO₂-related parameters in the Pacific;
- To provide a forum for working groups for data collection and analysis;
- To create a synthesized database of water-column CO₂-related parameters for the Pacific that has gone through a 2nd-level quality assessment (2nd-level QA), *i.e.*, an activity to correct for the offset in parameters among cruises or stations by way of cross-over analysis, MLR analyses, internal consistency among carbon parameters, *etc.*;
- To estimate anthropogenic CO₂, acidification, and natural variability in the Pacific from regional to basin scales.

Targeted areas

- The North Pacific, the equatorial Pacific, the South Pacific, and their marginal seas.

Datasets to be collected

- First priority is given to the datasets of post-WOCE cruises that include high-quality discrete hydrographic and chemical data including dissolved inorganic carbon (DIC), total alkalinity (TA), pH, partial pressure of CO₂ (*p*CO₂), dissolved oxygen (DO), nutrients (nitrate + nitrite, phosphate, silicic acid), dissolved organic carbon (DOC), ¹³C and ¹⁴C of DIC, and transient tracers such as CFCs, CCl₄, SF₆, *etc.*;
- Historical datasets that include these parameters;
- Metadata such as methods of analysis, information on quality assurance, and list of related publications.

Dataset sources

- Open datasets that are available from various data centers such as CCHDO, CDIAC, WDCGG, NODC, and websites of research organizations and programs. Original PIs should be informed of the use of datasets and invited to participate in this work.
- As yet unopened high-quality datasets from PIs who agree to submit them to this database and to participate in this data synthesis. By submitting data, PIs agree that data will be opened at end of 2nd level QC.

Data archives

- MIRC and/or CDIAC
- Toru Suzuki (MIRC) and Alex Kozyr (CDIAC) are responsible for cruise and data inventory

Access to the datasets

- Original and processed datasets stored in MIRC and/or CDIAC will be accessible only to the PIs who submitted data and members of the data synthesis working group.
- Modelers and other potential data users will be invited into the process towards the end of 2nd-level QA. A statement of cooperation will be available for them to sign, pledging proper use of the data and crediting of original PIs.

Data processing (2nd-level QA and offset correction)

- A processed database (PICES carbon database) that has gone through the 2nd-level QA and offset-corrections is created. It will be disseminated in a readable electronic format, preferably WHP exchange format, with quality flags and version (update) information. Details of the data format will be decided by working group members in consultation with CARINA group members such as Dr. Robert Key (Princeton University).

2nd-level QA will be performed for the following CO₂-related parameters:

- DIC analyzed using CRM for quality control (QC),
- TA analyzed using CRM for QC,
- pH,
- Dissolved Oxygen (DO),
- Nutrients (nitrate + nitrite, phosphate, silicic acid).

For DIC, TA, DO and nutrients, sub(regional) working groups are to be established to perform cross-over analysis for 2nd-level QA. Candidates are:

- Repeated lines on 137°E (P9) and 165°E (P13): Masao Ishii (JMA/MRI) and personnel in JMA;
- Repeated lines on 155°E and 175°E, and stations KNOT and K2: Nobuo Tsurushima (AIST) and personnel in JAMSTEC/MIO;
- A-line : Tsuneo Ono (HNF)
- Station Papa and Line P: James Christian and Lisa A. Miller (DFO);
- Station ALOHA : Christopher Sabine and Richard A. Feely (NOAA/PMEL);
- Other cross-overs in the North Pacific: Akihiko Murata (JAMSTEC), Christopher Sabine (NOAA/PMEL), and Toru Suzuki (MIRC);
- Equatorial Pacific: Masao Ishii (JMA/MRI) and Richard A. Feely (NOAA/PMEL);
- South Pacific: Akihiko Murata (JAMSTEC) and Richard A. Feely (NOAA/PMEL);
- Sub-group members need to closely communicate with each other and with the original PIs. The results of the cross-over analysis should be shared with all working group members;
- For pH, the number of data is expected to be smaller than for DIC and TA. Whether there are many cross-over stations is unclear at present, but will be investigated in early 2009. If any exist, a sub-working group will perform cross-over analysis for all areas after, or in parallel with, the evaluation of offsets in DIC and TA among cruises;
- For other parameters, such as CFCs, DOC, ¹³C and ¹⁴C, their 2nd-level QA are consigned to the experts on these parameters;
- Information on the 2nd-level QA, such as offset tables, is to be documented, and included in the final report.

Processed data policy

- The PICES carbon database will be open to the public through participating data centers, *i.e.*, MIRC, CDIAC, NODC. Other data centers (*e.g.*, of PIs organizations) may stage the data but there will be a “version of record”;
- Credit will be given to all PIs who submitted or processed datasets;
- Publishing the datasets in a data publishing journal “Earth System Science Data (ESSD)” published by Copernicus Publications (<http://www.earth-system-science-data.net/>) is to be considered.

Action items

- Target date to compile the original datasets is the end of January 2009;
- A small meeting will be held in Tokyo in March 2009 to assess the status of data collection;
- A data-synthesis workshop will be held at the PICES Annual Meeting in Jeju in October 2009. Meeting room space at PICES-2009 was requested via the PICES POC and BIO committees.

REPORT OF WG 19 ON *ECOSYSTEM-BASED MANAGEMENT SCIENCE* AND ITS APPLICATION TO THE NORTH PACIFIC

The Working Group on *Ecosystem-based Management Science and its Application to the North Pacific* (hereafter WG 19) held its final meeting on October 26, 2008, under the co-chairmanship of Drs. Glen Jamieson, Chang-Ik Zhang, and Ms. Patricia Livingston. A list of participants and the meeting agenda can be found in *WG 19 Endnotes 1* and *2*. *WG 19 Endnote 3* contains the draft Executive Summary of the PICES Scientific Report currently being finalized. This Executive Summary contains the main recommendations of WG 19 at the conclusion of its work.

AGENDA ITEM 2

Discussion of final report

The primary item on the agenda involved discussion of the completeness of the final report and the recommendations of the Working Group. Status of the brochure was also discussed.

AGENDA ITEMS 3 AND 6

Description and implementation of a standard reporting format for EBM initiatives

Working Group members went over the country profile format and Ecosystem Approach to Management (EAM) typology contributions. Canada and Korea have newer contributions that need to be incorporated into the document. Each country should look to make sure its contribution is still accurate after English language editing. Also, WG 19 needs to decide if the country contributions should be made comparable in terms of length. Some contributions are longer than others. The Ecosystem-based Management (EBM) matrix that depicts each country's progress was not filled out by each country. Should this matrix still be shown? Members commented that it is difficult to report on a national basis because there are regional differences in implementation. There are several issues that are not in the table at present. For example, offshore wave energy generation, tourism and sportfishing are not outlined. Mariculture may need to identify intertidal, pen culture, and onshore locations of the activity. The text will be modified to describe the typology and sectors as examples. Offshore wave energy generation could be identified as an emerging issue in the text. Regional implementation of EBM should consider the most important sectors in a particular area. Another aspect is evaluating the social cost of EBM implementation. Dr. Mitsutaku Makino will provide a paragraph about this. Japan will contribute an example for one prefecture. WG 19 members from China and Russia will be contacted to see if they are able to contribute a national example to this table. Contributions will need to be made before the end of the year.

The Working Group consulted with Dr. Skip McKinnell about how to format the report with respect to location of references, appendices, and section formatting. For now, each section will have its own specific recommendations and the executive summary will provide a roll-up of all the recommendations from each section. Order of sections was discussed. EAM typologies and country profiles will come first. An ecoregion approach would then logically follow. Consistency in the names of countries needs to be checked and terms of reference need to be verified because they were modified later. Dr. Zhang will review the section on monitoring to see if anything could be added.

AGENDA ITEM 4

Discussion of recommendations

The relationship of PULSE (see *WG 19 Endnote 3*) to other potential task teams of FUTURE was discussed and more members were nominated. A potential Study Group or Working Group on *Indicators of Human*

WG 19-2008

Well-being: Benefits and Health was mentioned. The Working Group recommended that the Convenors of Topic Session on “*Connecting the human and natural dimensions of marine ecosystems and marine management in the PICES context*” (S12) bring up this proposed group in the discussion part of their session. Potential members of the study group/working group could be some of the people presenting at S12. WG 19 members thought that this should be a study group initially to help focus the work and refine membership for a follow-on working group. A topic session for next year on spatial planning was discussed, and it was suggested that it be sponsored by MEQ and FIS.

AGENDA ITEM 5

Ecologically and biologically sensitive international marine areas in the North Pacific

Drs. Akihiko Yatsu and Jake Rice presented information on the current status of a Regional Fisheries Management Organization (RFMO) in international waters in the North Pacific and a joint Convention on Biological Diversity-International Union for Conservation of Nature (CBD-IUCN) effort that are both considering to look at the application of criteria for designating vulnerable marine ecosystems (VMEs) in North Pacific international waters. It appears that the RFMO is still being developed, and likely would not be able to initiate studies until the fall, 2009, at the earliest, while the CBD meeting to review progress on using the criteria in evaluation of VMEs will be in early fall, 2009. It was suggested by Dr. Rice that PICES might therefore be interested in considering addressing the usefulness of the criteria in the spring, 2009. WG 19 did not have any comment about PICES' possible role but agreed that species do not recognize national borders and EBM must extend to international waters. The proposed designation of VMEs in international waters would be a necessary step in the long-term achievement of EBM in the entire North Pacific.

AGENDA ITEM 7

Brochure

The brochure format was discussed. A figure depicting the differences between single sector management, ecosystem-based fishery management and multisector integrated managed was suggested. The terms EBM should be consistently used throughout the brochure although some mention could be made of the other terms that are in use. There was also support for translating into languages of the PICES member nations and making those available on the PICES website. There was some discussion on the possible perspectives and recommendations of the PICES Study Group on *Communications* about this brochure. Members were tasked with looking at various sections and provide edited text.

WG 19 Endnote 1

WG 19 participation list

Members

David Fluharty (U.S.A.)
Glen Jamieson (Canada, Co-Chairman)
Patricia Livingston (U.S.A., Co-Chairman)
Mitsutaku Makino (Japan)
In-Ja Yeon (Korea)
Chang-Ik Zhang (Korea, Co-Chairman)

Observers

Evgeny Barabanshchikov (Russia)
Ingrid Burgetz (Canada)
Oleg Katugin (Russia)
Skip McKinnell (PICES)
Thomas Okey (Canada)
Jake Rice (Canada)
Steve Rumrill (U.S.A.)
Yasunori Sakurai (Japan)
Akihiko Yatsu (Japan)

WG 19 Endnote 2**WG 19 meeting agenda**

1. Welcome and Introductions (Co-Chairs)
2. Discussion of completeness of final report, deliverables and timeframe
3. Report by each country: Describe and implement a standard reporting format for EBM initiatives (including more than fishery management) in each PICES country, including a listing of the ecosystem based management objectives of each country. Summary of compilation progress: Dave Fluharty
4. Discussion of recommendations – PULSE and SG on *Indicators of Human Well-Being: Benefits and Health*
5. Presentation by Jake Rice on SG on *Ecologically and biologically sensitive international marine areas in the North Pacific*
6. Overall review of final report
7. Discussion of brochure

WG 19 Endnote 3**Looking beyond WG 19**

We discussed how the findings and work of WG 19 could best be integrated and built upon within PICES in the years ahead, particularly within the context of the FUTURE program. Development of ecosystem-based management is still very much in its early stages in each of the PICES countries, and so we recommend that PICES continue to actively monitor progress into the foreseeable future. To provide a long-term forum for this process, we concluded that WG 19 might most appropriately evolve into a Task Team rather than a Section because Task Teams report to Science Board and are more broadly distributed across all of PICES, rather than simply reporting to one or two committees. We suggest that the Task Team's emphasis be on developing an integrative, science-based, ecosystem-scale understanding of the human dimension (across a diversity of sectors) in FUTURE, and suggest it be called "*PICES Understanding, Linking and Synthesis of Ecosystems*" (PULSE). A draft proposal for this Task Team with a basic background statement, terms of reference and suggested co-chairs and members is:

Objective

To monitor and synthesize regional and basin-wide ecosystem-based management (EBM) studies and initiatives (ecosystem health) and to provide a forum for the integration of FUTURE-related EBM practices and their implementation.

Draft Terms of Reference

1. The PULSE Task Team is the scientific body responsible for the promotion, coordination, integration and synthesis of research activities related to the implementation of EBM among PICES member nations. This goal would be accomplished by convening meetings, periodic scientific symposia or workshops, or by distributing information designed to foster cooperation and integration among existing or developing PICES programs, and possibly between and/or within member nations;
2. The PULSE Task Team will provide the scientific body to identify and improve indicators to measure progress in the achievement of EBM. It will provide the forum to discuss the needs, impacts and responses of coastal communities in a changing marine environment, and to enhance the use of this information by governments and society at large. It will provide a forum for the connection of ecosystem monitoring and status reporting of both environmental and social indicators (through linkage with MONITOR), and the subsequent implementation and adaptation of EBM;
3. Scientific collaboration and coordination with other international agencies, bodies and societies that are engaged in either EBM or human activities that are relevant to the achievement of EBM will be

WG 19-2008

undertaken. This will engage expertise not previously active in PICES, such as social-scientists and policy makers;

4. The PULSE Task Team will encourage establishment of other component activities, such as developing the basis for coupled human science-natural science models, and emerging approaches as needed to facilitate synthesis of the FUTURE Program.

Suggested members

We are seeking a structure that will ensure core connection with PICES Committees, key expertise from the various disciplines involved in studying ecosystem approaches to management, and national representation. We advocate a nomination process that will closely connect the Task Team to PICES Scientific Committees, such as ensuring that a member or designate from each of the Committees, and perhaps from the current Study Group on *Communications* is in PULSE. There is also perhaps merit in having member participation from different sectors besides fishing (*e.g.*, mariculture, *etc.*) and ecoregions.

Suggested Co-chairs: Mitsutaku Makino (Japan) and Gordon Kruse (U.S.A.)

Suggested members:

Janelle Curtis (Canada)
David Fluharty (U.S.A., SG-Communications)
Chris Harvey (U.S.A.)
Glen Jamieson (Canada, MEQ)
Xianshi Jin (China)
Patricia Livingston (U.S.A.)
Ian Perry (Canada)
Vladimir Radchenko (Russia, BIO)
In-Ja Yeon (Korea)
Chang-Ik Zhang (Korea, FIS)

EBM in International Waters

In the above, all details and discussion presented have been focused on initiatives being undertaken within the Exclusive Economic Zones of the PICES member countries, and while significant progress is being made in these regions to address issues related to EBM, the reality is that many species have spatial distributions in the Pacific Ocean that extend well beyond national jurisdictions. For these species, effective EBM can only be realised if national efforts to achieve EBM are harmonised with similar national efforts in shared national ecoregions and with multinational efforts in international waters. To this end, many of the initiatives to determine appropriate EBM steps in national waters, such as identifying ecoregions (spatial areas with a basically similar mix of species and environment) and within them, ecologically and biologically significant areas and species, need to be undertaken in offshore international waters of the PICES region.

REPORT OF WORKING GROUP 20 ON EVALUATIONS OF CLIMATE CHANGE PROJECTIONS

The Working Group on *Evaluations of Climate Change Projections* (hereafter WG 20) held its third meeting from 14:00–15:30 hours on October 25, 2008. After introductory formalities to members and observers (*WG 20 Endnote 1*) were conducted by Co-Chairmen, Drs. Michael G. Foreman and Yasuhiro Yamanaka, the draft agenda was reviewed and adopted without changes, and Dr. Enrique Curchitser kindly agreed to serve as rapporteur (*WG 20 Endnote 2*).

AGENDA ITEMS 3 AND 4

Discussion of action items arising from a workshop with CFAME, and update on Terms of Reference

The meeting began with a recap of the WG Terms of Reference (*WG 20 Endnote 3*) and an assessment of what had been achieved thus far. In light of the presentations by Drs. James Overland/Muyin Wang, James Christian, Emanuele Di Lorenzo, and Curchitser, Foreman and Yamanaka, at the workshop on “*Climate scenarios for ecosystem modeling*” (W4), it was felt that with the exception of items 4, 5, and 7, considerable progress had been made in all objectives.

With regard to the collaboration with CFAME (Climate Forcing and Marine Ecosystem Response), whose tenure as a Task Team ended at this PICES meeting, Dr. Foreman briefly described the assignments/homework arising from the CFAME inter-sessional workshop on “*Linking and visualizing climate-forcing mechanisms and marine ecosystem changes: A comparative approach*” held April 15–17, 2008 in Hawaii and the Task Team’s goal of completing their final report by year end. With regard to CFAME’s subproject on the California Current Ecosystem, Dr. Foreman stated that a recent email from CFAME member, Dr. Vera Agostini, requested information on projected changes to the stratification, temperature, river discharge, currents (e.g., undercurrent), eddies/meanders, winds (in relation to turbulence, upwelling, deep mixing), tidal mixing for (if possible), the northern, central, and southern subregions of the system. Though it was generally agreed one or more regional climate models with sufficiently high resolution would be needed to provide these projected changes with some degree of confidence, at present these models do not exist. Nevertheless, an intermediate step that should yield sufficiently accurate estimates for these variables would be the statistical downscaling of global climate model values that has been described in PICES workshops and sessions by Wang/Overland/Bond and Pal/Merryfield/Morrison/Foreman. It was further agreed that the two variables for which it would be most difficult to provide change estimates would be the undercurrent (its underlying dynamics and variability are still not fully understood) and eddies/meanders (though it might be possible to estimate these changes by running existing regional models with higher heat fluxes, this could not be done in the time frame needed by CFAME). It was resolved that Drs. Foreman, Overland, and Wang would do their best to provide the information that Dr. Agostini needed. For the other two CFAME ecosystems, Dr. Yamanaka agreed that he would work with Dr. Sanae Chiba in providing the necessary information for the Kuroshio/Oyashio system while Dr. Young-Shil Kang would work with Dr. Jae-Bong Lee in providing the necessary information for the Yellow and East China Seas system.

AGENDA ITEM 5

FUTURE Implementation Plan

Following a brief summary of the latest draft of the FUTURE Implementation Plan, a lively discussion followed on the roles of WG 20 and a possible follow-up working group. Though WG 20 was scheduled to complete its tenure at the 2009 PICES Annual Meeting, it was felt that the downscaling requirements of the FIS/POC proposed new Working Group on “*Forecasting Climate Change Impacts on Fish and Shellfish*” should justify asking POC and Science Board for a one year extension. After that, it was felt that a new

WG 20-2008

working group whose mandate would be to investigate the predictability of interannual to decadal variability might be warranted. Toward that end, it was decided that Dr. Di Lorenzo would work with Drs. Overland and Foreman in developing a proposal for a topic session along those lines for the next PICES Annual Meeting. (See *WG 20 Endnote 4* for the final proposal. Note that at the Science Board meeting on November 1, this proposed Topic Session was switched to a workshop to be scheduled before the main PICES-2009 Annual Meeting.) The success of that session would determine whether or not POC should proceed in creating the new working group.

AGENDA ITEMS 6, 7, 8

Final report, future workshops/meetings, items with financial implications

Other issues discussed are as follows:

1. Though extending WG 20 for another year forestalls planning the final report, it was agreed that we should be thinking of how that report should be structured. It is hoped that all WG 20 members could provide summaries of their work relevant to the terms of reference.
2. Even with an extension of WG 20's lifetime, the development, testing, and evaluation of regional climate models will go beyond the tenure of WG 20. So a new home needs to be found for this activity – perhaps within one of the new FUTURE Task Teams.
3. An informal WG 20 progress report meeting will be scheduled for those members attending the GLOBEC Open Science Meeting in Victoria, Canada in June 2009.
4. A new zooplankton working group (Working Group (WG 23) on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim*) might also be asking for climate change estimates relevant to their research. In order to respond to this request and perhaps others like it in the future, it might be possible to create an archive of downscaled results on some web server.
5. It was agreed that WG 20/POC would support Dr. Anne Hollowed's proposal for the creation of a new Working Group on "*Forecasting Climate Change Impacts on Fish and Shellfish*". See *WG 20 Endnote 5* for the background and Terms of Reference.
6. It was also agreed that WG20/POC needs to continue emphasizing the fact that the physics cannot be assumed done in FUTURE activities. Work needs to continue in better understanding the physical dynamics (e.g., interannual to decadal variability) relevant to ecosystems.

AGENDA ITEM 9

Other business

No other business was discussed and the meeting was adjourned.

WG 20 Endnote 1

WG 20 participation list

Members

James Christian (Canada)
Enrique Curshitsler (U.S.A.)
Emanuele Di Lorenzo (U.S.A.)
Michael G. Foreman (Canada, Co-Chairman)
Elena Ustinova (Russia)
Muyin Wang (U.S.A.)
Yasuhiro Yamanaka (Japan, Co-Chairman)
Sang-Wook Yeh (Korea)

Observers

Guoqi Han (Canada)
Albert J. Hermann (U.S.A.)
Masahide Kaeriyama (Japan)
Oleg Katugin (Russia)
David L. Mackas (Canada)
James E. Overland (U.S.A.)
Jake Schweigert (Canada)
John E. Stein (PICES)
Akihiko Yatsu (Japan)

WG 20 Endnote 2**WG 20 meeting agenda**

1. Welcome, introductions, opening remarks
2. Changes to, adoption of, agenda and appointment of rapporteur
3. Discussion of, and action items arising from, workshop with CFAME and new fisheries WG
4. Updates on work related to WG Terms of Reference
 - a. Shopping list for CFAME
 - b. Additional presentations to those in W4
 - c. Other
5. Discussion of FUTURE Implementation Plan: Roles for WG 20, its successor (?), and respective member countries
6. WG 20 final report: discussion, publications, work assignments
7. Future WG 20 workshops/meetings
 - a. Before or after GLOBEC Open Science Meeting in Victoria, June 22–26, 2009?
 - b. Final meeting and/or workshop/session at PICES-2009, Jeju, Korea, October 2009
 - c. Other?
8. Items with financial implications
 - a. Travel support requests:
 - (i) Invited speaker for June 2009 meeting?
 - b. Other items
9. Other business
10. Adoption of report for presentation at POC committee meeting

WG 20 Endnote 3**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;
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;
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;
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;
5. To ensure effective two-way communication with CLIVAR;
6. To convene workshops/sessions to evaluate and compare results;
7. To publish a final report summarizing results.

WG 20 Endnote 4

Proposal for a 1-day Topic Session for PICES-2009 on

“Exploring the predictability and mechanisms of Pacific low frequency variability beyond interannual timescales” [later changed to a workshop]

Introductory lecture

M. Foreman (POC) – *“Overview of current understanding of Pacific Ocean climate variability”*

Understanding the dynamics that control climate variability in the Pacific basin is essential for exploring the degree of predictability of the ocean–atmosphere and sea–ice climate systems of the North Pacific. The goal of this session is to improve the conceptual and quantitative frameworks used by the PICES community to interpret low-frequency climate variability in the Pacific basin, ranging from interannual to multi-decadal timescales. We invite contributions on a broad range of topics including (1) studies that link regional to basin scale dynamics, (2) investigations of “regime shift”, specifically the extent to which sharp transitions in the climate system are predictable and connected with low-frequency variations in the ocean–atmosphere and sea–ice systems, (3) studies that separate the stochastic and deterministic components of low-frequency climate fluctuations, (4) analysis of long-term observations collected in regional environments across the Pacific, specifically their relationship to large-scale climate processes as opposed to local scale dynamics, (5) climate change and how it may impact the statistics of Pacific climate (*e.g.*, frequency of “regime shifts”) and (6) more generally, studies that propose new mechanisms underlying low-frequency Pacific climate variability.

Sponsor: POC

Convenors: Emanuele Di Lorenzo (U.S.A.), Shoshiro Minobe (Japan)

Recommended Invited Speakers

John Fyfe, William Merryfield or Kenneth Denman (Canada) – climate modelling;
Tim Barnett or David Pierce (U.S.A.) – Pacific decadal variability and climate change;
Nicolas Gruber (Switzerland) – mechanism of global biogeochemical cycles;
other speakers from Japan, U.S.A. or Korea TBD.

Session Organization

1. Dr. Minobe and Di Lorenzo have agreed to convene the session.
2. The session will open with a 40-minute overview of the current theories and understandings of Pacific climate variability. The overview will be given by Dr. Foreman (POC) with contributions from several authors.
3. The session will last for no longer than one day.
4. We plan to have four invited speakers representing the countries involved in PICES. The goal is to use the invited speaker slots to invite and attract scientists who are currently not involved in PICES but who can bring new insights to the PICES community in terms of Pacific climate variability and climate change.

WG 20 Endnote 5

**Proposal for a new PICES/ICES Working Group on
Forecasting Climate Change Impacts on Fish and Shellfish (WG-FCCIFS)**

Proposed Parent Committees

ICES approved the formation of WG-FCCIFS as a permanent working group. FIS will serve as the parent committee for WG-FCCIFS with support from POC. The activities of WG-FCCIFS may be integrated into the PICES FUTURE program as a task team. WG-FCCIFS will report to the ICES Climate Change Steering Group, ICES Oceanography Committee, and the PICES FIS and POC Committees.

Suggested Co-Chairmen

Anne Hollowed (U.S.A.)
Manuel Barange (UK)
Suam Kim (Korea)
Harald Loeng (Norway)

Suggested Working Group members

Richard Beamish – Canada (NPAFC, PICES FIS)
Daniel Duplisea – Canada (ICES)
Thomas Okey – Canada (PEW Trust)
Michael Foreman – Canada (PICES POC)
Keith Brander – Denmark (ICES, IPCC ecosystem writing team)
Jürgen Alheit – Germany (ICES, GLOBEC SPACC)
Shin-ichi Ito – Japan (ESSAS, PICES POC)
Sang-Wook Yeh - Korea
Jason Holt - UK (QUESTFISH, ICES),
James Overland – U.S.A. (ESSAS, PICES POC)

Rationale

The work of WG-FCCIFS is essential to ensure that ICES and PICES will be able to provide guidance on the potential impacts of climate change on marine ecosystems and the response of commercial fish and shellfish resources to these changes.

The work done within ICES and PICES on climate change and fisheries has been diverse and has included: a) guidance on methods for selection of IPCC models under different emission scenarios for use in projections; b) techniques for downscaling IPCC model outputs to local regions, c) development of coupled ecosystem models for use in evaluating climate-induced shifts in environmental conditions, d) literature documenting relationships between climate forcing and marine fish and shellfish distribution and production, and e) stock assessment techniques for evaluating management strategies to mitigate the impacts of change. A challenge facing ICES and PICES is the need to integrate all of this research to provide stakeholders with quantitative estimates of the potential impact of climate change on marine life throughout the world. This challenge calls for the establishment of an interdisciplinary research team composed of experts from around the world who will focus attention on the development of common and standardized frameworks for forecasting climate change impacts on marine life, with particular emphasis on commercially important fish and shellfish. ICES and PICES should act now to ensure that our research communities develop the capabilities to provide quantitative contributions to the next IPCC reports and to provide guidance for management under climate change scenarios.

Several case studies will be identified by the Steering Group based on their potential for contributing to methodological development and the opportunity for comparison of marine species and community responses to climate forcing in different ecosystems. Members of the Working Group will be responsible for encouraging the development of regional interdisciplinary teams responsible for the production of forecasts. Members of the Working Group will provide guidance to the regional teams by providing a framework for the

WG 20-2008

development of the forecasts and communication of new advances in analytical tools. The culmination of the Working Group's effort will be presentation and discussion of results at an inter-sessional meeting and publication of results in a peer reviewed journal by 2011. The timing for the publication is critical because the future IPCC AR5 report is slated for release in 2013 and the IPCC only allows references to published papers.

Proposed Terms of Reference

We recommend that WG-FCCIFS is established to promote and coordinate research on the potential impacts of climate change on marine fish and shellfish around the world.

The Working Group will:

1. Promote research on climate change impacts on fish and shellfish by scientists in ICES and PICES member nations through coordinated communication, exchange of methodology, and organization of meetings to provide a venue for discussion and publication of results.
2. Develop frameworks and methodologies for forecasting the impacts of climate change on the growth, distribution and abundance of marine life with particular emphasis on commercial fish and shellfish;
3. Review the results of designated case studies to test methods;
4. Hold an inter-sessional symposium in early 2010 where scientists can present, discuss and publish forecasts of climate change impacts on the world's commercial fish and shellfish resources;
5. Establish techniques for estimating and communicating uncertainty in forecasts;
6. Evaluate strategies for research and management under climate change scenarios, given the limitations of our forecasts;
7. Produce publications that could be considered for the Fifth Assessment Report of the Intergovernmental Panel on Climate Change in 2013;
8. Publish a final report summarizing work.

The Working Group will utilize web technology to hold several virtual Working Group meetings. They will hold an inter-sessional Working Group meeting on June 21, 2009 one day prior to the GLOBEC Open Science meeting in Victoria, Canada. At that meeting members will review the results of designated case studies and discuss a symposium for 2010. WG-FCCIFS will report by September 2009 for the attention of the ICES Climate Change Steering Group, ICES Oceanography Committee, and the PICES FIS and POC Committees. WG-FCCIFS will provide several case studies that will contribute to the PICES FUTURE program.

Working Group members will seek widened participation for this group, including contact with relevant academic and inter-governmental organizations such as fisheries managers, the North Pacific Anadromous Fish Commission, the Intergovernmental Oceanographic Commission, and FAO for the symposium in 2010.

REPORT OF WG 21 ON *NON-INDIGENOUS AQUATIC SPECIES*

The Working Group on *Non-Indigenous Aquatic Species* (hereafter WG 21) held its third meeting October 24–25, 2008, under the co-chairmanship of Ms. Darlene L. Smith and Dr. Vasily Radashevsky. A list of participants and meeting agenda can be found in *WG 21 Endnotes 1* and 2.

AGENDA ITEM 2

Taxonomy initiative

In 2007, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan, provided funding to PICES for a project entitled “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” to develop international systems to collect, exchange and store relevant data. The project is anticipated to run for 5 years (from April 1, 2007 to March 31, 2012).

The project is made up of two components, one on marine non-indigenous species (MNIS) conducted by WG 21 and one on harmful algal blooms conducted by the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S). The MNIS sub-project is divided into two initiatives, one on the development of a MNIS database and the other on a taxonomic system to allow identification and documentation of MNIS establishment outside of their native habitat. The latter initiative, which is being led by Dr. Thomas Therriault, consists of four key elements: (1) the identification of taxonomic needs in PICES member countries, (2) the carrying out of rapid assessment surveys, (3) the initiation of standardized collector plate surveys, and (4) the development of taxonomic information system/tools.

The first WG21 Rapid Assessment Survey (RAS) to assess the presence of non-indigenous species was conducted from September 20–23, 2008, in Dalian, China. Dr. Lijun Wang of the National Marine Environmental Monitoring Center, SOA, was the local organizer. In addition to Drs. Therriault and Wang, the RAS team included Dr. Graham Gillespie (Pacific Biological Station, Canada) and Ms. Darlene Smith (National Headquarters, Fisheries and Oceans Canada); Dr. Hiroshi Kawai (University of Kobe, Japan); Dr. Li Zheng and Mr. Zhisong Cui (First Institute of Oceanography, SOA, China); Drs. Vasily Radashevsky, Eduard Titlyanov, Tamara Titlyanova (Institute of Marine Biology, FEB RAS, Russia) and Dr. Liudmila Budnikova (Pacific Research Institute of Fisheries and Oceanography, Russia); Drs. Blake Feist (Northwest Fisheries Science Center, NMFS, U.S.A.) and Judith Pederson (MIT Sea Grant Program, U.S.A.).

Two commercial ports (Dalian on the Yellow Sea and Bayu Quan on the Bohai Sea) were sampled by Dr Wang prior to the RAS. A third site, Ling Shui Qiao Beach, Dalian, was sampled by RAS participants on October 22, 2008. A total of 59 species were identified in Dalian Port, 29 species in Bayu Quan Port, and 60 on Ling Shui Qiao Beach. Dr. Therriault will produce a formal report of the Dalian RAS and will provide a written protocol for the RAS and collector plate surveys at a later date. Canada will provide collectors to countries wishing to deploy collector plates, and all data from the rapid assessment and collector plate surveys will be entered into the nonindigenous species database.

Professor Toshio Furota presented the results of a rapid assessment survey he conducted in Tokyo Bay, Japan. In summary, two sites were sampled; the Port of Tokyo and Piers off Haneda Airport in the inner Tokyo Bay. A total of 67 species and/or taxonomic groups were identified of which 15 are considered non-indigenous. The complete report from the Tokyo Bay rapid assessment survey can be found in *WG 21 Endnote 3*.

AGENDA ITEM 3

Non-indigenous species database

The second sub-project funded by MAFF (see Agenda Item 2) was the development of a comprehensive MNIS database led by Dr. Henry Lee II (U.S. Environment and Protection Agency, U.S.A.) and Ms. Deborah

WG 21-2008

Reusser (USGS-Western Fisheries Research Center at Marine Hatfield Science Center, U.S.A.). This initiative involves the development and population of a database of marine/estuarine species that can be queried for distributional, ecological, and physiological data at different taxonomic levels and spatial distributions. The database includes: species, a hierarchical biogeography at the realm, province and ecoregion level, ecosystem type, salinity, life history and development, habitat, temperature, trophic level and feeding, and invasion vectors.

A working copy version of the database was distributed to all WG 21 members at the meeting and assistance was provided by Ms. Reusser to ensure that it was successfully installed. January 2009 was established as the deadline for entry and submission of existing nonindigenous species by countries to Ms Reusser. The final version database, complete with query and output functions, picture storage, PDF storage and automated import utilities, will be completed by October 2009. Additional data entry and a possible web-based application will be discussed at PICES-2009 in Jeju, Korea.

AGENDA ITEM 4

WG 21 revised terms of reference

Given the refocusing of WG 21's work on the two MAFF-funded projects, WG 21 reviewed its current terms of reference and revised them (*WG 21 Endnote 4*) to reflect content and duration of the activities (*WG 21 Endnote 5*) under these projects. They were submitted to the MEQ Committee for approval.

AGENDA ITEM 5

6th International Conference on Marine Bioinvasions

Dr. Judith Pederson presented information on the 6th International Conference on Marine Bioinvasions to be held August 24–29, 2009 in Portland, Oregon, U.S.A. The Conference is entitled “*Marine bioinvaders: Agents of change in a changing world*” and details can be found at <http://www.clr.pdx.edu/mbic>. The themes are:

- Ecological and evolutionary impacts, including potential shifts with global change;
- Predicting the scale and diversity of invasions in the face of global change;
- Measuring and predicting spread on regional and global scales;
- Invasion patterns over time and space: does the past predict the future?
- Advances in detection, identification and tracking-to-origin capabilities;
- Management, rapid response, eradication and restoration.

The conference organizers are seeking financial support from PICES. Dr. Therriault volunteered to serve as a member of the conference's scientific steering committee. Dr. Yoon Lee (Korea) is already a member.

AGENDA ITEM 6

Possible cooperation between the Northwest Pacific Action Plan (NOWPAP) and PICES

Dr. Jeung Sook Park, Scientific Affairs Officer of NOWPAP Regional Coordination Unit, presented a statement on possible cooperation between NOWPAP and PICES. WG 21 reviewed it and concluded that while sharing information is desirable, there were insufficient details to make a recommendation to MEQ.

AGENDA ITEM 7

Recommendations

The Working Group recommends that the MEQ Committee approve:

- a. The revised terms of reference, with deliverables and milestones;

- b. Extend the lifespan of WG 21 until PICES-2012 (October 2012) to reflect the duration of the MAFF funding;
- c. Support the 6th International Conference on Marine Bioinvasions conditional on the organizers' acceptance of significant PICES input;
- d. Support a 2-day meeting of WG 21 at PICES-2009 in Korea.

WG 21 Endnote 1

Participation list

Members

Evgenyi Barabanshchikov (Russia)
 Blake Feist (U.S.A.)
 Toshio Furota (Japan)
 Graham Gillespie (Canada)
 Paul Heimowitz (U.S.A.)
 Masaya Katoh (Japan)
 Hiroshi Kawai (Japan)
 Henry Lee II (U.S.A.)
 Zheng Li (China)
 Wang Lijun (China)
 Vasily Radashevsky, (Russia, Co-Chairman)
 Deborah Reusser (U.S.A.)
 Darlene Smith (Canada, Co-Chairman)
 Thomas Therriault (Canada)

Observers

Ingrid Burgetz (Canada)
 Liudmila Budnikova (Russia)
 Jinho Chae (China)
 Zhisong Cui (China)
 Ted Grosholz (U.S.A.)
 Glen Jamieson (Canada)
 Judith Pederson (U.S.A.)
 Steven Rumrill (U.S.A.)
 Yasunori Watanabe (Japan)

WG 21 Endnote 2

WG 21 meeting agenda

1. Opening remarks and introductions
2. Taxonomy initiative
3. Non-indigenous species database
4. WG 21 revised terms of reference
5. 6th International Conference on Marine Bioinvasions
6. Statement on possible cooperation between the Northwest Pacific Action Plan (NOWPAP) and PICES
7. WG 21 Recommendations to MEQ Committee:

WG 21 Endnote 3

**Results of Rapid Assessment for marine invasion
in Tokyo Bay conducted in 2008**

Toshio Furota¹, Satoko Nakayama², Masanori Taru¹, Eijiro Nishi³, Taiji Kurozumi⁴, Tomoyuki Komai⁴,
Teruaki Nishikawa⁵, and Ko Tomikawa⁶

¹ Toho University,

² Japan Wildlife Research Center,

³ Yokohama National University,

⁴ Natural History Museum and Institute, Chiba,

⁵ Nagoya University,

⁶ Hiroshima University.

Observation Locations and Methods

A. Port of Tokyo

1. Suspended artificial panels (32×55 cm black acrylic) from a floating dock at Museum of Maritime Science in Port of Tokyo. Every 1 m deep from 1 m to 4 m near bottom. Established on May 11, 2008, and observed on September 22, 2008.
2. Hand collection in intertidal and subtidal bottoms by SCUBA at Daiba Beach and Museum of Maritime Science in Port of Tokyo. Conducted on September 15, 2008.

B. Piers Off Haneda Airport inner Tokyo Bay

1. Hand collection by SCUBA divers. Surface to bottom (20 m), conducted on July 15, 2008.

Preservation and identification

All samples were preserved in 10 % neutralized sea-water formalin.

Conclusion

A total of 67 species and/or taxonomic groups were identified. Among them, 17 species were judged to non-indigenous species, which consisted mainly of sessile species, except for 4 free-living ones; An Atlantic clam, *Mericanaria marcenaria*, a mud amphipod, *Monocorophium insidiosum*, a small spider crab, *Pyromaia tuberculata*, and a Mediterranean green crab, *Carcinus aestuarii*. This strongly indicates that benthic community in inner Tokyo Bay had been dominated by invasive species. Four major vectors of marine invasion with human activities had been suggested; attaching on ship hauls, sea chests, ballast waters, and intentional or unintentional transplantation with imported fishery species. Action to prevent the marine invasion has not been conducted in Japan. These suggest that there is a possibility of further invasions of marine organisms into the bay, and this will cause change of the benthic community in Tokyo Bay. Monitoring observation for next invasion could be required.

WG 21 Endnote 4

WG 21 revised terms of reference

- 1) Assesses the status of Non-Indigenous Aquatic Species in the PICES area by:
 - a) completing an inventory of currently reported estuarine and marine aquatic non-indigenous species in PICES member countries;
 - b) compiling definitions of terms and making recommendations on use of terms; and

- c) summarizing the situation on bioinvasions in the Pacific and compare and contrast to other regions in the Northern hemisphere.
- 2) Assemble an inventory of expertise and programs related Non-Indigenous Aquatic Species in PICES member countries by compiling:
 - a) a list of existing databases of Non-Indigenous Aquatic Species experts in PICES member countries; and
 - b) sources of information on relevant national research and monitoring programs.
- 3) Prevention and mitigation measures:
 - a) summarize initiatives on prevention and mitigation measures (*e.g.*, ICES Code of Practice for the Introduction and Transfer of Marine Organisms; IMO Ballast Water Management Convention and national policies of PICES member countries); and
 - b) develop recommendations for best practices for prevention and mitigation.
- 4) Promote collaboration between ICES Working Groups on Non-Indigenous Species by:
 - a) holding joint meetings of the ICES and PICES WG-21 as conveniently possible; and
 - b) developing and recommending an approach for enhances linkages between ICES and PICES on Non-Indigenous Aquatic Species.
- 5) Develop a Non-Indigenous Aquatic Species Database for the PICES area.
- 6) Establish a North Pacific Marine Non-Indigenous Aquatic Species taxonomy initiative including:
 - a) Conducting rapid assessment surveys and collector surveys; and
 - b) Developing taxonomic tools.
- 7) Publish an interim report in 2010 and a final report in 2012 summarizing results and recommendations.

WG 21 Endnote 5

Deliverables and milestones to complete WG 21 terms of reference

DELIVERABLE	PROJECT LEAD	MILESTONES
1) Assesses the status of Non-Indigenous Aquatic Species in the PICES area by:		
a) completing an inventory of currently reported estuarine and marine aquatic non-indigenous species in PICES member countries;	Henry Lee	January 15, 2009 – Countries to send data. March 31, 2009 – Inventory completed.
b) compiling definitions of terms and making recommendations on use of terms;	Thomas Therriault	October 2009 – To be completed.
c) summarizing the situation on bioinvasions in the North Pacific;	Henry Lee	October 2009 – Draft manuscript to be completed. October 2010 – Submitted to a peer-reviewed journal.
d) compare and contrast to other regions.	To be determined	October 2011
2) Assemble an inventory of expertise and programs related Non Indigenous Aquatic Species in PICES member countries by:		
a) compiling a list of existing databases of Non-Indigenous Aquatic Species experts;	Blake Feist	October 2009 – To be completed.
b) compiling sources of information on relevant national research and monitoring programs in PICES member countries.	Thomas Therriault	October 2012
3) Prevention and mitigation measures:		
a) summarize initiatives on prevention and mitigation measures (e.g., ICES Code of Practice for the Introduction and Transfer of Marine Organisms; IMO Ballast Water Management Convention and national policies of PICES member countries);	Paul Heimowitz	October 2009 – Henry Lee to summarize IMO; Judith Pederson to summarize ICES Code of Practice; Paul Heimowitz to lead on mitigation.
b) develop recommendations for best practices for prevention and mitigation.	Paul Heimowitz	October 2012 – To be completed.
4) Promote collaboration between ICES and PICES Working Groups on Non-Indigenous Species by:		
a) holding joint meetings of the ICES and PICES WG-21 as conveniently as practical;	Darlene Smith Vasily Radashevsky Judith Pederson	May 2007 – Joint meeting held concurrent with 5 th Marine Bioinvasions Conference. August 2009? – Joint meeting to be held concurrent with 6 th Marine Bioinvasions Conference.
b) developing and recommending an approach for enhances linkages between ICES and PICES on Non-Indigenous Aquatic Species.	Darlene Smith Vasily Radashevsky Judith Pederson	Annually – Share meeting reports and project status. Ongoing liaison between the ICES and PICES chairs.
5) Develop a comprehensive Non-Indigenous Aquatic Database.		
a) Develop a database prototype;	Henry Lee Deborah Reusser	Completed October 2007.
b) Intercessional workshop to test the revised prototype and establish database	All	Completed March 2008 in Busan, Hosted by NFRDI.

DELIVERABLE	PROJECT LEAD	MILESTONES
structure in Busan, hosted at NFRDI;		
c) Enhanced prototype based on intercessional workshop;	Henry Lee Deborah Reusser	Completed October 2008.
d) Final comments on the database to Henry Lee and Deborah Reusser;	All working group members	Comment period closes December 31, 2008.
e) Transmission of current NIS data to Henry Lee preferably in the database or by spreadsheet (See ToR 1);	All WG 21 members	Deadline January 15, 2008.
f) Compiled data	Henry Lee	Deadline March 31, 2008.
g) Final Version 1 of the stand alone database including query functions;	Henry Lee Deborah Reusser	October 2009 – Final working version of the database.
h) Recommendation on Web-based application;	All WG 21 members	October 2009
i) Development of Web-based application, if approved;	TBD	To be completed October 2012.
j) Continued data entry.	All WG 21 members	Annually until October 2012.
6) Establish a North Pacific Marine Non-Indigenous Aquatic Species taxonomy initiative.	Thomas Therriault	
a) Dalian Rapid Assessment Survey;	Thomas Therriault and Wang Lijun	Completed October 2008.
b) Busan Rapid Assessment Survey;	Thomas Therriault and TBD	October 2009
c) A demonstration RAS will be held in Japan for developing countries. Countries to be invited may include Vietnam, Malaysia, Indonesia, Philippines, Thailand and Mauritius;	Thomas Therriault and TBD	Date to be determined between April 2010 and March 2011.
d) Rapid assessment in Russia;	Thomas Therriault and TBD	October 2011
e) Final Report.	Thomas Therriault	October 2012
7) Publish an interim report in 2010 and a final report in 2012 summarizing results and recommendations.	Darlene Smith Vasily Radashevsky	October 2009 – Web brochure outlining the Non-indigenous Aquatic Species issues and WG-21's work on taxonomy and database. October 2010 – Interim report summarizing results and recommendations. October 2012 – Final report summarizing results and recommendations.

**REPORT OF WG 22 ON *IRON SUPPLY AND ITS IMPACT ON
BIOGEOCHEMISTRY AND ECOSYSTEMS IN
THE NORTH PACIFIC OCEAN***

The Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22) held its first meeting on October 25, 2008 from 11:00 to 18:00 under the co-chairmanship of Drs. Fei Chai and Shigenobu Takeda. Members who attended the meeting are listed in *WG 22 Endnote 1* and the meeting agenda can be found in *WG 22 Endnote 2*. The planned schedule and timeline of the Working Group is summarized below:

October 2007

PICES XVI (Victoria, Canada)

- Disbandment of the Advisory Panel on *Iron Fertilization Experiment in the Subarctic Pacific Ocean* (IFEP-AP)
- Establishment of a new Working Group (WG 22), under the direction of Biological Oceanography Committee (BIO)

October 2008

PICES XVII (Dalian, China)

- first WG 22 meeting

October 2009

PICES-2009 (Jeju, Korea)

- second WG 22 meeting (Workshop)

October 2010

PICES-2010 (Seattle, U.S.A)

- third (final) WG 22 meeting (PICES Scientific Report)

AGENDA ITEM 2

Review of WG 22 Terms of Reference

Terms of reference for the Working Group were examined and adopted without revision (*WG 22 Endnote 3*).

AGENDA ITEMS 3 AND 4

Overview on atmospheric deposition of iron in the North Pacific and on vertical and horizontal supplies of iron in the North Pacific

Dr. Chai presented an overview on the atmospheric deposition of iron in the North Pacific Ocean on behalf of Dr. Natalie Mahowald; Dr. Jun Nishioka talked about horizontal iron supplies in the western subarctic Pacific; Dr. Mark Wells discussed the effects of mesoscale eddies in transporting iron in the eastern subarctic Pacific.

AGENDA ITEM 5

Review of national and international, past and ongoing activities on iron biogeochemistry

National reports were given by Canada (Maurice Levasseur), China (Zhongyong Gao) and the U.S.A. (Mark L. Wells). International reports and activities discussed at the meeting consisted of:

- SCOR working group on synthesizing previous ocean iron fertilization data (Shigenobu Takeda),
- Chinese SOLAS project and Asian Dust and Ocean EcoSystem (ADOES) (S. Tan),

WG23-2008

- IOC/WESTPAC (Mitsuo Uematsu),
- Natural Fe Lagrangian Experiments (FeLEX) in the Southern Ocean (Meng Zhou),
- London Convention on Ocean Iron Fertilization (Patricio Bernal and Fei Chai).

Dr. Chai attended the London Convention Scientific Meeting on Iron Fertilization (May 19–23, 2008) where he provided a brief description of PICES and its function to the meeting Scientific Groups. He noted that:

- PICES scientists had been involved in 6 out of 12 iron fertilization experiments during the past 15 years and that PICES has provided a platform to facilitate research activities on ocean iron fertilization (OIF) experiments in the North Pacific. The Advisory Panel on *Iron Fertilization Experiment in the Subarctic Pacific Ocean* was formed under the PICES, and had been responsible for coordinating three OIF experiments in the subarctic Pacific. The Advisory Panel not only helped to coordinate the field experiments, but also facilitated data synthesized and publications.
- The newly established Working Group (WG 22), *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean*, co-chaired by Drs. Shigenobu Takeda (Japan) and Fei Chai (U.S.A.) will focus on two primary goals for the next three years: a) to promote better understanding of natural and anthropogenic iron supplies to the North Pacific and their impact on biogeochemistry and ecosystems; and b) to facilitate closer ties among various research communities (aerosol, physical oceanography, biology, chemistry and modeling) to better integrate new findings and to provide needed feedback to help coordinate research activities.
- In regard to future OIF experiments, PICES can act as an independent scientific organization, and is willing to provide scientific expertise on future OIF experiments in the North Pacific Ocean, including independent evaluation and assessments. The review process will be for the interests of advancing scientific knowledge and potential impact on marine ecosystems in the North Pacific.

AGENDA ITEM 6

Work plan for implementing the Terms of Reference

A work plan, consisting of the following points, was discussed for implementing the Terms of Reference:

- Develop a North Pacific Fe database (Takeda and Wells),
- Determine the natural supplies of iron to the North Pacific (atmospheric dust transport; movement of iron-enriched waters),
- Examine the linkages between iron supply and ecosystem responses,
- Plan national and international scientific programs,
- Set basic questions and make a hypothesis for future iron-related activities in the North Pacific,
- Plan international scientific programs for testing the hypothesis,
- Perform joint cruises,
- Conduct modelling studies (Chai and Yamanaka).

AGENDA ITEM 7

Proposal for a 1-day workshop at PICES-2009

WG 22 proposed a 1-day workshop on natural supplies of iron to the North Pacific to be held at PICES-2009 in Jeju, Korea (*WG 22 Endnote 4*). Recommended co-convenors for the workshop are: Shigenobu Takeda (Japan), Fei Chai (U.S.A.), and William R. Crawford (Canada). Travel support is requested for two scientists to attend the workshop, one scientist on iron biogeochemistry (Ken Bruland, U.S.A.) and another on ecological modelling (Yamanaka, Japan).

WG 22 Endnote 1**WG 22 participation list**Members

Fei Chai (U.S.A., Co-Chairman)
 William P. Cochlan (U.S.A.)
 Zhongyong Gao (China)
 Paul J. Harrison (Canada)
 Kyung-Ryul Kim (Korea)
 Maurice Levasseur (Canada)
 Jun Nishioka (Japan)
 Hiroaki Saito (Japan)
 Suzanne Strom (U.S.A.)
 Shigenobu Takeda (Japan, Co-Chairman)
 Charles Trick (Canada)
 Mitsuo Uematsu (Japan)
 Mark L. Wells (U.S.A.)
 Yasuhiro Yamanaka (Japan)

Observers

not available

WG 22 Endnote 2**WG 22 meeting agenda**

1. Welcome and introductions (Co-Chair), and adoption of agenda
2. Review of WG 22 terms of reference
3. Overview on atmospheric deposition of iron in the North Pacific
4. Overview on vertical and horizontal supplies of iron in the North Pacific
 - Jun Nishioka: Horizontal supplies of iron in the western subarctic Pacific
 - Mark Wells: Effects of mesoscale eddies in transporting iron in the eastern subarctic Pacific
5. Review of national and international, past and ongoing activities on iron biogeochemistry and its impact on marine ecosystems in the North Pacific Ocean
 - National: Canada [M. Levasseur]; China [Z. Gao]; Japan [S. Takeda]; U.S.A. [M.L. Wells];
 - International: SCOR working group on synthesizing previous OIF data [S. Takeda] Chinese SOLAS project and Asian Dust and Ocean EcoSystem (ADOES) [S. TAN] IOC/WESTPAC [M. Uematsu]
 - London Convention on Ocean Iron Fertilization [P. Bernal and F. Chai]
 - Natural Fe Lagrangian Experiments (FeLEX) in the Southern Ocean [M. Zhou]
6. Develop a detailed work plan for implementing the Terms of Reference
7. Proposal for a one-day workshop at PICES-2009

WG 22 Endnote 3**WG 22 Terms of Reference**

1. Compile and synthesize available iron biogeochemistry data in the North Pacific;
2. 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;
3. Determine the natural supplies of iron to the North Pacific, which includes atmospheric dust transport and movement of iron-enriched waters, and examine linkages between iron supply and ecosystem responses;
4. Identify gaps and issues related to experimental and modeling activities, encourage and plan national and international scientific programs on iron biogeochemistry and its impact on marine ecosystems in the North Pacific;
5. Elucidate the role of iron as a potential regulator of harmful algal bloom (HAB) in coastal ecosystems of the North Pacific.

WG23-2008

WG 22 Endnote 4

Proposal for a 1-day workshop at PICES-2009 on

“Natural supplies of iron to the North Pacific and linkages between iron supply and ecosystem responses”

In the subarctic North Pacific Ocean, iron plays a central role in regulating phytoplankton productivity and pelagic ecosystem structure. There are several processes that supply iron from land, shelf sediment and deep waters to the upper ocean. The goal of this workshop is to examine key processes of these iron supply processes that includes atmospheric deposition of mineral Aerosols and combustion substances, lateral transport of coastal iron-enriched waters by eddies and boundary currents, and deep vertical mixing during winter or by strong tidal current at narrow strait. Such knowledge will be used to identify key biogeochemical pathway that should be introduced into the ecosystem models and to plan international scientific programs for better understandings of marine ecosystem responses to changing iron supplies in the North Pacific.

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) convened its first meeting on October 24, 2008 under the co-chairmanship of Drs. William Peterson and Song Sun. At least 16 persons attended the full workshop with perhaps the same number attending portions of the workshop. A list of those who attended the complete workshop can be found at the end of this report (*WG 23 Endnote 1*). A draft of the agenda was reviewed and adopted without changes (*WG 23 Endnote 2*).

AGENDA ITEM 2

Summary of research – Country reports

One member from each PICES member country provided a 30-minute summary of past, present and future research related to krill species in local waters, with emphasis focused on *Euphausia pacifica* and *Thysanoessa* spp. Although the presentations are not available on the PICES website, anyone interested in a certain talk can e-mail the author or Co-Chairman, bill.peterson@noaa.gov, to request a copy.

Canada

Dr. David Mackas informed the Working Group that the earliest work on life cycle, growth rate and production of *E. pacifica* in the Strait of Georgia was by Heath (1977, Ph.D. thesis). Coastwide surveys of ichthyoplankton in 1980 were used to summarize krill cohort structure and growth (Fulton *et al.* 1982). A thesis by Summers (1993) explored growth of *Thysanoessa spinifera*. Studies of long-term variations in abundance of *E. pacifica* and *T. spinifera* have been carried out by Tanasichuk (1998); Dr. Mackas tracks long-term changes in abundance from his sampling program off the west coast of Vancouver Island, including the study of cross-shelf transport and retention mechanisms, and patchiness and their causes have been investigated recently. Dr. Steve Romaine (DFO, Institute of Ocean Sciences) has developed algorithms for calculating the patch structure of krill from acoustic surveys in the Strait of Georgia. Strengths of the Canadian program are: spatial distribution, population dynamics, and a long time series. Gaps include the need for work on live animals, especially for rates of metabolism and reproduction, and the study of mechanism(s) of population regulation, including reproduction, predation and parasites.

China

Dr. Song Sun stated that the dominant species in Chinese waters are *Euphausia pacifica* and *Pseudeuphausia sinica*. Most of the work in China is focused on sampling and experimental work in the Yellow Sea and the East China Sea, but with some research on the Antarctic krill *Euphausia superba*. *Euphausia pacifica*, along with the copepod *Calanus sinicus*, are the dominant species in both the Yellow and East China seas, and thus receive most of the research attention. Major research cruises were carried out monthly in summer and quarterly in winter to determine krill distribution and abundance. They are most abundant in the middle of the relatively shallow Yellow Sea (maximum water depths of about 90 m) with a maximum in adult biomass in the autumn. Maxima in abundances of eggs are in the spring, similar to that reported for the northeast coast of Japan. Egg production experiments showed that spawning is most intense in March–May, averaging about 40 eggs per female in April and May. A major piece of research needed is to understand how the adults survive the very warm summer months when surface waters in the Yellow Sea can exceed 25°C. Apparently the adults reside in the deeper (and colder) waters of the Yellow Sea and migrate each night to the base of the pycnocline to feed on phytoplankton.

Japan

Dr. Yuji Okazaki presented an “*Overview of krill biology and ecology in the western North Pacific*”. He reported on the krill fishery off the east coast of northern Japan – the fishery takes place from February to May and is well-regulated. Krill are harvested mostly for the aquaculture industry but some are dried for human

consumption. In terms of research, the published work of Taki on distribution (including vertical distribution), abundance and growth was reviewed. Some new work on egg production was presented showing that *Euphausia pacifica* can lay eggs during temperatures as low as 5°C in April, at the time of the spring bloom; the major spawning season is April–May; egg production measurements have been made April–July, with an average output of approximately 60 eggs per female. Dr. Okazaki also reviewed Japanese work on *Thysanoessa* spp. and noted that they seldom make up more than 10% of the total euphausiid biomass. New work is now being prepared for publication on *Thysanoessa* by Taki and Kim from Hokkaido University. The available historical data were reviewed, and Dr. Okazaki noted that the euphausiids from the Odate collection have not been analyzed but cautioned that the small mouth of the Norpac net may have resulted in low catches of krill. Collections from the PH-line (off Hokkaido) are being processed for eggs and larvae, and taxa that likely do not avoid plankton nets. Future work is planned to concentrate on sampling along the A-line which will focus on comparison of krill in nets of various sizes (bongo vs. MOHI net), and on growth rate experiments.

Korea

The Korean report was given by Dr. Hyoung-Chul Shin. Surveys of krill in Korean waters have been conducted by the National Fisheries Research and Development Institute (NFRDI) on a bimonthly basis but these samples have not been processed for krill eggs, larvae, juveniles or adults. Surveys of krill in the Yellow Sea in spring and fall were reported by Yoon (2000). Distributions seemed to be controlled more by temperature than by chlorophyll. Dr. Shin also reported on some work carried out at a nuclear power plant – the screens for water intake used for the cooling towers can at times be clogged with *Euphausia pacifica* – we heard a report on this at the krill Topic Session on “*Life history and ecology of euphausiids in coastal and oceanic waters around the Pacific Rim*” (S2) (Chae, PICES XIV). The potential is great for additional work on krill in Korean waters and plans are being discussed that may lead to new work on distribution, abundance, feeding, egg production, and growth. Ships are available for surveys and in-house expertise exists for identification of krill as well as the use of acoustics during krill surveys that could be used to estimate krill biomass and patch structure. There is also expertise on lipid analysis that would help clarify krill’s role in the food chain.

Russia

Dr. Yury Zuenko stated that there are no scientific programs focused on euphausiids in Russia. However, euphausiids are (and were always) studied as a part of the zooplankton community. General information is available on zooplankton resources, distribution, species composition, and biology of the main species, including euphausiids, in the Far-Eastern Seas and Northwest Pacific. Within regional ecosystem-based programs, the Pacific Research Institute of Fisheries and Oceanography (TINRO-Centre) conducts annual surveys of zooplankton (sometimes twice in a year) over the Okhotsk Sea and western Bering Sea, and off the Kuril Islands. From time to time (once in 3–4 years) the northern Japan Sea is surveyed. Foreign EEZs are surveyed within bi-lateral programs with Japan and the U.S.A. (previously also with the Democratic People’s Republic of Korea (North Korea) and China). Again, although krill are not the target species, they are collected in the plankton nets but probably only the eggs and larvae are collected quantitatively. Although many samples have been collected, many need to be analyzed, giving the opportunity for joint collaborative work. There are as yet no plans for any experimental work although such work could move forward with proper training.

U.S.A.

Ms. Tracy Shaw reviewed the research that has been carried out in the California Current, Gulf of Alaska and Bering Sea by as many as 30 investigators. Her comprehensive talk covered work in the laboratory on vital rates, including developmental times, bioenergetics, physiology and respiration, feeding, growth and reproduction. Field work on age structure, seasonal cycles of spawning, seasonal and interannual variations in brood sizes, and growth were compared. She also reviewed synthesis activities planned by the U.S. GLOBEC program.

AGENDA ITEM 3

Gaps in krill research that need to be filled

WG 23 prepared an outline which listed the gaps in knowledge and plans for research that will fill those gaps. The Working Group discussed what research needed to be done to produce a synthesis and comparison of the ecology, life history and population dynamics of krill around the Pacific Rim.

1. Standardization of sampling through use of the same nets, or, if this is not possible, the need for “catchability coefficients” of krill by various types of nets. Better estimates of abundance and biomass are needed in order to be able to make regional comparisons.
2. Size of animals in different regions and seasonal differences in size; comparative length-weight regressions.
3. Feeding habits and diets through experimental work on living animals and through use of lipid biomarkers and stable isotopes.
4. Aggregations of krill. This needs more study – what are the advantages to an individual for staying within a swarm? Are there physiological benefits? More night sampling is needed.
5. Age of adults. More work is needed to explore the utility of the lipo-fuscin method of age-determination.
6. Sampling in critical habitats. Are there “critical habitats” that we are not sampling and which need more study? Suggested examples include the Japan/East Sea, particularly in Korean waters, Monterey Bay (CA), Heceta Bank (OR), Unimak Pass (AK), Northeast Japan.
7. Use of acoustics to estimate biomass and patch structure.
8. Modeling of krill.
9. More measurements of egg production rates in relation to temperature and chlorophyll.
10. A project that looks at population structure using modern techniques of microsatellites or SNPS is needed to determine the degree to which populations of *Euphausia pacifica* are connected.
11. An interest was expressed in setting up a “krill library” where all important publications could be available. This would include theses, cruise reports, and grey literature. Ideally, all would be available in English.
12. All participants expressed interest in having a set of digital photographs of krill life cycle states that could be used in presentations. Also, any video clips showing krill aggregations would be of interest as well. These could all be stored on the same website where the “krill library” was maintained. The need to find a “home” for this material, perhaps on the PICES webpage was discussed.

Also discussed was the possibility of using krill in NEMURO models that would compare zooplankton population dynamics in waters around the Pacific Rim (see for example a recent paper by Terui and Kishi (2008), Population dynamics model of Copepoda (*Neocalanus cristatus*) in the northwestern subarctic Pacific. Ecological Modelling 215: 77–88.)

A final report was given by Dr. Micho Kishi, Hokkaido University, Japan. He reviewed progress on his and his student’s work on incorporating krill into the NEMURO modeling framework. The model has stage-specific feeding rates, with larvae feeding on two size-classes of phytoplankton, and juveniles and adults feeding on both phytoplankton and on copepods. Developmental rates and transition times between stages follow data in Ross (1982). The model seemed to do a reasonable job in tracking the seasonal cycles of abundance of eggs, larvae, juveniles and adults, given the agreement between the model and observations of Taki (2004), and reported by Dr. Okazaki in Japan’s report (Agenda Item 2).

AGENDA ITEM 4

Exchange of scientists, graduate students and post-docs

The Working Group discussed the potential for an exchange of scientists, graduate students, and post-docs in order to learn from one another how best to sample euphausiids and how to conduct experimental work on living krill. Also discussed were any cruise plans for 2008–2009 that would benefit from international

WG 23-2008

cooperation; possible visits to other laboratories; and the possibility of convening “hands-on” practical workshops during which the Working Group would teach students and other scientists how to carry out experimental work with krill

AGENDA ITEM 5

General discussion

A portion of the general discussion was set aside to hear a talk by Dr. Jaime Jahncke on “*Krill related studies in the Gulf of the Farallones, California*”. This contribution was to be a poster presented during the Poster Session of main PICES Annual Meeting but seemed that it would be useful to include it during our meeting. The talk included discussion of a large research program that is working on spatial and temporal relationships between krill and seabirds that nest on island in the Gulf of the Farallones, located offshore of San Francisco. Of particular interest is krill patchiness and patch size and how this relates to forage opportunities for the sea birds, in particular the Cassin’s auklet.

Most of the remaining time was devoted to a general discussion of the krill workshop planned for the GLOBEC Open Science Meeting to be held in Victoria June 2009. The workshop, entitled “*Krill biology and ecology in the World’s oceans*”, is being organized by Dr. Peterson along with Drs. Angus Atkinson, Bettina Meyer and Jaime Gómez-Gutiérrez (*WG 23 Endnote 3*). The objective is to convene a gathering of krill biologists and ecologists from around the world to discuss the life history and population dynamics of all krill species. These discussions were first initiated at the 4th International Zooplankton Production Symposium in Hiroshima, Japan, May 2007. A number of Working Group members agreed to submit abstracts for the GLOBEC meeting – Yuji Okazaki, Song Sun, Hyoung-chul Shin, David Mackas and William Peterson.

WG 23 Endnote 1

WG 23 participation list

Members

Se-Jong Ju (Korea)
Hyung-ku Kang (Korea)
David Mackas (Canada)
Yuji Okazaki (Japan)
William T. Peterson (Co-Chairman, U.S.A.)
C. Tracy Shaw (U.S.A.)
Hyoung Chul Shin (Korea)
Song Sun (Co-Chairman, China)

Observers

Harold Batchelder (U.S.A.)
Hongsheng Bi (U.S.A.)
Jaime Jahncke (U.S.A.)
Michio J. Kishi (Japan)
Bernard Megrey (U.S.A.)
Jennifer Menkel (U.S.A.)
Tom Wainwright (U.S.A.)
Yury Zuenko (Russia)

WG 23 Endnote 2

WG 23 meeting agenda

1. Welcome and introductions
2. Summary of past, present and future research related to krill species in local waters
3. Discuss the gaps and plans for research that will fill those gaps.
4. Discuss the potential for an exchange of scientists, graduate students, and post-docs.
5. General discussion

WG 23 Endnote 3**Proposal for a 2-day workshop at the GLOBEC Open Science Meeting in June 2009 in Victoria, Canada, on “Krill biology and ecology in the World’s oceans”**

Chairs: Angus Atkinson (UK), Jaime Gómez-Gutiérrez (Mexico), Bettina Meyer (Germany) and William Peterson (U.S.A.)

Objective: To convene a gathering of krill biologists and ecologists from around the world to discuss the life history and population dynamics of all krill species. This is timely because krill have been important elements of a number of the GLOBEC core programs and a great deal has been learned from the GLOBEC fieldwork that needs to be synthesised. These discussions were first initiated at the 4th International Zooplankton Production Symposium, in Hiroshima, May 2007. At that meeting we convened a workshop and were overwhelmed with presentations (42 oral and poster presentations) and attendance (approx 100 participants). A product of the meeting was a special issue of selected papers from the Symposium to be published in *Deep-Sea Research II*; the special issue is now in the final editing phase. A total of 18 research papers have been found to be acceptable for publication.

Aims of the proposed GLOBEC OSM Workshop include:

- For workers on different species to get together to discuss methods/approaches that have proved effective for one species. Then we can see whether they can be applied to other euphausiid species.
- To make sure there is a degree of harmony (or at least that there is no serious disconnect) in their approaches. It is also to improve technical aspects of specific methods.
- To generate ideas for future collaborations, for example laboratory/seagoing exchanges of personnel and of exchange and pooling of datasets to address wider-scale issues.
- To produce a tangible product, to show where krill research is at the moment, hurdles to progress and potential solutions. We suggest that an overview type paper in MEPS/review length journal (authored e.g., by all participants) would be excellent.

We propose a 2-day workshop, with the first day being a series of short 10-minute presentations with, say, a 5-minute discussion around each (15 minutes total). These presentations would have some data (obviously) as examples, but would aim to give more of a flavour of the state of the research in their own lab/research group in relation to the session theme, with some questions, future directions and “hooks” to start the discussion. The second day could then be devoted to framing particular themes and issues for more detailed discussion, then breakout groups, *etc.*, before coming together at the end to talk about how we are all going to put together the written product. We expect active participation by young investigators and graduate students.

The Table below shows some topics that may be valid, with some potential speakers/contributors. This is clearly incomplete and of course there is some overlap across themes. Also note that some topics, e.g., modelling and genetics, are blended across several themes. An alternative approach would be to have them as separate, defined themes.

Topic	Possible speakers	Notes
Controls on Distribution	Peterson, Zhou, Goodall-Copestake, Atkinson	- To what extent are euphausiids drifters in ocean currents? - Use of advective models to understand distribution, - Role of swimming/vertical migration in dictating distribution, - Combining historical datasets for a larger-scale understanding of distribution, - Contrasting controls in upwelling areas, S Ocean, N Atlantic and N Pacific Genetic approaches to stock separation – functional and genetically defined sub-pops.
Determining absolute biomass and abundance	Demer, Watkins/Fielding, Nicol	- How reliable are nets and acoustics in determining absolute abundance/biomass? - Can we make better efforts to combine them?

WG23-2008

Topic	Possible speakers	Notes
Behaviour	Kaartvedt, Yen, Kawaguchi, Brierley	<ul style="list-style-type: none"> - Role of laboratory/experimental studies, - Sensory biology, - Role of underwater cameras/ROVS, <i>etc.</i> - Role of moored instrumentation and advanced acoustics (<i>e.g.</i>, to determine swimming/migration speed in <i>M. norvegica</i>, <i>etc.</i>).
Reproductive biology	Gómez-Gutiérrez, Cuzin	<ul style="list-style-type: none"> - What affects reproductive output? - Food quantity/quality effects and egg condition/viability, - Spawning periodicity – field and histological approaches.
Larval biology	Meyer Shaw/Feinberg	<ul style="list-style-type: none"> - Critical phases concept, - Alternative developmental pathways (<i>e.g.</i>, intermediate/missed stages), - What can we learn from inter-species comparisons?
Ecophysiology and Energy budget	Ross/Quetin, Daly, Taeshke, Tarling, Jarman, Teschke	<ul style="list-style-type: none"> - What dictates moulting frequency? - Is moulting a “pacemaker” for maturation/spawning? - Issues with measuring rate processes in euphausiids, - Cues for seasonal behaviour (hormones <i>vs.</i> external cues) experimental and genetic approaches, - What are main unknowns in the energy budget - does not knowing them matter? - Role of lipids across different krill species – are their common themes?
Feeding and diet	Passmore, Schmidt, Stuebing, Kaartvedt	<ul style="list-style-type: none"> - Evaluation of emerging methods (<i>e.g.</i>, immunoassays, quantitative genetics), - Value of combined methods, - Application from one species (<i>e.g.</i>, paired mandible method for <i>M. norvegica</i>) to others, - Evaluating specific issues with gut contents, feeding incs, FA biomarkers, stable isotopes.
Population parameters: Growth rate Mortality rate	Pinchuk, Feinberg/Shaw, Gómez-Gutiérrez, Mortality rate expert needed	<ul style="list-style-type: none"> - “Standardising” IGR approaches, - Methods to evaluate length frequency data, - Comparison of growth rates across euphausiid species, - Methods of determining mortality rate, - Sources of mortality: predation versus parasitism/pathogens/“old age”.
Developing whole/partial life cycle models	Hofmann, Tarling, Fach, Murphy	<ul style="list-style-type: none"> - Where are we at with the various species? - Identifying key knowledge gaps and how to address them.
Schooling and vertical migration	Zhou, Kaartvedt, Tarling, Mangel/Alonzo, Hofmann, Sourisseau/Simard	<ul style="list-style-type: none"> - Inter-species comparison of extent of schooling/vertical migration, - Behaviour and characteristics of schools, - Advantages and disadvantages of schooling (including modelling approaches), - Variability in DVM and costs/benefits (including modelling approaches), - DVM and schooling as mechanisms for retention/efficient swimming.
Future impacts on euphausiids	Kawaguchi, Ross	<ul style="list-style-type: none"> - Changes in temperature/ice cover/food/ phenology/ph – approaches to predicting the future, - Timescale of change and rates of adaptation to change, - Other challenges: pollution, UV, harmful algal blooms, <i>etc.</i>

REPORT OF THE ADVISORY PANEL ON *CONTINUOUS PLANKTON RECORDER SURVEY IN THE NORTH PACIFIC*

The Advisory Panel on Continuous Plankton Recorder Survey in the North Pacific (hereafter CPR-AP) met from 18:00–19:30 hours on October 28, 2008 in Dalian, China, during PICES XVII under the chairmanship of Dr. Charles B. Miller. A list of participants and meeting agenda is given in *CPR-AP Endnotes 1 and 2*.

AGENDA ITEM 1

Funding for the North Pacific CPR program

Dr. Sonia Batten reported on her ongoing work with the North Pacific CPR program and on its funding status. The program is continuing, but on a reduced scale due to funding difficulties. At present the budget forecast includes: \$50,000 from the North Pacific Research Board (NPRB) for 2008, starting from June with promise of \$50,000 from NPRB for each year from 2009–2013, and \$75,000 for 2008–2009 from Fisheries and Oceans Canada, with a promise of \$50,000 for three following years. The 2008 money has been spent on late-season collecting and some partial sample analysis.

Dr. Batten informed the Advisory Panel that only 40% of the required support was secured for the next three years: 2009, 2010 and 2011, that is, \$150,000 more each year was needed for full support of sampling, sample counting and Dr. Batten's efforts in all those years. A proposal to the U.S. National Science Foundation by Dr. Russell Hopcroft at the University of Alaska, Fairbanks, may provide some money but the terms are difficult because the money, if granted, cannot be directly used by SAHFOS or Dr. Batten. It would help, however, principally by supporting sample analysis in Alaska.

Extended discussion of potential U.S. participation in support of CPR, particularly through NOAA, included the means to move the question upward to the levels in NOAA that might be able to decide on a contribution. These means will all be attempted. Private funding possibilities were also considered, particularly the Moore Foundation, which is funding several other marine initiatives, including CMORE (marine microbial ecology with David Karl, Sallie Chisholm and others), and a plastics-in-the-sea study program. The Moore Foundation does not accept proposals, but CPR-AP should find a means to approach them.

Japanese funding has been sought and Dr. Hiroya Sugisaki will continue to follow up on it. Helpful initiatives include (1) a proposal from Dr. Ryosuke Makabe to the British Royal Society International Scholarship program to work with SAHFOS and (2) a plan by Dr. Sanae Chiba to submit a proposal in Japan to work on the E–W CPR samples. Success for either of these initiatives could stimulate Japanese interest in supporting CPR work.

The Advisory Panel proposed that a new letter from Governing Council or the Secretariat be sent to appropriate U.S. governmental officials, thanking NPRB and DFO for their contributions and asking again that NOAA, USFWS, even possibly the State Department, contribute. (After the CPR-AP meeting, Drs. Miller and Phillip Mundy drafted this letter and forwarded it to the standing PICES committees.)

AGENDA ITEM 2

Scientific activities of the program

The funds in hand for 2008 were spent on getting CPR samples collected and stored. The E–W run was sampled in May, July and September, the N–S run in June, August and September. The N–S run was thus reduced from 6 runs to 3, losing the valuable early spring tows. A reduced analysis of the 2008 N–S samples shows a later development schedule than in the most recent years. A paper in progress by Dr. Batten reviews

CPR-AP-2008

the variation in developmental timing of the dominant copepod species across the Gulf of Alaska. In 2009 it is planned to concentrate the N–S run on early spring tows and the E–W runs in spring.

Dr. William Sydeman reported that progress continues on writing the bird census results from the E–W run. A manuscript is promised by early 2009.

AGENDA ITEM 3

CPR workshop at PICES-2009

Dr. Sugisaki suggested that a workshop on the CPR program might be a good idea for PICES-2009 in Korea. Dr. Batten noted that by then the CPR program will be 10 years along – an anniversary of sorts. It was eventually decided that a review workshop on CPR, to be held shortly (June 22–26, 2009) by the GLOBEC program, will fully exploit the market for interest in CPR, and not holding another workshop at PICES-2009.

AGENDA ITEM 4

Future CPR workshop at PICES-2009

Dr. Miller asked to be relieved as Chairman of CPR-AP and, pending approval by MONITOR, Dr. Mundy agreed to take over. (MONITOR approved Dr. Mundy's appointment at its meeting on October 29.)

CPR-AP Endnote 1

CPR-AP participation list

Members

Sonia D. Batten (Canada, SAHFOS)
Charles B. Miller (U.S.A., Chairman)
Phillip R. Mundy (U.S.A.)
Jeffery M. Napp (U.S.A.)
Song Sun (China)

Observers

Robin Brown (Canada)
William Sydeman (U.S.A.)
Hiroya Sugisaki (Japan, MONITOR Chairman)

CPR-AP Endnote 2

CPR-AP meeting agenda

1. Funding for the North Pacific CPR program
2. Scientific activities of the program
3. Future CPR workshop at PICES-2009
4. Appointment of a new CPR Chairman

REPORT OF THE ADVISORY PANEL FOR A CREAMS/PICES PROGRAM IN EAST ASIAN MARGINAL SEAS

The meeting of the Advisory Panel for a *CREAM/PICES Program in East Asian Marginal Seas* (CREAMS-AP) was held on October 28, 2008 in Dalian, China during the 17th PICES Annual Meeting. Six members of the Advisory Panel and 6 observers representing Japan, Korea and Russia attended the meeting (*CREAMS-AP Endnote 1*). Dr. Kyung-Ryul Kim, Co-Chairman of the Advisory Panel, opened the meeting at 18:00 h. Dr. Vyacheslav Lobanov, Advisory Panel member of Russia, was designated as the rapporteur. Dr. Kim explained the agenda of the meeting (*CREAMS-AP Endnote 2*) and working schedule. The agenda was accepted without any additional items or changes.

AGENDA ITEM 2

Report on 2008 Summer School

Dr. Yasunori Sakurai, Co-Chairman of CREAMS-AP, informed participants about the PICES International Summer School on “*Ecosystem-based management and ecosystem approach*” that was organized by the Faculty of Fisheries Sciences, Hokkaido University, Hakodate, Japan from August 23–26, 2008. The school was attended by 51 students from Japan (20), China (18), Korea (6), Russia (5), U.S.A. (1) and UK (1). Their participation was supported by research grants from Japan and China and travel support for 5 students by PICES. The program consisted of 6 lectures on ecosystem-based management, sustainable development of fisheries, available modeling tools, *etc.* and group discussions on 6 related subjects. The students also participated in poster presentations, an excursion to a fishery port and discussion with fishermen. The Advisory Panel congratulated Dr. Sakurai and organizers of the Summer School on its successful implementation and thanked them for their efforts.

AGENDA ITEM 3

Capacity building activities in 2009

a. 2009 Summer School Program in Korea

Dr. K.-R. Kim reported on preparations for a PICES Summer School on “*Satellite oceanography*” to be held August 23–26, 2009 at Seoul National University. The school will consist of lectures, workshops and hands-on exercises provided by up to 15 lecturers (including 5 foreign) for up to 30 students. PICES is asked to support travel for 5 foreign students and 1 foreign lecturer. A tentative plan for this school was already supported by PICES Science Board. CREAMS-AP members were asked to complete the formation of an organizing committee and develop a tentative program for this school by the end of December 2008. A contact point is Dr. Kyung-Ae Park (kapark@snu.ac.kr).

b. 2009 Russian activity

Dr. Vyacheslav Lobanov informed everyone on the unclear situation in oceanographic research funding system in Russia and the uncertainties in organizing a PICES Winter School on “*Biogeochemical processes in the ice-covered area*” that would be held in Vladivostok, Russia. The Advisory Panel agreed to cancel this plan unless the situation in oceanographic funding in Russia improves.

AGENDA ITEM 4

North Pacific Ecosystem Status Report and discussions on international cooperation

a. PICES Ecosystem Status Report

Dr. Lobanov discussed the current status of arrangements by the PICES Secretariat in preparing the next North Pacific Ecosystem Status Report (NPESR). He explained that the report structure and team of lead authors for

CREAMS-AP-2008

each structure had been just developed and fixed at an *ad hoc* NPESR meeting held yesterday. Dr. Kyung-Il Chang of RIO/SNU suggested organizing a special workshop that would discuss data/information accumulated in the North Asian Marginal Seas from 2003–2008 which would serve as a basis for the synthesis of their status and trends to update the related chapters of the NPESR. The workshop would be held at Seoul National University, Korea in the second half of February 2009. The Advisory Panel accepted this suggestion and thanked RIO/SNU for their initiative.

b. Hakuho-maru cruise in 2009

Dr. K.-R. Kim stated that the Japan/East Sea cruise on the GEOTRACES program that was initially planned on the R/V *Hakuho-maru* by Japanese universities, with participation of foreign researchers, is postponed from the summer of 2009 to 2010 because of the unexpected increase of fuel costs in Japan.

c. Russia–Korea cooperation

Dr. Lobanov announced that the joint Russian–Korean cruise of V.I. Il'ichev Pacific Oceanological Institute FEB RAS and Research Institute on Oceanography, SNU, is also postponed to 2010 because of increased fuel prices.

d. GLOBEC Open Science Meeting

Dr. Sakurai talked about the preparations for a GLOBEC Open Science Meeting to be held in June 2009 in Victoria, Canada. A 2-day workshop on “*Arctic and Antarctic ecosystems*” and 1-day workshop on “*Comparison of global marginal seas ecosystems*” (tentative titles) are proposed for the meeting program. He asked the Advisory Panel members to support the steering of these workshops.

d. China-Japan-Korea GLOBEC Symposium

Dr. Suam Kim, CREAMS-AP member from Korea and former PICES CCCC Co-Chairman, discussed the progress of preparations for the China-Japan-Korea GLOBEC Symposium to be held in Korea in December 2009. The Advisory Panel expressed its support for the symposium and noted that the EAST-I program, which is one of the CREAMS-AP activities, could be part of the symposium. It was also suggested that Advisory Panel members encourage scientists in their respective member countries to participate actively at the meeting, especially young scientists and students, and to provide the necessary support for their participation.

AGENDA ITEM 5

Other related activities

Dr. Chang announced the coming 15th PAMS Meeting to be held April 23–25, 2009 in Busan, Korea. The main theme of the Meeting is “*Observations, Understanding, and Prediction of Climate Variability in PAMS*”. The scientific topics of the symposium will include:

- Regional climate processes in PAMS,
- Kuroshio and its interaction with PAMS,
- Responses of PAMS to global warming,
- Asian monsoon and ENSO and their impacts to PAMS,
- Modeling and future climate projections in PAMS,
- Waves and tides in PAMS,
- Extreme events,
- Biogeochemistry and ecosystems in PAMS,

and other topics related to PAMS oceanography. The deadline for submission of session proposals is November 30, 2008, while the submission of abstracts is February 28, 2009. Contact point is Dr. K.-I. Chang (kichang@snu.ac.kr). The Advisory Panel members expressed their support for the symposium and agreed to encourage scientists in their respective member countries to participate actively in the meeting.

AGENDA ITEM 6

Future of CREAMS-AP after summer 2008*a. EAST-II – Time-series program for the East China and Yellow seas*

Dr. K.-R. Kim related that initial activity for establishing a second program under the CREAMS/PICES initiative, the East Asian Time-series (EAST-II), and focussing on the East China Sea and Yellow Sea, was undertaken by Drs. Fei Yu (China) and Jae-Hak Lee (Korea). However, they informed the Co-Chairmen that more discussion among the leading scientists and existing oceanographic programs in the region is required to prepare a draft for the EAST-II. The Advisory Panel expressed its support for the further development of the EAST-II program.

b. Election of new CREAMS-AP Chairmen

The Advisory Panel unanimously endorsed the re-election of Drs. Kim and Sakurai as the co-chairmen of the Advisory Panel for a CREAMS/PICES Program in the East Asian Marginal Seas.

c. Next meeting

CREAMS-AP agreed to hold its next meeting in conjunction with the 15th PAMS meeting in Busan, Korea on 25 April, 2009.

AGENDA ITEM 7

Miscellaneous items

No items were suggested for discussion.

AGENDA ITEM 8

Closing

Dr. K.-R. Kim closed the meeting at 20:00 h, October 28, 2008.

CREAMS-AP Endnote 1**CREAMS-AP participation list**Members

Kyung-Ryul Kim (Korea, Co-Chairman)
Suam Kim (Korea)
Vyacheslav B. Lobanov (Russia)
Yasunori Sakurai (Japan, Co-Chairman)
Pavel Ya. Tishchenko (Russia)
Yury I. Zuenko (Russia)

Observers

Kyung-Il Chang (Korea)
Dr. Chang-Keun Kang (Korea)
Hong-Sun Kim (Korea)
Vladimir Ponomarev (Russia)
Yongjun Tian (Japan)
Gennady Yurasov (Russia)

CREAMS-AP-2008

CREAMS-AP Endnote 2

CREAMS-AP meeting agenda

1. Opening remarks
2. Report on 2008 Summer School, Japan (Sakurai)
3. Discussion on capacity building activities in 2009:
 - a. 2009 Summer School Program in Korea (S.-J. You/K.-A. Park)
 - b. 2009 Russian activity (Lobanov)
4. North Pacific Ecosystem Status Report and discussions on international cooperation
 - a. *Hakuho-maru* cruise in 2009 (Gamo)
 - b. Russia-Korea cooperation (Lobanov)
 - c. North Pacific Ecosystem Status Report (Skip McKinnell, PICES)
 - d. GLOBEC Open Science Meeting in June 2009 in Victoria, Canada (Sakurai)
 - e. China-Japan-Korea GLOBEC Symposium in December 2009, Korea (S. Kim)
5. Other related activities
 - a. 15th PAMS meeting (K.-I. Chang)
6. Future Plan of CREAMS-AP after summer 2008
 - a. EAST-II
 - b. Elections of the AP Chairmen
 - c. Next AP meeting
7. Miscellaneous items
8. Closing

REPORT OF THE ADVISORY PANEL ON *MARINE BIRDS AND MAMMALS*

The eighth meeting of the Advisory Panel for *Marine Birds and Mammals* (MBM-AP; under the auspices of the BIO Committee) was held from 10:00–12:30 hours on October 26, 2008 during PICES XVII in Dalian, China. Drs. William Sydeman and Hidehiro Kato, Co-Chairmen of MBM-AP, called the meeting to order and welcomed the participants (*MBM-AP Endnote 1*). Revised Terms of Reference were reviewed and supported as written (*MBM-AP Endnote 2*). The agenda was reviewed and approved by the Panel members (*MBM-AP Endnote 3*). The meeting focused on current activities of MBM-AP and other relevant matters, including discussion of possible future workshops and topic sessions, and the role of MBM-AP in the new PICES Science Program, FUTURE. Members and observers reiterated the need for the Panel, that the Panel serves to generate interest in marine birds and mammals within the PICES community, and that the Panel has been active in coordinating and facilitating multi-disciplinary investigations, symposia, and workshops for PICES.

AGENDA ITEM 3

Reports from participants

Dr. Sydeman reported that a special volume based on the Topic Session (S11) on “*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)*” from PICES XVI (2007) is now slated for publication in the *Marine Ecology Progress Series* (MEPS). Originally, this special volume was to be published in *Deep-Sea Research II*, but only four papers were submitted which was insufficient for a special volume in this journal. MEPS is interested in the topic and additional potential contributions have been solicited. Papers are due by mid-December 2008. MBM-AP will solicit additional contributors. If fewer than four papers are accepted, each paper will be published as a stand-alone article. If more than four papers are accepted, there will be a special theme section in MEPS devoted to this topic.

Dr. Kato reported on activities of the International Whaling Commission (IWC) (*MBM-AP Endnote 4*). He is the PICES representative to the IWC and attended the 60th scientific committee meeting of the IWC in Santiago, Chile in June. Japan is contributing to ecosystem models on the impacts of whales on marine ecosystems. There will be a number of important workshops, one on climate change and cetaceans in March/April 2009 in the United States. Diseases, both emerging and resurging, were topics of conversation. A general discussion ensued on emerging issues affecting marine mammals, and cetaceans in particular. The effects of noise and ship-strikes generated considerable discussion, and resulted in potential proposals for future PICES workshops.

Dr. Kato reported on pinniped surveys off Hokkaido focusing on Steller’s sea lions. There are potentially 600 animals in the population, and animals could be affected by entanglement in set and gill net fisheries. To avoid potential impacts, culling is proposed, and a model (Potential Biological Model) revealed that up to 120 animals could be taken without affecting the population.

Dr. Mikhail Stepanenko reported on many important Russian activities in 2008, including special surveys of marine mammals in the Sea of Okhotsk, Seal (Tuleny) Island, and research on endangered western gray whales. Efforts are focused on understanding the population dynamics of sea lions and fur seals and western gray whales. The surveys were conducted to assess potential pollock fishery effects on marine mammals, and no impacts were detected. A survey of the Commander Islands revealed 38 pinnipeds entangled in fishing nets, but this is a very small proportion of the population. TINRO-Center scientists have also been studying walrus in the Arctic Ocean where the situation is not good, reflective of the effects of climate change on ice.

MBM-AP-2008

Dr. Seok-Gwam Choi reported on a new survey for marine mammals in Korean waters in the Yellow Sea. The survey will be conducted every 3 years, with a focus on Minke whale distribution and abundance. The survey will be conducted from oceanographic research vessels, and hydrographic information will be obtained as well. Dr. Choi also reported on a tagging study on spotted seals; 10 seals were tagged and tracked in 2008. There have been recent pilot whale strandings in Korea which remain unexplained.

AGENDA ITEM 4

Discussions

a. The role of MBM-AP in FUTURE

Dr. Sydeman reviewed aspects of the new PICES Science Program (FUTURE) with the group, and solicited feedback and discussion. The Panel and observers considered how to best contribute to this program, which is focused on (1) understanding climate change and anthropogenic impacts on marine ecosystems in the PICES region, (2) forecasting future ecosystem change, and (3) better communications with society.

A number of important points were raised. There are many long-term datasets on marine birds and mammals that could and should be used in the analysis of marine ecosystem change. Marine birds and mammals are excellent indicators of marine ecosystem structure and functions and should be used in this capacity. Multi-decadal information on populations, diet, and demographic attributes are available for analysis.

There have been many long-term changes in marine bird and mammal populations in the North Pacific, as well as changes in range and distribution, and changes in phenology and other life history characteristics that are likely to be related to climate variability and change in the North Pacific. In particular, the Advisory Panel and observers thought that research on birds and mammals could be used to assess how much of the observed ecosystem variability could be attributed to natural or anthropogenic effects.

Changes in bird and mammal populations will also have an impact on the ocean, as these predators consume large quantities of prey and may act as “top-down controls” of food webs and ecosystem dynamics. The Panel and observers agreed that models of hypothetical changes in bird, but especially mammal, populations and rates of consumption based on either increasing or decreasing abundance would be revealing, with implications for future ecosystem dynamics and fisheries. In this manner, MBM-AP could play a role in the forecasting goals of FUTURE. A workshop on this topic should be proposed.

The potential for birds and mammals to play an important role in PICES communications was discussed. The Advisory Panel and observers agreed that birds and mammals are of great interest to the public, and therefore should play an important role in FUTURE communications. There were questions about the role of MBM-AP scientists, versus specialists in science communication, with this effort. Eventually, it was agreed that scientists could and should be involved, but that specialists in communication should play the primary role in crafting clear messages.

In summary, the group recommended new efforts to integrate marine birds and mammals into PICES models of energy and trophic interactions, end-to-end food web studies, and comparative responses of ecosystems to climate changes.

b. Workshop and Topic Session suggestions

Following the discussion of FUTURE, MBM-AP and observers discussed what could be put forth as a future workshop for PICES-2009 in Korea. A number of exciting ideas for workshops were suggested, including (1) cetacean ship-strikes: places and times where whales concentrate and are vulnerable to accidents with fast-moving vessels; (2) marine birds and mammals as ecosystem indicators, (3) comparative ecosystem studies focused on birds and mammals, and (4) how best to integrate information on marine mammals in ecosystem models and forecasting. It was decided that a workshop or topic session on seabirds and marine mammals as

ecosystem indicators would be deferred until PICES-2010 in the U.S. Eventually, the idea which rose to the top for PICES-2009 was how to incorporate marine mammals in ecosystem modeling and forecasting. A description for a proposed workshop on this topic can be found in *MBM-AP Endnote 5*. Co-convenors will be Drs. Sydeman and Kato.

AGENDA ITEM 5

Other ideas

In general, there has been good participation over the years in MBM-AP from Canada, Japan and the U.S. Korea provided one scientist (Dr. Seok-Gwam Choi) on behalf of its member, Dr. Zang-Guen Kim. Russia provided two scientists (Drs. Oleg Katugin and Mikhail Stepanenko) on behalf of their delegates. MBM-AP asks that China provide members, and that Canada and Korea provide seabird experts, in particular, a new seabird expert, Ms. Christine Abraham of DFO, Canada, would be a welcome addition.

MBM-AP Endnote 1

MBM-AP participation list

Members

Hidehiro Kato (Japan, Co-Chairman)
William Sydeman (U.S.A., Co-Chairman)

Observers

Russell Bradley (U.S.A.)
Seok-Gwam Choi (Korea)
Marsha Gear (U.S.A.)
George Hunt (U.S.A.)
Jaime Jahncke (U.S.A.)
Oleg Katugin (Russia)
Jarrod Santora (U.S.A.)
Mikhail Stepanenko (Russia)

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-2008

MBM-AP Endnote 3

MBM-AP meeting agenda

1. Call to order – review agenda (modify as needed)
2. Introductions from member nations, meeting participants
3. Reports from participants
 - a. PICES XVI/S11 publication on climate change and phenology – Marine Ecology Progress Series (Sydeman);
 - b. liaison with International Whaling Commission (Kato)
 - c. others (group)?
4. Discussions
 - a. MBM-AP and FUTURE (new PICES Science Program) – how can/should MBM-AP contribute?
Goals of FUTURE:
 - i. Understanding climate change, anthropogenic effects and ecosystem dynamics
 - ii. Forecasting and forecasting tool development
 - iii. Communicating
 - b. MBM-AP and PICES-2009
 - i. Workshop suggestions?
 - Diet studies
 - Ecosystem indicators?
 - ii. Theme session suggestions?
 - Beyond biomass: Comparative demography, lower and upper trophic levels
 - Ecosystem objectives: Setting the FUTURE
 - “Translational” science: Communicating to society
5. Other ideas?
6. Wrap-up

MBM-AP Endnote 4

PICES/MBM-AP participation in International Whaling Commission activities

Based on agreement between the Secretariats of PICES and IWC, an exchange of observers at annual meetings has occurred since 2001. Since 2003, PICES has sent Dr. Hidehiro Kato to the annual meeting of the IWC Scientific Committee. The emphasis of these meetings has been on studies of whale stocks in relation to ecosystem variability and environmental issues. Through the activities of MBM-AP, the PICES observer has reported back to the BIO Committee. An IWC observer has attended PICES meetings since 2001, participating in MBM-AP meetings as well as scientific sessions. The IWC observer has submitted official reports to both IWC Scientific Committee and the Commission meetings, which have been widely used in discussions at the relevant sub-committee levels.

At PICES XVI, the Advisory Panel reiterated the need for Dr. Kato to serve as the PICES observer to the 60th IWC Scientific Committee meeting; and this action was approved by BIO. Dr. Kato participated in the 60th IWC meeting held at Santiago, Chile in June 2008. He submitted the PICES observer report from the 60th IWC/SC at PICES XVII in Dalian, China (see below), and plans to continue as the observer/liaison between PICES and the IWC for the foreseeable future.

PICES Observer Report on the 60th IWC Scientific Committee Meeting
by Hidehiro Kato

Tokyo University of Marine Science and Technology, Tokyo 104-8477, Japan

The 60th scientific committee (SC) meeting of the International Whaling Commission (IWC) was held at Santiago, Chile from June 6–13, 2008. A total of 233 participants from 28 countries, including 77 invited experts and 11 observers from 6 international organizations (CCAMLR, ACCOBAMS, IOC, IUCN, NAMMCO and PICES) participated at this year's annual meeting. PICES was especially welcomed by the IWC/SC.

Under the SC, seven sub-committees (revised management procedure; bowhead, right and gray whales; in-depth assessment; Southern Hemisphere whales; small cetaceans; whale watching) and seven working groups (Aboriginal whaling management procedure; stock definition; bycatch and other human-induced mortality; environmental concerns; ecosystem modeling, DNA testing, IA-North Pacific minke whales). Every substantial issue was discussed at the sub-committees or the working group and then forwarded to plenary of the committee. The SC has worked mainly on Comprehensive Assessments (CA) of whale stocks, Implementation trials of Revised Management Procedure (RMP) after cessation of commercial whaling, and agreed with the scientific basis of RMP in 1996.

The SC has continued work on general RMP issues, including work towards finalizing the guidelines and requirement for implementing the RMP. This year, the SC focused especially on the review of stock status of Southern blue whales, humpback whales and population analyses on the Antarctic minke whales as well as North Pacific minke whales under the CA. In addition, the current population status of North Atlantic right whales and western North Pacific gray whales were reviewed and their endangered statuses were of special concern. Two ongoing Japanese scientific permit programs in the Antarctic (JARPA II) and in the western North Pacific (JARPEN II) were highlighted and it was agreed that a dedicated review meeting would be held in early 2009.

For environmental issues, the SC discussed a number of matters related to environmental factors that affect cetaceans. In particular, the SC agreed to hold workshops during the inter-sessional period: the effects of climate change on cetaceans; the second phase of the POLLUTION 2000+ programme looking at the effects of chemical pollutants on cetaceans and the joint CCAMLR/IWC workshop for ecosystem modeling in the Antarctic.

Priorities for next year's meeting are:

- (1) review report of the Second Climate Change Workshop,
- (2) review report of the POLLUTION+ Phase II Planning Workshop,
- (3) receive the State of the Cetacean Environment Report (SOCER),
- (4) review the report from the inter-sessional group on Cetacean Emerging and Resurging Disease (CERD).

In addition, for ecosystem modeling, the following issues are high priority topics:

- (1) review the report from the joint CCAMLR/IWC Workshop; and
- (2) review models from JARPEN II.

Next year's annual meeting of IWC/SC will be held at Madeira, Portugal in May 31 to June 12, 2009.

MBM-AP Endnote 5

Proposal for a 1-day BIO workshop at PICES-2009 on
“Integrating marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in the North Pacific”

In many North Pacific marine ecosystems, marine mammals are showing considerable changes in abundance. In general, cetaceans, recovering from historical exploitation, are increasing, whereas some pinniped species are declining regionally, whereas others are increasing. Models of marine mammal prey consumption indicate that ~20-60% of secondary production may be taken by these top consumers. Therefore, marine mammals may exert “top-down” control on food webs, as well as functioning as competitors to fish, seabirds, and humans for mid-trophic level food resources. One of the goals of FUTURE is to forecast potential ecosystem change that may be attributable to climate and anthropogenic forcings. Given this goal, we are proposing this workshop to review and assess rates of marine mammal population and prey consumption changes in the North Pacific. Presentations will be solicited on changes in marine mammal abundance, distribution, diet, and prey consumption. Discussion will focus on how to best integrate this information into models of ecosystem dynamics, with and without climate change and anthropogenic fishing impacts.

Conveners: William Sydeman (U.S.A.), Hidehiro Kato (Japan)

Potential Invited Speakers: Ian Boyd (U.K.), Jeffrey Polovina (U.S.A.), Fei Chai (U.S.A.), Kerim Aydin (U.S.A.), Isaac Kaplan (U.S.A.)

REPORT OF THE ADVISORY PANEL ON *MICRONEKTON SAMPLING INTER-CALIBRATION EXPERIMENT*

At the 2007 Annual Meeting, the Advisory Panel on the *Micronekton Sampling Inter-calibration Experiment* (MIE-AP) prepared to submit a draft of the final report at the time of 2008 Annual Meeting. However, the necessity of conducting additional sample analyses from the MIE-1 and MIE-2/3 cruises caused a delay in the preparation of the draft report. Consequently, the Advisory Panel decided to postpone the draft submission until PICES-2009. A brief description of the analyses, presently ongoing, follows.

MIE-1

Scientists participating in MIE-1 have finished identification of all fish and squid specimens collected during the cruise, but they still have some crustacean samples to identify. Although about half samples have already been analyzed, currently the complete size- frequency analyses of all crustaceans and other plankton from remaining samples are underway. The addition of more samples will provide higher statistical power in the comparative analysis by reducing the deviation of data.

To date, three papers directly from the results of the cruise are at different stages of preparation (sampling gear comparison, comparison between nets vs. acoustics, and fish larvae).

MIE-2 and 3

Comparison of sampling efficiency for dominant fish species has been finished for both of the cruises. But that for euphausiids, including size-frequency distribution, is underway. Scientists at Hokkaido University analyzed acoustic data obtained during the MIE 2/3 cruises, including density estimate and geostastical analyses of fish/euphausiids. Publication of two papers are anticipated from the gear comparison (one for comparison of sampling efficiency of fish by different fishing gears; another for euphausiids), and one paper from the net/acoustic comparison. Scientists at Hokkaido University analyzed acoustic data obtained during the MIE 2/3 cruises, including density estimate and geostastical analyses of fish/euphausiids.

Apart from these analyses, Japanese scientists made a cruise to test J-QUEST, an integrated system to visualize and quantify micronekton, in August 2008. A topical issue for this year is a new lighting apparatus which is invisible to fish and therefore does not affect fish behavior. The development of J-QUEST will be summarized in the final report.

SUMMARY OF SCIENTIFIC SESSIONS AND WORKSHOPS

Science Board Symposium (S1)

Beyond observations to achieving understanding and forecasting in a changing North Pacific: Forward to the FUTURE

Co-Convenors: John E. Stein (SB), Michael J. Dagg (BIO), Gordon H. Kruse (FIS), Glen S. Jamieson (MEQ), Hiroya Sugisaki (MONITOR), Michael G. Foreman (POC), Bernard A. Megrey (TCODE), Harold P. Batchelder (CCCC), Michio J. Kishi (CCCC), Fangli Qiao (China), Sinjae Yoo (Korea) and Mikhail Stepanenko (Russia)

Background

FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems), the new Science Program undertaken by PICES member countries, has the broad goals of: (1) understanding the responses of marine ecosystems in the North Pacific to climate change and human activities at basin-wide and regional scales; (2) providing forecasts of what might be expected based on a current understanding of how nature works; and (3) communicating this information effectively to its members and to society in general. Past advances in understanding marine ecosystems in the North Pacific have been largely based either on the direct analysis of observations, or on the development of conceptual and numerical models that help to describe the processes underlying the observations. Though these activities will continue to play an important role in FUTURE, the provision of forecasts and estimates of their associated uncertainties necessitates moving beyond observationally based understanding, so that ecosystem responses to natural and anthropogenic changes can be anticipated and communicated effectively to society. Presentations were invited to address the goals of FUTURE and the three key research questions that it identifies:

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

Presentations addressing other components of FUTURE such as: (1) communicating scientific information to governments, policy makers, and society at large and (2) forging partnerships with social scientists, were also welcomed.

Summary of presentations

The Science Board Symposium was held on Monday, October 27, 2008 and consisted of 14 oral presentations (including 1 keynote and 6 invited talks) plus 5 posters. It focused on the new areas of FUTURE: current forecasting capability, communication of science to society, impacts of ecosystem change on human society, and human influences in coastal areas. The keynote speech by Fangli Qiao addressed the first focal point, namely how to improve forecasting capability. He noted that there are two major problems in circulation models. Firstly, mixed layer depths predicted by general circulation models were typically shallower than observations and sea surface temperature from model outputs were higher than the observations. Secondly, the cold tongue structure in the equatorial Pacific was colder than the observations. It was then noted that wave-motion related vertical mixing plays an important role in the upper ocean but is not included in many current circulation models. He showed a new model of the coupling between waves on circulation could improve results when wave vertical mixing effects were included in the model. Based on this, he suggested wave-tide-circulation coupled models could improve our forecasting.

The remaining talks covered a wide range of topics including improvement of forecasting ability, North Pacific decadal variability, anthropogenic impacts in the coastal regions, and the relationship between social and natural phenomena. From a perspective not typical of PICES topics, Lawrence Hamilton addressed one of the main questions of FUTURE, which is how societies are affected by changes in the

marine ecosystems. He illustrated the interactions among ocean conditions, fisheries and effects on coastal communities through case studies from Iceland, Northwest Newfoundland, Faroe Islands, Greenland, and western Alaska. The interdisciplinary studies of linked ecological and social changes in fisheries-dependent regions revealed a number of broad patterns. Large ecological shifts, disastrous to historical fisheries, have resulted when unfavorable climatic events occur on top of overfishing. These resulted in demographic transitions in fishing societies, such as human population decline, older populations, and sex ratio changes.

Eitaro Wada introduced his approach of integrative studies involving observation, modeling and simulation. He compared the classification of marine biomes based on satellite data with that based on stable isotopes. A newly developed stable isotope method for amino acid trophic levels was suggested to validate NEMURO.FISH and ECOSIM models. He also proposed to use $\delta^{13}\text{C}$ to estimate the growth rates of phytoplankton in the ocean.

Using SeaWiFS data, Jeffrey Polovina showed that there has been an expansion of the least productive areas in the ocean's subtropical gyres over past decade. Based on fishery data and model simulations, he also anticipated the following changes in the subtropical gyre in response to climate change: (1) a continued decline in fished species with low Productivity/Biomass ratio and at high trophic levels; (2) an increase in mid-trophic level species especially those with high P/B ratios; (3) an increase in high trophic level species not caught in fisheries; and (4) due to the increase in high P/B species, the ecosystem will be more sensitive to climate forcing – making mean P/B of the catch a useful indicator.

Icarus Allen focused on developing coupler methodologies to link models using Newtonian approaches (*e.g.*, physics and phytoplankton), with those of the Darwinian world (*e.g.*, zooplankton and fish) and those of the human world (economics and policy). He illustrated the challenges using examples of MEECE (Marine Ecosystem Evolution in a Changing Environment) and GCOMS (Global-Coastal Ocean Modeling System). MEECE is a European Integrated Project, which aims to increase ecosystem modeling predictive capacities. The objective of GCOMS is to couple the shelf seas ecosystems to the global ocean.

Hiroaki Saito first summarized the predicaments of the “Anthropocene” era, and era dominated by human activities that affect the global ecosystem. He then pointed out the necessity and difficulties of forecasting the future of ecosystems. Strategies were proposed for FUTURE that include: (1) developing a general ecosystem model, such as eddy-resolving 3D-NEMURO, under IPCC or other climate scenarios to understand the change comprehensively and supply the basic scenarios of the future North Pacific ecosystems to specific models; (2) understanding the mechanisms of present ecosystem responses to perturbations, (3) understanding sensitive processes in the ecosystem (vulnerability, amplifiers, key-stone species, *etc.*) to perturbations; (4) developing specific models to forecast selected ecosystem or selected ecosystem processes whose change would have significant impacts for society.

The presentation by Emanuele Di Lorenzo explained how the first two dominant modes of ocean–atmosphere co-variability evident in sea level pressure and sea surface height can explain decadal climate and ecosystem variations in the North Pacific. These include the Aleutian Low, Pacific Decadal Oscillation (PDO), North Pacific Oscillation (NPO) and the recently identified North Pacific Gyre Oscillation (NPGO). He put forward a hypothesis on how these variability modes are linked. In addition, using a set of ten coupled climate models from the Intergovernmental Panel on Climate Change (IPCC), he assessed the degree of realism of the IPCC models to reproduce the first two decadal modes of ocean–atmosphere co-variability in the North Pacific during the twentieth century (1901–2000) and to project changes in future scenarios (2001–2100). The model results showed that GFDL 2.0 produced the best results.

Using the NEMURO.FISH model Shin-ichi Ito made future predictions of Pacific saury under global warming scenarios. To improve the model, laboratory experiments were conducted to measure several unknown parameters. The model results suggested the possibilities of size reduction, and increase of Pacific saury abundance under global warming conditions. Suggestions were also presented on how to improve the modeling.

In moving from strict modeling to the application of science in decision making, Harold Batchelder discussed how to improve decision making in Coho salmon management. The approach was to enhance the

existing “multi-indicator” approach by using Bayesian enhanced multidimensional decision support theory. Applying the method, it was found that social complexity makes it difficult to achieve consensus decisions. Formal decision support strategies (DSS) provide ways to include bias, data trustworthiness, criteria importance, and world beliefs of diverse stakeholders. While DSS may not achieve consensus, through the process, uncertainty, bias and beliefs can be qualitatively or quantitatively accounted for, and thus when applied to salmon forecasting, or other fishery species, has potential societal benefits in applying science in decision making.

George Sugihara presented a very different theoretical perspective in approaching nonlinear, non-equilibrium ecosystems that are prone to regime-like and non-stationary behavior. He first showed that lack of correlation does not necessarily mean there is no relationship between variables, by using the example of Lorenz attractors. As a positive alternative to classical correlation models and equilibrium-based fishery modeling approaches, concepts and forecasting methods from nonlinear time series analysis were introduced and applications were discussed that hold implications for a non-equilibrium ecosystem-based management of fisheries.

The remainder of the symposium was focused on environmental problems in coastal regions. Paul Harrison described the oceanographic and biological processes in the Pearl River Estuary, which is a sub-tropical estuary and the second largest in China based on discharge volume from the Pearl River. Processes in the estuary vary spatially and temporally (wet vs. dry season). Despite the huge nutrient loads from the Pearl River plus local sewage discharge, eutrophication was not as severe as one would expect due to the estuary’s remarkable capacity to cope with excessive nutrients. In summer, intermittent upwelling of nitrogen-poor water sometimes relieves the eutrophication condition. Since phosphorus potentially limits the amount of algal biomass in summer, controlling phosphorus could be an efficient way of controlling eutrophication. Dr. Harrison also suggested that monitoring programs are essential to detect ecosystem response since nutrient loads are likely to change over the next several decades. Rong-Shuo Cai then discussed analyses of monthly mean sea surface temperatures (SST) and atmospheric circulation divergences (ACD) in the China Sea and its adjacent ocean using the empirical orthogonal function (EOF), polynomial function and spectrum analysis. The results show that SST anomaly and ACD anomaly fields have three major patterns: (1) interannual and inter-decadal variations, (2) warming of the regional seas particularly since 1980s, and (3) intensification of the atmospheric circulation divergences. When the long-term temporal variation of SST and ACD were compared with the frequency of red tides during 1972 to 2005, the results implied that the red tide events might be related to regional climate change. The results of the analysis of 10 year’s ocean color data in the East China Sea and Yellow Sea by Joji Ishizaka showed detailed characteristics of spatial and temporal variability in satellite chlorophyll-*a* in the region. According to his analysis, the Changjiang River discharge might be the dominant factor of variation of summer satellite chlorophyll-*a* in the East China Sea. He also showed that the magnitude of spring blooms has increased during the last 10 years in the Yellow Sea, possibly a sign of eutrophication. This study demonstrated that ocean color remote sensing can be efficiently used as a monitoring tool for coastal environments. Lastly, Song Sun presented an overview of drastic changes in the Yellow Sea ecosystem. Many ecological events have happened in recent years, including giant jellyfish blooms, starfish blooms, salp blooms and green algae blooms. Some details of these events were discussed with interesting questions on their causes and processes.

List of papers

Oral presentations

Fangli Qiao, Zhenya Song, Changshui Xia and Yeli Yuan (Keynote)

Wave-tide-circulation coupled model: To improve the forecasting ability for FUTURE

Lawrence C. Hamilton (Invited)

Ocean, fishery and society: Interconnections among systems in change

Eitaro Wada (Invited)

Marine ecosystem studies of today and tomorrow with emphasis on the western North Pacific Ocean

Jeffrey J. Polovina, Melanie Abecassis, Evan A. Howell and Séverine Alvain

Developing an understanding of future changes in the North Pacific Subtropical Gyre marine ecosystem

J. Icarus Allen (Invited)

On the simulation of the impacts of multiple climatic and anthropogenic drivers on marine ecosystems

Session Summaries-2008

Hiroaki Saito (Invited)

A strategy for marine ecosystem studies in the first half of the 21st century

Emanuele Di Lorenzo, Jason Furtado and Niklas Schneider

North Pacific decadal variability in the future

Shin-ichi Ito, Taizo Morioka, Yasuhiro Ueno, Satoshi Suyama, Masayasu Nakagami, Akihiro Shiimoto, Fumitake Shido and Michio J. Kishi

Future projection of Pacific saury to climate change and its improvements by experimental and observational approaches

Harold (Hal) P. Batchelder, Michael Harte, David Ullman and William Peterson

Bayesian decision support to improve flexibility and reduce uncertainty in ecological forecasting of coho salmon marine survival

George Sugihara (Invited)

Causality, prediction and nonlinearity in fisheries why adaptive fitting fails

Paul J. Harrison and Kedong Yin (Invited)

Eutrophication impacts in Hong Kong waters are reduced by physical and chemical factors

Rong-shuo Cai, Qi-long Zhang and Ji-long Chen

Spatial and temporal oscillations of SST and atmospheric circulation divergence in the offshore area of China and its adjacent ocean and their associations with the red tide

Joji Ishizaka

Long-term change of primary production in the Yellow Sea and East China Sea

Song Sun, Chaolun Li, Fang Zhang and Yuanzi Huo

A changing ecosystem: The Yellow Sea

Posters

Vladimir B. Darnitskiy and Maxim A. Ishchenko

Some properties of oceanic waters off Japan

Lyudmila I. Mezentseva and Oleg V. Sokolov

Change of weather components at the seashore of the Far East as a result of the changes in general circulation of atmosphere

Sukgeun Jung, Dong-Woo Lee, Yeonghye Kim, Hyung-Kee Cha, Hak-Jin Hwang and Jeong-Yong Lee

Contrasting recruitment of two gadoid species (*Gadus macrocephalus* vs. *Theragra chalcogramma*) to Korean coastal waters in relation to climate change

Vladimir Ponomarev, Elena Dmitrieva and Nina Savelieva

Changing climate and teleconnections in the Asian Pacific

MONITOR/TCODE/BIO Topic Session (S2)

Linking biology, chemistry, and physics in our observational systems - present status and FUTURE needs

Co-Convenors: Hernan E. Garcia (U.S.A.), David L. Mackas (Canada), S. Allen Macklin (U.S.A.), Jeffrey M. Napp (U.S.A.), Young-Jae Ro (Korea) and Toru Suzuki (Japan)

Background

Numerical models are becoming increasingly complex, attempting to integrate vertically and horizontally ecosystem forcing, processes and predictions across multiple trophic levels from bacteria to human populations. Data requirements for daily, seasonal, annual and decadal predictions differ according to single species, species assemblages or multi-trophic level interests. To add to the challenge, the types of sensors and frequency of measurements vary greatly across ecosystem components, particularly in the biological sector. This session encouraged contributions that: (1) define and specify the types, frequency, duration and spatial resolution of observational data required for current numerical models; (2) review existing and emerging advanced technologies capable of supplying biomass and species or functional group information; (3) review existing and emerging data sources and technologies capable of integrating these data with physical and chemical information; and (4) showcase novel data assimilation techniques and formal organization of data or database frameworks that facilitate the operational use of observational data to predict the effects of anthropogenic and climate forcing on the major ecosystems of the North Pacific.

Summary of presentations

The session was partially successful in attracting papers that provided examples and technologies for FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems), the next major science integrated program of PICES. There were a total of 17 talks, of which 2 were invited. Three oral presentations were by scientists who identified themselves as “early career” scientists eligible for a best paper award. There were no cancellations for the oral presentations. In addition, there were 22 posters accepted for the session, although not all were presented in Dalian.

There were several talks on models and modeling which addressed some parts of the session objectives. Yamanaka and colleagues (Invited) informed us of the evolution of the PICES NEMURO model and the many offspring of NEMURO. They emphasized how the purpose or goals of each exercise influenced the changes to NEMURO, and how the model needed to be customized for different biogeographic zones. Ro demonstrated how an existing network of meteorological and oceanographic observational stations and an existing numerical model were used to respond to an urgent societal need, the prediction of the spread of oil from a spill off the western coast of Korea. The presentation included advice for future improvement of their operational model. Chai (Invited) presented an excellent overview of how model and data were being used in the equatorial South Pacific Ocean to forecast seasonal or monthly chlorophyll distribution for use in an ecosystem approach to the anchoveta fishery. Christian explored the ability of models to predict primary productivity and pCO₂ from satellite estimates of chlorophyll in the Pacific Ocean.

There was a single presentation on the organization of data (Objective 4) with Macklin and Megrey updating us on the PICES Metadata Federation, including new changes to language and other requirements that will hopefully make it easier for all to submit metadata. An e-poster presented later in the day by Shevchenko and colleagues demonstrated the new PICES Clearinghouse that is under development.

Several talks reviewed existing or emerging technologies to supply biomass or species/functional group relationships (Objective 2). Batten briefly reviewed the PICES North Pacific Continuous Plankton Recorder Program and demonstrated how it could be used to examine the effect of eddies on biomass and species richness. Moving to very small organisms, Zhang *et al.* presented their work using Denaturing Gradient Gel Electrophoresis (DGGE) to show how one could begin to separate the bacterial community into identifiable groups. The technique is not quantitative by itself, but could be used with other techniques (such as culturing) to obtain proportions of bacteria by group. Tang *et al.* presented preliminary results of their tests of a new omni-directional, multi-beam sonar that has the potential to improve estimates of fish abundance derived from traditional single or dual fixed-beam SONAR currently in use by fisheries scientists.

Two presentations discussed application of new or advanced methods of observation in physical oceanography. Ito *et al.* presented results from a pilot study using gliders in the Oyashio Current, demonstrating a strong link to operational ocean forecasting, while Bezotvetnykh *et al.* demonstrated the utility of using acoustic tomography in a shallow coastal area to measure currents.

The remainder of the talks were a collection of somewhat disparate topics from the status and review of euphausiid data sets along the west coast of North America to the long-term monitoring in sardine spawning areas off Japan, measurements and estimates of different parts of the carbonate system in the coastal waters of Russia, upper ocean export of carbon in the Bering Sea basin and Chukchi Sea, distribution of persistent organic substances in the coastal zone of China, distribution of trace metals in the surface sediments of the coastal waters of Russia, and improving analysis methods for optical remote sensing.

Highpoints:

- Ecosystem models such as NEMURO are advancing and show promise for FUTURE forecasting,
- PICES is developing its own metadata Clearinghouse that could streamline access and delivery of ecosystem data for FUTURE,
- There area a wide range of new sensors and platforms.

Session Summaries-2008

Issues and Obstacles:

- End-to-end inclusion of information from metadata to data to analyses and forecasts is yet to be demonstrated,
- Much information presented at this session is not cataloged adequately for FUTURE use,
- We still have not mastered the difficult task of fully integrating interdisciplinary data into complete, analyzable data sets. The cabled observatories NEPTUNE and VENUS are likely the best examples.

List of papers

Oral presentations

Yasuhiro Yamanaka, Yoshie Naoki, Maki Noguchi Aita, Taketo Hashioka, Hiroshi Sumata, Naosuke Okada, Takeshi Okunishi and Shin-ichi Ito (Invited)

Observational data for determining physiological parameters and validating model simulations: Suggestions by NEMURO developers

Francisco P. Chavez and Fei Chai (Invited)

The realities of integrated measurement and modeling systems

S. Allen Macklin and Bernard A. Megrey

The PICES Metadata Federation: Pacific-wide marine metadata discovery, management and delivery for FUTURE

Young Jae Ro, Kwang Young Jung and Chung Ho Lee

“Hebei Spirit” oil spill fate and trajectory modeling in the western coast of Korea, Yellow Sea

Jennifer Menkel and William T. Peterson

Status of Krill (*Euphausia pacifica* and *Thysanoessa spinifera*) in the northern California Current EEZ: A review of sampling methods and data sets

Hiroya Sugisaki, Kiyotaka Hidaka, Tadafumi Ichikawa, Yutaka Hiroe and Yuuichi Hirota

Introduction for long-term monitoring in the sardine spawning area: Seasonal and annual variations of plankton biomass and compositions

Yong Tang, Koji Iida, Tohru Mukai and Yasushi Nishimori

Measurement of fish school abundances in shallow sea using omnidirectional multi-beam sonar

Zhen-dong Zhang, Shu-fen Wang and Ya-nan Zou

DGGE technique and its application in marine environmental microbial diversity study

Shin-ichi Ito, Yugo Shimizu and Shigeho Kakehi

An application of a deeper-type underwater glider to observe temperature, salinity, DO and Chl-*a* distributions and its connection to an operational ocean forecasting model

James R. Christian

Photosynthesis, photoacclimation, and ocean surface pCO₂

Petr P. Tishchenko, Pavel Ya. Tishchenko and Alexey M. Koltunov

Peculiarities in distribution parameters of the carbonate system of Amurskiy Bay (East/Japan Sea) during summer 2007

Hao Ma, Mingduan Yin, Liqi Chen, Jianhua He, Wen Yu and Shi Zeng

Upper ocean export of particulate organic carbon in the Bering Sea estimated from thorium-234

Ziwei Yao, Zhongsheng Lin, Xindong Ma, Yanjie Wang and Dongmei Zhao

Distribution maps of persistent organic substances in the coastal zone of China

Mikhail V. Simokon and Lidia T. Kovekovdova

Assessment of trace metals contamination in surface sediments of Peter the Great Bay (Japan/East Sea)

Georgiy Moiseenko, Vadim Burago, Igor Shevchenko and Yury Zuenko

The application of empirical orthogonal functions in the ocean remote sensing

Sonia Batten, Bill Sydeman, Mike Henry, David Hyrenbach and Ken Morgan

Ship of opportunity observations of mesoscale eddies in the Gulf of Alaska

Vladimir V. Bezotvetnykh, Evgeny A. Voytenko, Yury N. Morgunov and Dmitry S. Strobykin

Multifunction acoustic hardware and software system for support of works execution and studies in ocean shelf zones

Posters

Bin Liang, Yumin Yang, Hanpeng Jiang, Binxia Cao and Yaobing Wang

DNA fingerprint via REP-PCR of *Escherichia coli* isolates from different point sources of fecal pollution in Jinzhou Bay of China

Hongbo Li and Yubo Liang

The distribution character of Cyanobacteria *Synechococcus* sp. in the Northern Yellow Sea, China

Igor Burago, Georgiy Moiseenko, Olga Vasik and Igor Shevchenko

From metadata federation to geospatial portal

Igor D. Rostov, Natalia I. Rudykh, Vladimir I. Rostov and Valentina V. Moroz

Oceanographic atlas of the South China Sea

Evgeniya A. Tikhomirova

Oceanographic regime of Peter the Great Bay (Sea of Japan)

Qilun Yan and Gengchen Han

National coastal ecological system monitoring program–SOA

Dongmei Li, Sha Liu, Yanan Yu, Xingbo Wang, Tao Song, Xing Miao, Guanhua Chen and Yubo Liang

Real-time PCR for quantification of the protistan parasite *Perkinsus olseni* in Manila clam *Ruditapes philippinarum*

Anatoly Obzhirov, Renat Shakirov, Olga Vereschagina, Natalia Pestrikova, Anna Venikova, Olesia Yanovskaja and Elena Korovitskaja

Methane investigation in water column and sediment in the Okhotsk Sea

Renat B. Shakirov, Anatoly Obzhirov, Jens Greinert and Urumu Tsunogai

Methane venting, gas hydrates and mud volcanoes linked to the oil-gas accumulations in the Sea of Okhotsk and Sakhalin Island

Avianna F. Zhukovskaya, Nina N. Belcheva and Viktor P. Chelomin

The role of high molecular weight proteins in response to cadmium in scallop *Mizuhopecten yessoensis*

Valentina V. Slobodskova, Evgeniya E. Solodova and Viktor P. Chelomin

DNA damage (Comet Assay) as a biomarker of Cd exposure in 1-year-old marine seed scallops *Mizuhopecten yessoensis*

In-Seong Han, Takeshi Matsuno, Tomoharu Senjyu, Young-Sang Suh and Ki-Tack Seong

Behavior of a low salinity water mass during summer in the South Sea of Korea using *in-situ* observations

In-Seong Han, Young-Sang Suh, Lee-Hyun Jang and Ki-Tack Seong

Ship of opportunity monitoring for short-term variability of the thermohaline front across the Jeju Strait

Sergey Kamenev and Alexander Tagiltsev

High-resolution acoustic complex for marine environment monitoring

Xindong Ma, Zhongsheng Lin, Liangliang Chu and Ziwei Yao

Distribution and sources of typical persistent organic pollutants in surface sediments from the southern Yellow Sea

Akira Nakadate, Hiroyuki Sugimoto and Naotaka Hiraishi

Improvement of the ocean CO₂ flux analysis for the subtropical North Pacific Ocean

Daoming Guan, Huade Zhao and Ziwei Yao

Distribution and flux of nitrous oxide in the Liaohe Estuary

Alexey V. Bulanov, Pavel A. Salyuk, Alexey A. Ilin and Sergey S. Golik

Application of efficient optical methods for determination of some major chemical components in seawater and phytoplankton

Sarah Ann Thompson, William J. Sydeman, Franklin B. Schwing, John L. Largier and William T. Peterson

The California Current Integrated Ecological Database (CCIED): Linking ocean observing with Integrated Ecosystem Assessments (IEA)

Zhongqiang Li, Zhiguo Bu and Wenlin Cui

Demonstration system of real-time monitoring eco-environment of the Bohai Sea

MEQ Topic Session (S3)

Species succession and long-term data set analysis pertaining to harmful algal blooms

Co-Convenors: Hak-Gyoon Kim (Korea) and Mark L. Wells (U.S.A.)

Background

Increasing numbers of harmful algal bloom (HAB) events in many coastal locations are a result of significant changes in the dominant species compared to earlier periods. These changes may stem from introductions of new species or from range extensions, but they seem more likely to have arisen from changes in the environmental conditions that promote the dominance of a particular HAB species. Often, it has been concluded that anthropogenic influences on hydrology, land-use, nutrient inputs, *etc.* are the root cause of these changes, but there are examples of HAB incursions into regions that lack these pressures. An ecosystem approach focusing on decadal-scale changes in environmental conditions and planktonic species composition may provide some clarity on the causes of intensified HAB events. Talks on physical-scale to nutrient-scale factors that may affect species succession towards HAB species dominance were especially welcome.

Summary of presentations

While gaining predictive insights to the onset and occurrence of harmful algal blooms is a central goal of HAB research, we still have very limited capabilities, largely because of our incomplete knowledge of the ecophysiology of HAB species. The underlying purpose of this session was to determine whether phytoplankton community succession prior to HAB outbreaks on both seasonal and interannual time scales may provide clues to better explain these events. The half day session opened on Tuesday morning, October 28, 2008 with Dr. William Sunda (invited speaker) detailing a new conceptual model of ecosystem disruptive algal blooms; events that severely alter or degrade ecosystem functions and serve as an extreme form of HAB events. Dr. Songhui Lu (invited speaker) spoke about the species succession occurring during a large bloom of *Karenia mikimotoi* in the East China Sea during 2005. Seven other presentations detailed long-term trends and phytoplankton successional patterns covering the entire PICES region, from Hong Kong waters through central and northern China, Korea, Russia and the United States. In many cases an increasing frequency and intensity of HAB events coincided with increasing temperature and nutrient input trends, though this may not be the case in Amurskii Bay, Russia. The poster session topics focused on a range of topics from bacterial associations with HAB species, restoration of a HAB affected artificial lagoon, studies of red tides and massive green algal blooms, to data integration efforts to facilitate research and modelling of HAB events. In attendance were scientists from: Japan (13), China (12), USA (6), Russia (5), Korea (3), Canada (2), Denmark (1).

List of papers

Oral presentations

William Sunda, D. Rance Hardison and Kyle Shertzer (Invited)

Positive feedback and the development of ecosystem disruptive algal blooms

Jinhui Wang, Yanqing Wu, Zhien Li and Lingyun Xiang

The succession of bloom caused species: A result of complexity and variability of Changjiang estuary ecosystem

Hak-Gyoon Kim, Heon-Meen Bae, Chang-Kyu Lee, Sam-Geun Lee, Yang-Soon Kang, Young-Tae Park, Wol-Ae Lim, Sook-Yang Kim, Chang-Su Jung, Jeong-Min Shim and Yoon Lee

An overview on the species succession of HABs in Korean coastal waters for the last three decades

Kedong Yin

Long-term trend in phytoplankton species composition in the Pearl River estuarine coastal waters during 1991-2004

Songhui Lu (Invited)

Ecological study of a *Karenia mikimotoi* bloom in the East China Sea in 2005

Tatiana Yu. Orlova, Inna V. Stonik and Olga G. Shevchenko (presented by T. Morozova)

Long-term changes in the phytoplankton of the coastal waters off Vladivostok (Amurskii Bay, the Sea of Japan), 1992-2007

Raphael Kudela, Vera L. Trainer, Grant Pitcher, Teresa Moita, P. Figueiras, Trevor Probyn and Theodore J. Smayda

GEOHAB Core Research Project – Species succession of harmful algal blooms in upwelling systems

Renyan Liu and Yubo Liang

The review of study on shellfish poisoning toxins in China

Feng-ao Lin, Xing-wang Lu, Hao Luo and Ming-hui Ma

The historical and present situation of the red tide and its characteristics in the Bohai Sea of China

Posters

Yaqu Chen, Liyan Shi and Weimin Quan

Ecological restoration of an artificial lagoon in the Hangzhou Bay, Shanghai

David G. Foley

Data integration to help identify and monitor harmful algal blooms along the west coast of North America

Mingyuan Zhu, Ruixiang Li and Zongling Wang

Study on growth of macro green algae *Enteromorpha prolifera*

Aijun Zhang, Hong-Liang Zhang and Zijun Xu

Research on the characteristics of red tides in Qingdao

FIS Topic Session (S4)***Institutions and ecosystem-based approaches for sustainable fisheries under fluctuating marine resources***

Co-Convenors: David L. Fluharty (U.S.A.), Xianshi Jin (China), Mitsutaku Makino (Japan), Vladimir I. Radchenko (Russia), Laura Richards (Canada) and Chang-Ik Zhang (Korea)

Background

In PICES member countries, some fisheries resources are in high abundance and healthy, but others are decreasing or already depleted. Most causes of stock declines can be ascribed to climate changes and overfishing. Stocks in declining or depleted conditions require prompt management actions based on sound science. This session provided opportunities to address such questions as: (1) How do current fishery institutions address sustainable fisheries and what institutional changes may be necessary to fully implement an ecosystem-based approach to fisheries management? (2) What are the roles of fishers and government concerning sustainable fisheries under fluctuating resources? (3) How should fishery management strategies recognize and address changes in productivity prior to, during and after regime shifts? and (4) What kind of information and research activities are needed to support sustainable fisheries management in an ecosystem context, given regime shifts? This session encouraged papers addressing institutions, management strategies, and research supporting sustainable fisheries management of fluctuating marine resources using ecosystem-based approaches. Lessons from other marine ecosystems were invited for comparison to the PICES region

Summary of presentations

Papers presented all explored aspects of the four themes of Topic Session 4 as framed in the background paragraph above. The invited talk by Keith Criddle demonstrated how governance systems and management strategies that assume a static relationship between biological and social systems are bound to fail and illustrated how nonstationary dynamics systems differ from a stationary approach. At the international level Jake Rice identified a pending conflict in marine ecosystems between the positions of countries adhering to the Convention on Biological Diversity and the various Conventions under the auspices of the Food and Agriculture Organization. He called on regional scientific bodies like PICES to engage in the provision of scientific information in a consistent manner to member countries in order to promote institutional coherence.

While it is not possible to review each of the session talks and the accompanying posters in detail it is useful to characterize the overall content and to call attention to their contributions to development of management approaches suitable for the challenges of today's fisheries in making a transition to sustainability. Many of the papers focused on some aspect of the way climate variability contributes to fluctuations in marine resources. Clearly, the lessons learned for management institutions are that such fluctuations must be taken into account and, even better, that the changes should be predicted to the extent feasible as forecasting skills increase.

An underlying theme that developed over the course of the session was the need to consider the incentives for fishermen to respond to ecosystem changes and social system changes. Such fluctuations imply that management arrangements and institutions must be flexible and robust to change. Innovative examples of how adaptive responses have been employed and how to internalize the external diseconomies of fishing were presented for sand eels and general fisheries in Japan as well as the swordfish fishery in Hawaii.

Taking into account fluctuating resources was shown to be extremely challenging in terms of understanding the fundamental spatial and temporal variability of stocks of red king crabs in Alaska, coastal molluscan fishery resources in Australia, North Pacific salmon and on artificial oyster reefs in China. The use of nested risk indices such as the objectives risk index, species risk index, fishery risk index and, ultimately a management status index, was applied in the eastern Bering Sea trawl fishery in testing how to holistically assess and manage fisheries and their associated habitats for ecosystem-based management. A final cautionary note was sounded by study of the fisheries off California where long-term

Session Summaries-2008

assessment of the variability of fished and unfished stocks shows clearly that a truncated age structure in the fished populations increases the variability and sensitivity of such populations.

List of papers

Oral presentations

Keith R. Criddle (Invited)

Management of linked nonstationary dynamic bioeconomic systems

Jake Rice

The role of marine science in promoting policy coherence across marine management and conservation institutions

Takaomi Kaneko, Takashi Yamakawa and Ichiro Aoki

Fisheries management by a non-cooperative income pooling system as a remedy for the “tragedy of the commons”

Inja Yeon, Chang-Ik Zhang, Jae Bong Lee, Hak-Jin Hwang, Jong-Bin Kim, Myoung-Ho Sohn, Mi-Young Song, Heeyong Kim and Yi-Un Kim

Korean institutional and ecosystem-based approaches for sustainable fisheries under fluctuating marine resources

Akihiko Yatsu (Invited)

Fisheries management and ecosystem regime shifts: Lessons learned from the Kuroshio/Oyashio current system

Minling Pan and Shichao Li

Fisheries policy designs in response to climate changes – A case study of the Hawaii-based longline swordfish fishery

Jie Zheng, Gordon H. Kruse and M.S.M. Siddeek

Could the collapse of the Bristol Bay red king crab stock in the early 1980s have been avoided? – A case study for ecosystem-based management

John K. Keesing, Fred E. Wells and Tennille R. Irvine

Long-term stability of coastal molluscan fisheries resources and biodiversity aided by effective spatial and temporal management intervention

Weimin Quan, Liyan Shi and Yaqu Chen

Faunal utilization of created intertidal oyster (*Crassostrea rivularis*) reef in the Yangtze River estuary, China (S4-5100)

Masahide Kaeriyama, Hyunju Seo and Shigehiko Urawa

Situation and perspective on production trends of Pacific salmon in the North Pacific

Hee Won Park and Chang-Ik Zhang

Ecosystem-based fisheries resource assessment and management system in Jeonnam marine ranching in Korea

Chang-Ik Zhang, Anne B. Hollowed, Jennifer Boldt, Pat Livingston and Jim Ianelli

An ecosystem-based risk assessment for the eastern Bering Sea trawl fishery

Chih-hao Hsieh, Christian N.K. Anderson, Stuart A. Sandin, Roger Hewitt, Anne B. Hollowed, John Beddington, Robert M. May and George Sugihara

Fishing effects enhanced variability and sensitivity of exploited fish populations

Posters

Yongjun Tian, Hideaki Kidokoro and Tadanori Fujino

Long-term variability of demersal fish community in the Japan Sea: Impacts of the climatic regime shifts and trawl fishing with recommendations for management

Jae Bong Lee, Hee Won Park and Chang-Ik Zhang

Relative states of exploited Korean coastal marine ecosystems using multiple ecological indicators

Chieko Kato, Takashi Yamakawa and Ichiro Aoki

Construction of spatial distribution model for an appropriate estimation of fisheries resources abundance in the East China Sea and the Yellow Sea

Young Il Seo, Joo Il Kim, Taeg Yun Oh, Sun Kil Lee and Seung Jong Lee

Ecosystem approaches to fisheries resources rebuilding assessment for *Octopus minor* in Korea

Hyunju Seo, Hideaki Kudo, Sukyung Kang and Masahide Kaeriyama

Spatiotemporal change in growth pattern of Japanese and Korean chum salmon

MEQ/FIS Topic Session (S5)***Mariculture technology and husbandry for alternate and developing culture species***

Co-Convenors: Ingrid Burgetz (Canada), Shuanglin Dong (China), Toyomitsu Horii (Japan) and Hyun-Jeong Lim (Korea)

Background

PICES member countries share a common interest in the development of highly efficient, environmentally friendly and diverse aquaculture industry. The diversification of aquaculture operations through the culture of new species and the use of innovative grow out technologies is of world-wide interest to both industry investors and the agencies responsible for ecosystem protection. In many Pacific Rim countries recent developments of effective and efficient fish feed, development of animal husbandry protocols to ensure fish health and welfare, and advances in reproductive physiology using state-of-the-art molecular techniques show promise for enabling the socio-economic acceptance of aquaculture operations while preventing or mitigating environmental impacts. A variety of tools presently exist that permit the modeling of environmental risk from these developments and the subsequent incorporation of risk into an ecosystem management scheme.

Summary of presentations

The presentations covered a variety of applications of mariculture in PICES member countries, moving through themes related to mariculture for stock enhancement, understanding physiological effects of culture conditions, to measuring and modeling environmental interactions, including disease and organic loading to inclusion of climatic information into models and information to enhance the sustainability of aquaculture activities. There were a total of 9 oral presentations and 11 posters prepared for this session, which had representation from each PICES member country.

The invited speaker, Shienori Suzuki (Fisheries Research Agency, Japan) started the session by describing efforts that have been underway since 1981 in Japan to enhance the stocks of the endangered barfin flounder. This effort has been increasingly successful, particularly since the inclusion of new tools to discriminate between families, while maximizing the genetic diversity and minimizing inbreeding from the limited wild stock that has been captured. Kwang Hoon Kim (Pukyong National University, Korea) followed with a presentation comparing the growth of wild and cultured black seabream, concluding that the decrease in growth rate of cultured black seabream in year 3 was due to culture conditions, as cultured seabream are used for enhancing wild populations rather than for harvesting.

These two stock enhancement-related presentations were followed by a presentation by Nikolina Kovatcheva (Russian Federal Research Institute of Fisheries and Oceanography, Russia) focusing on health and stress related questions associated with culture conditions for king crab, using a novel monitoring approach to determine the heart rate and overall stress levels.

This was followed by three presentations focusing on environmental interactions associated with marine aquaculture activities – from salmon aquaculture and the presence of sea lice in the surrounding environment, to the organic inputs associated with scallop farming and oceanographic modeling studies used to assess environmental sustainability.

The session concluded with presentations on moving to an ecosystem science approach to aquaculture research and management, disease management challenges and the introduction of the terms of reference of the proposed working group, focusing on the environmental interactions of marine aquaculture. This was followed by a lively discussion on the direction of the proposed working group. Participants in this discussion emphasized the need for additional communication on the opportunities and challenges for scientific exchange and collaboration regarding the interactions between marine aquaculture and the environment. As well, enhancements that can be achieved through marine aquaculture (*i.e.*, habitat restoration, stock enhancement) were identified as an area that should be considered as discussions on this working group move forward. The importance of linking oceanographic data acquisition to both inform

and enhance scientific modeling of the interactions and to inform overall management approaches of marine aquaculture in the environment was also emphasized.

List of papers

Oral presentations

Shigenori Suzuki, Maria Del Mar Ortega-Villaizan Romo, Takashi Ichikawa, Tadashi Andoh, Naoto Murakami, Taizou Morioka, Kyouhei Fukunaga, Takahiro Matsubara, Sachio Sekiya, Takuma Sugaya and Nobuhiko Taniguchi (Invited)

Current situation in stock enhancement of barfin flounder *Verasper moseri* in Japan

Kwang Hoon Kim and Chang-Ik Zhang

Growth of cultured and wild black seabream in the coastal water of Yeosu, Korea

Nikolina P. Kovatcheva, Roman M. Vasilyev, Ivan A. Zagorsky, Sergey V. Kholodkevitch and Aleksey V. Ivanov

Monitoring of the physiological state of red king crab (*Paralithodes camtschaticus*) in artificial conditions

Moirra Galbraith and David L. Mackas

Distribution of planktonic larval sea lice (*Lepeophtheirus salmonis*) in the Broughton Archipelago, British Columbia, Canada

Xiutang Yuan, Yubo Liang, Mingjun Zhang, Dan Liu and Daoming Guan

In situ study on self-pollutant loading in suspension aquaculture system of Japanese scallop *Patinopecten yessoensis* from Changhai sea area, North Yellow Sea, China

Katsuyuki Abo, Toshinori Takashi and Hisashi Yokoyama

Environmental indicators and modeling studies for assessing sustainability of marine aquaculture

Larissa A. Gavko

Marine climatology – New concept of agricultural meteorology studying interrelation between environment factors and sea farming efficiency

Ingrid Burgetz, Jay Parsons and Steve MacDonald

Ecosystem-based approaches and environmental interactions of marine aquaculture: Opportunities and priorities from a Canadian perspective

Kevin H. Amos

Interactions between marine aquaculture and marine ecosystems: Infectious aquatic pathogens and disease

Posters

Chunjiang Guan, Qing Liu, Peng Li and Donzhi Zhao

Study on using *Sargassum thunbergii* to purify aquaculture water of sea cucumbers in mesocosm experiment

Larissa A. Gavko

Influence of environmental factors in forecasting mollusks yield on marine farms (for Possyet Bay, Sea of Japan)

Shu-Xi Liu, Guo-fan Zhang, Xiao Liu and Wen-Xin Yin

Self-fertilization family establishment and its depression in bay scallop *Argopecten irradians* from different growing areas

Ludmila S. Dolmatova, Olga A. Zaika and Valeria V. Romashina

Cytokine production in coelomocytes of the holothurian *Eupentacta fraudatrix* and seastar *Asterias amurensis*

Yubo Liang, Dongmei Li, Sa Liu, Xingbo Wang, Tao Song, Xing Miao, Guanhua Chen and Guize Liu

Spatial distribution of *Perkinsus olseni* in the Manila clam *Ruditapes philippinarum* along Chinese coast

Donghui Xu and Guangxing Liu

Experiment on the rearing of larval Japanese flounder, *Paralichthys olivaceus* with *Schmackeria poplesia* (Copepoda: Calanoida)

Jeong Hee Nam, Yun Joon Park and Hyun Do Jeong

Characterization of the repeating sequence present in the specific genomic ORF region of iridovirus

Ju Heon Kim and Hyun Do Jeong

Molecular cDNA cloning and analysis of the organization and expression of immune genes from rock bream (*Oplegnathus fasciatus*) infected by Iridovirus

Ki Won Shin and Hyun Do Jeong

Megalocytivirus susceptible for freshwater Pearl gourami (*Trichogaster leeri*) have a risk of transmission to seawater rock bream (*Oplegnathus fasciatus*)

Kwang Il Kim, Ji Woong Jin and Hyun Do Jeong

Molecular characterization of Noroviruses in various samples from the southeastern coast of Korea

Young Jin Kim, Lyu Jin Jun and Hyun Do Jeong

Quantification of various tet genes in tetracycline resistant bacteria from microflora in fish

POC Topic Session (S6)***Coastal upwelling processes and their ecological effects***

Co-Convenors: Tal Ezer (U.S.A.), Vyacheslav Lobanov (Russia) and Xingang Lü (China)

Background

Upwelling is a key process in marine ecosystems linking physical oceanography, chemistry, and marine ecology. It brings rich nutrient water to the upper ocean so it has great impacts upon fisheries in these regions and on the ecological environment, and may also provide a suitable environment for harmful algal blooms. This session focused on three aspects of upwelling: (1) observations, numerical modeling and mechanism analysis of upwelling and related processes; (2) the quantitative evaluation of upwelling on marine ecology (biological production, diversity, *etc.*); and (3) changes in upwelling systems as a result of climate change. The session was considered to be helpful for the ecosystem-based management of the marine environment.

Summary of presentations

POC Topic Session 6 on “*Coastal upwelling processes and their ecological effects*” came to a successful end on October 29, 2008. The main topics were (1) observations, numerical modeling and mechanism analysis of upwelling and related processes, (2) evaluation of upwelling on marine ecology; and (3) changes in upwelling system as a result of climate change.

A total of 35 abstracts were submitted to this session (of which 8 were moved to other sessions). Finally, 25 submissions were accepted for presentation in this Session, including 13 as oral presentations for a ¾-day session and 12 as posters (although not all were presented due to cancellations). The session included three invited speakers from Hong Kong (China) and the United States of America.

The session covered the latest studies from almost the whole North Pacific and discussed diverse methodologies including cruise observation, satellite remote sensing, and numerical modeling. Examples of coastal upwelling systems and their dynamics were presented for different locations such as the South China Sea, the Yellow Sea, the Japan/East Sea, the Bering Strait, the Gulf of Alaska, the Caribbean Sea, and the waters off the west coast of North America.

One of the important points mentioned by several speakers was that besides the classic along-shore wind-driven upwelling mechanism, there are various other proposed important processes that are not yet well understood and need further analysis and observations; these include upwelling due to offshore processes and eddies, tides, estuarine flow, and wind stress curl. The upwelling influences on marine ecology, especially in the Eastern Boundary Ecosystem, were also investigated. In the California Current large marine ecosystem, the changes of the coastal upwelling in the past four decades were quantitatively studied from a view of phenology.

Therefore, we need to continue the interdisciplinary nature of the upwelling studies, considering the various processes and various spatial and temporal scales involved, from small-scale short-term local processes, to basin-scale long-term climate variations. We believe that by bringing together experts in those areas of research, Topic Session 6 has deepened our understandings of coastal dynamics and their ecological effects, and thus will help future collaborations and the development and management of ecosystem-based marine systems.

As the financial support from PICES is limited and can not totally meet the needs of the invited speakers, First Institute of Oceanography, China provides 1100USD to cover the accommodation and registration fees of Dr. Steven J. Bograd. We would like to thank all the speakers for the interesting and well structured presentations, and the organizers of this annual meeting for inviting us to chair this session. We also would like to thank Dr. Jianping Gan, Dr. Tal Ezer, and Dr. Bograd for their wonderful talks as invited speakers.

List of papers

Oral presentations

Jianping Gan, Anson Cheung, L. Li, L. Liang, X. Guo and D. Wang (Invited)

Alongshore variability of upwelling induced by variable shelf topography and river plume in the northeastern South China Sea

Pifu Cong, Dongzhi Zhao, Limei Qu and Changan Liu

Analysis of coastal upwelling and its ecological impacts in the China Sea using remote sensing

Xingang Lü, Fangli Qiao and Changshui Xia

Numerical simulation of the summertime surface cold patches and upwelling in the Yellow Sea

Elena A. Schtraikhert, Sergey P. Zakharkov and Tatyana N. Gordeychuk

Chlorophyll-*a* concentration at wind-induced upwelling regions in Peter the Great Bay in 2003-2007

Tal Ezer, Digna T. Rueda-Roa and Frank Muller-Karger (Invited)

Unusual mechanisms for driving coastal upwelling and near-shore currents: Examples from the Caribbean Sea and biological consequences

John A. Barth, F. Chan, Stephen D. Pierce, R. Kipp Shearman, Anatoli Y. Erofeev, Laura Rubiano-Gomez and Justin Brodersen

Interannual variability and modeling of upwelling-driven shelf hypoxia off the central Oregon coast

Michael G. Foreman, Wendy Callendar, Amy MacFadyen and Barbara Hickey

Present and future upwelling off the entrance to Juan de Fuca Strait

Albert J. Hermann, Sarah Hinckley, Elizabeth L. Dobbins, Dale B. Haidvogel, Nicholas A. Bond, Phyllis J. Stabeno and Calvin Mordy

Significance of curl-driven upwelling to production in the Coastal Gulf of Alaska

Zhongyong Gao and Liqi Chen

The different water masses of the Bering Strait throughflow and their mixing on the way to the Arctic Ocean

Steven J. Bograd, Isaac Schroeder, Nandita Sarkar, William J. Sydeman and Franklin B. Schwing (Invited)

The phenology of coastal upwelling in the California Current: Interannual variability and ecosystem consequences

Elena Vilyanskaya and Gennady Yurasov

The peculiarities of the coastal upwelling in Peter the Great Bay

Hee Dong Jeong, Yang Ho Choi and Chang Su Jeong

Cold water appearance in the southwestern coast of Korea in summer

Vyacheslav Lobanov, Vladimir Zvalinsky, Pavel Tishchenko, Anatoly Salyuk, Svetlana Y. Ladychenko and Aleksandr F. Sergeev

Coastal upwelling and its ecological effects in the northwestern Japan Sea

Posters

Huasheng Hong, Xin Liu and Bangqin Huang

Seasonal and interannual variations of phytoplankton in the southern Taiwan Strait

Victor Kuzin, Elena Golubeva and Gennady Platov

Simulation of the Bering Sea water propagation to the Arctic-North Atlantic

Fedor F. Khrapchenkov

The upwelling effect on the north shelf area of Sakhalin Island based on hydrological measurements and satellite imaging data (2005-2007)

Fedor F. Khrapchenkov and Nadezda M. Dulova

Seasonal variability of water currents and temperature in Peter the Great Bay of the Sea of Japan in 2004 - 2007

Svetlana Y. Ladychenko, Vyacheslav B. Lobanov and Olga O. Trusenkova

Mesoscale eddy dynamics off Peter the Great Bay, northwestern Japan Sea

Georgy Shevchenko, Valery Chastikov and Elena Vilyanskaya

Wind-induced autumn upwelling near western coast of Sakhalin Island

Alexander Romanov, Alexander Tsoy and Georgy Shevchenko

Eddies determination in the North Kuril area from satellite altimetry, SST and chlorophyll-*a* data

CCCC/POC Topic Session (S7)***Marine system forecast models: Moving forward to the FUTURE***

Co-Convenors: Michael G. Foreman (Canada), Thomas C. Wainwright (U.S.A.), Hao Wei (China), Yasuhiro Yamanaka (Japan), Sinjae Yoo (Korea) and Yury I. Zuenko (Russia)

Background

As marine system models mature, they are increasingly used to forecast future conditions, both for understanding potential effects of climate change and for projecting system responses to management activities. In particular, the PICES FUTURE Program is focused on forecasting and understanding the responses of North Pacific marine systems to climate change and human activities. This work will reach beyond the models currently used by the PICES community to include models that provide system forecasts, assess uncertainty, and link together multiple levels of system organization. Achieving meaningful forecasts that are useful for management of marine resources will require cross-disciplinary approaches that link processes ranging from atmospheric and ocean physics, through biology to socio-economic systems.

This session focused on multidisciplinary coupled models designed to forecast marine systems in the PICES region, including both strategic (long-term) and tactical (short-term) forecasts linking across two or more disciplines (such as physical oceanography, climate, ecosystem dynamics, marine resource management, or socio-economic systems). Presentations describing approaches to assessing and communicating the reliability (or uncertainty) of coupled marine system forecasts were particularly encouraged.

Summary of presentations

The CCCC/POC Topic Session was held on Friday, October 31, 2008, and consisted of 15 oral presentations and 5 posters. These included presentations from every PICES member country, plus Norway and the Philippines. The keynote talk by Kenneth Drinkwater provided a valuable perspective on the role of models in marine ecology and climate change research. Dr. Drinkwater noted the wide diversity of biological models used in assessing climate effects and the need for more comparative model studies (across models and for contrasting ecosystems) to gain the broadest insight on ecosystem response to climate change. He emphasized the need for more and better interactions between modelers and observationalists with constructive feedback between the two (modelers indicating the need for more focused observations; observationalists providing feedback on model results). He outlined the limits on present global climate models and the need for better expression of uncertainty in results. Finally, he concluded that we need to get on with ecosystem projections even if they are highly uncertain, and that modelers should expect and embrace failure because mistakes are the basis of learning.

Remaining talks covered diverse topics. The keynote talk was followed by two talks focused on fishery problems. Caihong Fu presented a strategy for assessing effects of climate and fishing in the Strait of Georgia using the OSMOSE coupled biophysics and fishery model. Maria Rebecca Campos tied issues of ecosystem exploitation to human bioeconomics with an analysis of fishery conservation policies in the Phillipines. These talks were followed by a number of presentations related to lower trophic level (nutrients and plankton) production. Yuheng Wang showed results of 40-year simulations of the ecosystem in Jiaozhou Bay with an emphasis on phytoplankton production and community structure. Hao Wei provided an overview of ecosystem modeling studies in coastal China, covering a range of topics including nutrient and primary production dynamics, individual-based models (IBMs) of anchovy and copepods, and models for understanding coastal hypoxia. Albert Hermann examined the limits of predictability of plankton response to physical forcing in a coupled biophysical model applied to the Bering Sea and coastal Gulf of Alaska. Yury Zuenko applied an empirical model relating temperature to fecundity and survival of zooplankton to predict zooplankton abundance in the Japan/East Sea. Hiroshi Sumata presented preliminary results for a project embedding the NEMURO model into a fine-scale eddy-resolving global general circulation model. Sinjae Yoo used a 2D biophysical model of the East China Sea shelf to show that coastal wind-driven upwelling is a plausible mechanism to drive offshore plankton blooms. Three posters also addressed lower trophic production: Evgeniya Tikhomirova presented a model

of primary production, Xiuhua Yan presented a study of phytoplankton dynamics in Xiamen Bay, and Maki Noguchi Aita presented model-based studies of the effects of iron on global phytoplankton distribution. Several presentations addressed new developments in modeling ocean physics. Jia Gao discussed results of a model of tides and tidal currents in the Bohai Sea in relation to outflow from the Yellow River. Jinrui Chen applied a high resolution model of tides and tidal circulation in Jiaozhou Bay to examine the effects of construction of the Olympic sailing facility on the bay. Zhenya Song and Qi Shu presented related talks on the improvement of predictions of ocean physics by incorporating wave-induced mixing into the dynamic equations. Xunqiang Yin discussed the potential of the Ensemble Adjustment Kalman Filter (EAKF) to improve simulation results for temperature and salinity profiles compared to data from the Argo system. Two poster presentations also addressed models of ocean physics: Svetlana Shkorba presented a technique for statistical forecasting of sea ice in the Sea of Japan, and Yasumas Miyazawa presented progress toward a data-assimilation system for marginal seas to improve ocean circulation model results in the Southeast Asia and West Pacific region. The final talk by Thomas Wainwright focused on software infrastructure available for integrating cross-disciplinary models on regional and global scales. The session ended with a brief discussion of the opportunities and obstacles for developing multidisciplinary forecasting tools.

List of papers

Oral presentations

Kenneth F. Drinkwater (Invited)

Requirements for forecasting marine systems – A non-modeller’s view

Caihong Fu, Ian Perry, Angelica Peña , Yunne Shin and Morgane Trevers

Towards end-to-end modeling for investigating the effects of climate and fishing in the Strait of Georgia ecosystem, Canada

Maria Rebecca A. Campos

Moving forward to the future: Bioeconomic modelling of fishery conservation policies in the Philippines

Yuheng Wang Liang Zhao, Zhenyong Wang and Hao Wei

Simulation on phytoplankton system evolution of Jiaozhou Bay for recent 40 years

Hao Wei, Liang Zhao, Tian Tian, Jun Han, Yuheng Wang, Jie Shi, Xiangxin Li, Luning Wang, Zhe Liu, Zhenyong Wang, and Chengyi Yuan

Ecosystem modeling studies in the coastal water of China

Jia Gao, Xueen Chen and Huaming Yu

Numerical simulation for tides and tidal currents in the Bohai Sea

Albert J. Hermann and Bernard A. Megrey

Examining the predictability limits of NPZ-fish dynamics in the Coastal Gulf of Alaska and the Bering Sea using a numerical model

Yury I. Zuenko, Natalia T. Dolganova and Victoria V. Nadtochy

Forecasting of climate change influence on zooplankton in the Japan/East Sea

Hiroshi Sumata, Taketo Hashioka, Takashi T. Sakamoto, Tatsuo Suzuki and Yasuhiro Yamanaka

Application of 3-D NEMURO to an eddy-permitting general circulation model for the global domain

Sinjaee Yoo, Ig-Chan Pang, Sung-Jun Pang and Jisoo Park

Wind-driven coastal upwelling and offshore summer phytoplankton blooms on the East China Sea shelf

Jinrui Chen, Shiliang Shan, Huaming Yu and Xueen Chen

Three-dimensional high-resolution numerical study of the tide and tidal current in the Jiaozhou Bay and Olympic sailing site

Zhenya Song and Fangli Qiao

The improvement of the simulated sea surface temperature seasonal cycle in the equatorial eastern Pacific by surface wave-induced vertical mixing

Qi Shu, Fangli Qiao, Zhenya Song, Changshui Xia and Yongzeng Yang

The improvement of MOM4 by adding wave-induced mixing

Xunqiang Yin, Fangli Qiao, Yongzeng Yang and Changshui Xia

Ensemble adjustment Kalman filter study for Argo data

Thomas C. Wainwright, Jim J. Colbert and Bernard A. Megrey

Integrating ocean system models using a software framework

*Posters***Evgeniya A. Tikhomirova and Vladimir I. Dulepov**

Model for estimation of primary production

Svetlana P. Shkorba

Probabilistic forecast for the ice cover evolution in the Sea of Japan

Yasumasa Miyazawa, Yoshikazu Sasai and Kazuo Nadaoka

Toward a data-assimilation system for marginal seas in the SEA-WP region

Maki Noguchi Aita, S. Lan Smith, Michio J. Kishi and Yasuhiro Yamanaka

Effects of iron on spatial and temporal phytoplankton distribution using a global 3-D ecosystem model (Fe-NEMURO)

Xiuhua Yan

A modeling study of phytoplankton dynamics in Xiamen Bay

MEQ Topic Session (S8)***Consequences of non-indigenous species introductions***

Co-Convenors: Blake Feist (U.S.A.) and Mingyuan Zhu (China)

Background

Non-indigenous species (NIS) are ubiquitous throughout the world's marine, coastal and estuarine waters. There is little doubt that human-mediated dispersal of NIS and subsequent establishment of NIS has altered biodiversity, species assemblages, food web dynamics, and trophic structure and interactions in marine ecosystems. These alterations have ecological, biological, evolutionary and economic consequences, especially in coastal and estuarine systems of all PICES member countries. It is ironic that mariculture and the global shipping trade have been identified as the most affected economically, given that these two activities are often identified as the primary vectors of marine NIS introductions. While there are many threats to the biota and ecosystem integrity of the North Pacific, the threat of marine NIS is arguably the least understood.

Summary of presentations

The presentations covered a variety of marine NIS topics relevant to all PICES member countries. The central themes included biogeography, potential and observed impacts, monitoring, vectors, and rapid response. There were a total of 17 oral presentations and 1 poster prepared for this session, with representation from each PICES member country.

The invited speaker, Dr. Edwin "Ted" Grosholz (Department of Environmental Science and Policy, University of California, Davis, U.S.A.) started the session by providing an overview of marine NIS consequences in coastal and nearshore systems. The consequences he described ran the gamut of spatio-temporal scales, ranging from community up through ecosystem levels. His presentation set the stage for the remaining talks as he touched on impacts (socio-economic as well as ecological), vectors, case studies, and policy/management implications.

The second presentation was an overview of biogeographic patterns of invasion in near-coastal and estuarine communities in the Northeast Pacific (NEP) based on surveys by the U.S. EPA's Environmental Monitoring and Assessment Program (EMAP) and the EPA/USGS synthesis of native and non-native species in the "Pacific Coast Ecosystem Information System" (PCEIS) database. This was followed by a series of four presentations that addressed vectors of introduction. These included: the occurrence of non-indigenous polychaetes in Russian ports; the origin, expansion, and fate of introduced populations of non-indigenous macroalgae (from East Asia including Japan, Oceania, North America, *etc.*); distribution, origin and vectors of marine NIS on the Pacific coast of Canada; and, spatio-temporal variability in the abundance and size of *Nemopilema nomurai* in Korean waters, with implications for vectors.

The next four presentations were organized around an impacts (potential and documented) theme. The presentations covered topics including: changes in the biogeography of harmful dinoflagellates and

Session Summaries-2008

raphidophytes along the Chinese coast, as well as strong northward shifts in the spatial distribution of *Phaeocystis globosa* and *Karenia mikimotoi* blooms; consequences of NIS that have been introduced for marine aquaculture in China, including secondary introductions such as pathogens; the range expansion and potential community level impacts of European green crab on the Pacific coast of Canada; and, impediments of native Olympia oyster recovery due to interactions with non-indigenous aquatic species along coastal Oregon.

Following these presentations, we learned about the application of autonomous underwater vehicles (AUV) for detecting invasive tunicate prevalence in deeper marine waters; rapid response plans and their utility in quickly eradicating newly discovered NIS; coupling of individual based models (IBMs) with existing 3D ocean circulation models for predicting the northward range expansion of European green crab along the west coast of North America; and, Dr. Tom Therriault presented results from a multi-year, interdisciplinary program for identifying, tracking and understanding biological and economic impacts of NIS in Canada.

Dr. Darlene Smith, Co-Chair of Working Group on *Non-indigenous Aquatic Species* (WG 21), introduced the final two presentations. These presentations showcased two of the major products from the Working Group: the Rapid Assessment Surveys in PICES member country ports and the North Pacific NIS database (supported by the Ministry of Agriculture, Forestry and Fisheries of Japan). The Rapid Assessment Surveys have been coordinated by Dr. Tom Therriault (DFO Canada) and they provide valuable information about the prevalence of marine NIS in ports around the Pacific. Dr. Deborah Reusser and Dr. Henry Lee, II have led development of the North Pacific non-indigenous species database, which is a spatially explicit database of all known NIS occurrences in all PICES member countries.

List of papers

Oral presentations

Edwin Grosholz (Invited)

A new agenda for addressing the impacts and management of coastal invasions

Henry Lee II, Deborah Reusser, Walter Nelson and Janet Lamberson

Changes in latitude, changes in attitude – Emerging biogeographic patterns of invasion in the Northeast Pacific

Vasily I. Radashevsky

Unknown vector of organism transportation with ballast water between the Northwest Pacific and Southwest Atlantic

Takeaki Hanayuda, Shinya Uwai, Judie Broom, Wendy Nelson and Hiroshi Kawai

Origin and dynamics of two non-indigenous algal populations (*Undaria pinnatifida*, Phaeophyceae; and *Ulva pertusa*, Ulvophyceae) using molecular markers

Graham E. Gillespie, Thomas W. Therriault and Glen S. Jamieson

Marine non-indigenous species on the Pacific coast of Canada: Distribution, origin and vectors

Soo-Jung Chang, Won-Duk Yoon and Yoon Lee

Spatio-temporal variability in the abundance and size of *Nemopilema nomurai* (Scyphozoa: Rhizostomeae) in Korean waters

Jinhui Wang, Yanqing Wu, Yutao Qin and Yihong Li

The threat of potential alien species in the East China Sea and a mitigation strategy

Lijun Wang

Species introduced for marine aquaculture and their impacts in China

Graham E. Gillespie and Thomas W. Therriault

Biology and ecological impacts of the European green crab, *Carcinus maenas*, on the Pacific coast of Canada

Steven S. Rumrill

Interactions with non-indigenous aquatic species pose an impediment to recovery of native Olympia oyster (*Ostrea conchaphila*) populations within Coos Bay, Oregon, USA

Thomas W. Therriault, Graham E. Gillespie and Glen S. Jamieson

Looking for non-indigenous species in Canada: Preliminary results from a multi-year, multi-discipline program

Judith Pederson, Victor Polidoro, James Morash, Justin G. Eskesen, Dylan Owens, Franz Hover and Chrys Chrysostomidis

Advancing technologies to identify marine invaders in support of fisheries management

Paul Heimowitz

Rapid response plans for aquatic invasive species

Blake E. Feist, Kevin See, Carolina Parada and Jennifer Ruesink

Predicting the northward range expansion of non-indigenous European green crab (*Carcinus maenas*) along the west coast of North America

Darlene Smith

Introduction of a PICES project on marine non-indigenous species supported by the Ministry of Agriculture, Forestry and Fisheries of Japan

Thomas W. Therriault

Rapid Assessment Surveys: PICES WG-21's approach

Deborah Reusser and Henry Lee II

Evolution of biogeography in the 21st Century – Development of a North Pacific non-indigenous species database

Poster

Xuezheng Lin and Xiaohang Huang

Introduced marine organisms in China from Japan and their impacts

BIO Topic Session (S9)

End-to-end food webs: Impacts of a changing ocean

Co-sponsored by IMBER

Co-Convenors: George Hunt, Jr. (U.S.A.), Hiroaki Saito (Japan) and Sinjae Yoo (Korea)

Background

A holistic end-to-end approach is needed to study the impacts of global change in marine food webs, including the influences on biogeochemistry and feedbacks to climate. This approach is encapsulated by the term “end-to-end food webs”, which is defined as “feeding interactions, nutrient flows and feedbacks in an end-to-end food web of primary producers, consumers and decomposers.” This food web approach retains the energy transfer and nutrient cycles of traditional food webs, but emphasizes the importance of understanding food web dynamics simultaneously at all levels and scales. To achieve an integrated understanding of end-to-end food web dynamics requires a merging of knowledge from many marine-related disciplines, including those concerned with global climate, marine food webs, marine ecosystems, marine biogeochemistry and biodiversity.

Summary of presentations

Sum of 34 studies (25 orals and 9 posters) were presented (1 oral and 1 poster cancelled) on October 28 and 30 (1½ days). There were about 70 attendants each day.

In the first and second slot of talks, structure and dynamics in microbial and planktonic food webs were presented. Many studies focused on trophic cascading effects. Various techniques were introduced for the studies of food-web structure and dynamics such as stable isotopes, fluorescent probes, PCR, *etc.* The scheduled invited talk by Dr. A. Peña was canceled; instead, Dr. J. I. Allen gave a talk on integrated E2E modeling.

Studies presented in the first and second slots of the second day were focused on higher trophic levels such as pollock, cod, seabirds, and marine mammals. Many presentations were not limited within a single prey–predator interaction, but focused on the dynamics in several trophic levels and also on the influence of climate change on food-web dynamics. New information was presented on the feeding ecology of previously unstudied issues such as giant jellyfish, minke whales in Korean waters, *etc.*

Studies on higher trophic levels continued in the third and fourth slots on October 30. Many of them were targeted on the influences of climate change on seabirds through changes in upwelling, prey abundance and composition. These papers highlighted the interconnections of food webs from physical processes through several trophic levels to the top predators. A review paper on the impact of global warming on global marine ecosystems wound up the session.

Many studies were focused on the indirect influence of climate change on target species through changes in physical oceanographic conditions and the food-web structure as well as the direct influence (*e.g.*, temperature, weather). Presentations on the feedback from marine ecosystems to the terrestrial

Session Summaries-2008

ecosystem (seabird egestion in the colony) and atmosphere (DMS production by phytoplankton) showed that the change in marine food-web dynamics has an influence outside of the oceans. A study estimating habitats of oceanic whales using satellite images showed a new direction to investigate the impact of environmental change in marine ecosystems. Presentations covered many food-web processes with adequate overlaps and were quite useful in reviewing the present state of knowledge. Discussions were quite active throughout the session. We believe the presentations in this session inspired the attendees' scientific motivation for future studies.

List of papers

Oral presentations

J. Icarus Allen (Invited)

Bio-physical interactions on the NW European Shelf and thoughts on the next generation of ecosystem models

Mitsuhide Sato, Shigenobu Takeda and Ken Furuya

Temporal variation in the cellular labile iron pool of phytoplankton during an *in situ* iron enrichment experiment as measured by flow cytometry

Sarah-Jeanne Royer, Martine Lizotte, Maurice Levasseur, Michael Arychuk, Michael Scarratt, Keith Johnson, C.S Wong, Connie Lovejoy, Marie Robert, Sonia Michaud and Ronald P. Kiene

DMSP microbial dynamics along a natural iron gradient in the Northeast Pacific

Hongbin Liu, Bingzhang Chen, Mianrun Chen, Xihan Chen, Loklun Shek, Hongmei Jing and Thomas Wong

Planktonic microbial food web dynamics in Hong Kong coastal waters

JiHo Seo, Seok Hyun Youn, Jeong Kyu Yoo and Joong Ki Choi

The variation in zooplankton abundance related to sea water temperature changes in Incheon coastal waters, Gyeonggi Bay from 2000 to 2007

Chang-Keun Kang (Invited)

Food web structure in the continental shelf and slope waters of the Korean peninsula: Stable isotope approach and prospects for future research

Eun-Jin Yang, Sinjae Yoo, Jung-Ho Hyun, Jae-Hoon Noh, Hyung-Ku Kang, Dongseon Kim and Chang-Woong Shin

Structure and dynamics of the planktonic food web during spring and summer in the Ulleung Basin, East Sea/Japan Sea

Jeffrey M. Napp, Christine T. Baier and Suzanne L. Strom

Mesozooplankton grazing and egg production in the coastal Gulf of Alaska

Hiroaki Saito, Keiichiro Ide, Masatoshi Moku, Hiroya Sugisaki and Kazutaka Takahashi

The end-to-end food web of the subarctic Pacific from the viewpoint of *Neocalanus* copepods

Orio Yamamura (Invited)

Inside and outside the food web: Factors affecting dynamics of walleye pollock

Hye Eun Lee, Won Duk Yoon and Suam Kim

Feeding biology of *Nemopilema nomurai* (Scyphozoa: Rhizostomeae) and its ecological implication

George L. Hunt, Jr., Kenneth O. Coyle and Jeffrey M. Napp

Does a warming climate aid pollock recruitment in the eastern Bering Sea? A new look at assumptions behind the Oscillating Control Hypothesis

Franz Mueter and Ken Coyle

From physics to humans: Climate effects on Bering Sea food webs and fisheries

Chung-Youl Park and Woo-Seok Gwak

Stomach contents of Pacific cod (*Gadus macrocephalus*) in Korean coastal waters

Vjacheslav S. Labay and Yuri R. Kochnev

Long-term changes in the *Nuculana pernula* community of the southern Okhotsk Sea as an indicator of global benthic change

Olga Yu. Tvurneva, Valery. I. Fadeev, Yuri M. Yakovlev and Vladimir V. Vertyankin

Changes in the movement and distribution of western gray whales between known feeding areas in 2002-2007

Jung Hyun Lim, Zang Geun Kim, Kyung-Jun Song, Hyeok Chan Kwon, Seok Gwan Choi, Yong-Rock An and Chang-Ik Zhang

Feeding habits of minke whales in Korean waters

Hongsheng Bi, William T. Peterson, Jesse Lamb and Cheryl Morgan

Couplings between multi-scale physical processes and copepod communities along the Washington and Oregon coast

William J. Sydeman, Nandita Sarkar, Isaac D. Schroeder, Kyra L. Mills, Jarrod A. Santora, Sarah Ann Thompson, Robert M. Suryan and Steven J. Bograd (Invited)

Seabirds as environmental indicators: Climate variability, phenology, prey availability and tests of the "integrator" hypothesis

Jaime Jahncke, Meredith L. Elliott, Benjamin L. Saenz, Jennifer E. Roth and Christine L. Abraham
Planktivorous seabird responses to variability in coastal upwelling in Central California

Jarrold A. Santora, William J. Sydeman and Steve Ralston
Do seabirds at sea in the California Current reflect krill distribution, abundance and patch structure?

Jennifer E. Roth, Russell W. Bradley, Peter Warzybok, Christine L. Abraham and Jaime Jahncke
Ocean processes driving the phenology and productivity of marine birds in the California Current System

Katarzyna Zmudczyńska, Lech Stempniewicz, Adrian Zwolicki, Lech Iliszko, Bronislaw Wojtuń and Jan Matula
The influence of plankton- and fish-eating seabird colonies on the Arctic tundra ecosystem of Spitsbergen

Hiroko Sasaki, Hiroshi Kiwada, Koji Matsuoka and Sei-Ichi Saitoh
The relationship between cetacean distributions and oceanographic conditions in the western North Pacific

Kazuaki Tadokoro, Takashige Sugimoto and Michio J. Kishi
The effects of anthropogenic global warming on the marine ecosystem

Posters

Guoping Zhu, Liuxiong Xu, Xiaojie Dai, Yingqi Zhou and Wei Liu
Comparative study of the feeding habits of bigeye *T. obesus* and yellowfin tuna *T. albacares* in the east-central tropical Pacific Ocean

Xiuning Du and Guangxing Liu
Species composition and abundance of phytoplankton in the Northern Yellow Sea in the winter of 2006

Sang Chul Yoon, Hyung Kee Cha, Sung Il Lee, Dae Soo Chang, Sergey Solomatov, Pavel Kalchugin and Jae Hyeong Yang
Biomass, density, and community structure of fish collected by bottom trawl in the northwestern and southwestern East Sea during 2006-2007

Marta Gluchowska, Slawomir Kwasniewski, Katarzyna Wojczulanis-Jakubas, Dariusz Jakubas, Katarzyna Blachowiak-Samolyk and Lech Stempniewicz
Still enough Arctic zooplankton for Little Auks on Spitsbergen, but for how long?

Kyung-Jun Song, Zang Geun Kim, Seok Gwan Choi, Yong-Rock An, Suk-Jae Kim and Moon-Kab Park
Occurrence of cetaceans on the fast ferry route between Korea and Japan

Hyun Woo Kim, Seok-Gwan Choi and Zang Geun Kim
Seabird distribution patterns in the East/Japan Sea in spring 2007

Kyum Joon Park, Seok Gwan Choi, Yong Rock An, Zang Geun Kim, Hyun Woo Kim, Ji Eun Park, Tae-Geon Park, Zhiquang Ma and Zhichuang Lu
Abundance and distribution of minke whales (*Balanoptera acutorostrata*) in the Yellow Sea in 2008

Jung Hwa Choi, Wongyu Park, Jung Nyun Kim, Sung Tae Kim and Young Min Choi
Understanding the relationship between zooplankton and shrimp biomass as driven by climate changes in the Yellow Sea, western part of Korean peninsula during 1968-2007

Peter Warzybok, Russell W. Bradley, Meredith L. Elliott, Benjamin L. Saenz, Nina J. Karnovsky and Jaime Jahncke
How effective are Cassin's auklets as environmental monitors in Central California?

FIS Topic Session (S11)

Effects of fisheries bycatch and discards on marine ecosystems and methods to mitigate the effects

Co-Convenors: Hui Chun An (Korea) and Patricia Livingston (U.S.A.)

Background

This was the first time PICES sponsored a topic session on bycatch. Attention to bycatch is important because it impacts marine ecosystem components; thus it is a key consideration in evaluating the success in ecosystem-based approaches to fishery management. Commercial fisheries using gears, such as bottom trawling, capture both target and non-target species. In some instances, bycatch mortality is sufficiently high to adversely affect the stock status and productivity of non-target species. To minimize unintended impacts on the environment, commercial fisheries should strive to increase their selectivity by reducing the bycatch of birds, mammals, turtles and other non-target species, as well as by reducing the catch and discard of undersized commercial species. This session examined the magnitude of bycatch of non-target species, effects of bycatch mortality on the health of non-target stocks, and recent research on methodology to reduce bycatch and discards in the PICES region. Particular emphasis was placed on studies that resulted in changes in commercial fishing practices.

Summary of presentations

The session was well-attended and began with an excellent invited talk that covered all the facets of bycatch reduction, with numerous examples. Successful reduction of bycatch involves a number of steps: (1) catch monitoring to determine bycatch levels, (2) development of techniques to reduce bycatch, (3) implementing a bycatch reduction method, and (4) communicating the results to all parties. It is essential to involve fishers at every step in this process.

Six talks and one poster provided specific examples of bycatch reduction or estimation in different PICES regions. Examples were provided from the Republic of Korea with respect to bycatch reduction in the snow crab gillnet fishery and a study of factors and gears involved in minke whale bycatch. Snow crab research was initiated upon request of the fishing industry and involved studies of mesh selectivity that have now been implemented along with the use of biodegradable gear. These changes will reduce the bycatch of female and undersized crabs. Minke whale catch occurs in several gear types in Korean fisheries. An analysis was performed to look at spatial and biological characteristics of the whale bycatch. A variety of mitigation measures are planned for study including acoustic alarms, time/area closures, and gear modifications. One Russian researcher presented information on the study of gear and fish loss and how to improve fish retention by changing the soak time of gear. Two of the U.S. talks involved looking at fishery information relative to endangered species locations. These related to loggerhead turtle bycatch in Hawaii and the short-tailed albatross potential overlap with trawl fisheries in Alaska. The turtle research involves developing a daily oceanographic product based on sea surface temperature that can inform fishermen in real-time about areas to avoid. The short-tailed albatross research is evaluating the potential for bycatch of this species in a situation where bycatch is not easily observed because the bycatch is not retained in the gear. The final U.S. talk provided an overview of a U.S. national implementation policy with respect to bycatch and provided a number of examples of research and management issues involved in bycatch reduction in Alaska groundfish fisheries. The topic session ended with a presentation on a potential workshop on bycatch proposed for PICES 18.

List of papers

Oral presentations

Steven J. Kennelly (Invited)
Reducing bycatch in the world's fisheries

Heui Chun An, Chang-Doo Park, Jong Keun Shin and Kyoung-Hoon Lee
Bycatch reduction in the snow crab gillnet fishery of Korea

Kyung-Jun Song, Zang Geun Kim, Seok Gwan Choi, Yong-Rock An and Chang-Ik Zhang
Fishing gears involved in entanglements of minke whales in the southwestern East/Japan Sea

Larisa P. Nikolenko
How big are the losses of Greenland turbot (*Reinhardtius hippoglossoides*) and crabs (*Lithodes aequispina* and *Chionoecetes angulatus*) during deep-sea bottom net and long-line fishing in the Okhotsk Sea?

Evan A. Howell, Jeffrey J. Polovina, Donald R. Kobayashi, George H. Balazs, Denise M. Parker and Peter Dutton
A new dimension to the problem of loggerhead turtle (*Caretta caretta*) bycatch in the Hawaii-based longline fishery

Stephani G. Zador, Julia K. Parrish, André E. Punt, Jennifer L. Burke and Shannon M. Fitzgerald
Determining spatial and temporal overlap of an endangered seabird with a large commercial trawl fishery

Patricia A. Livingston, Jennifer Boldt, Shannon M. Fitzgerald, William Karp and David Witherell
Assessing and reducing the amounts and impacts of fisheries bycatch in Alaska marine ecosystems

Posters

Hyoung Chul Shin, Doonam Kim and Kyu Jin Seok
To monitor and mitigate the incidental mortality and discards from fisheries; Lessons from the Southern Ocean, a test bed of ideal management

MEQ Topic Session (S12)***Connecting the human and natural dimensions of marine ecosystems and marine management in the PICES context***

Co-Convenors: David L. Fluharty (U.S.A.), Mitsutaku Makino (Japan), R. Ian Perry (Canada) and Chang-Ik Zhang (Korea)

Background

A complete definition of marine ecosystems includes the human components. Consideration of ecosystem-based management, at least within the natural sciences, usually leaves out the human dimensions, or includes it only as fishing effort. For ecosystem-based management to succeed, however, humans need to be included. This session builds on the Science Board Symposium of 2003 titled “*Human dimensions of ecosystem variability*”. Human relationships and how humans interact with the ocean have been changing in nature and strength over time. Natural variability in marine systems can be large, but so are socio-economic pressures and considerations relating to marine environments. Determining appropriate socio-economic indicators to complement indicators of natural climate variability, *e.g.* for ecosystem-based management, is an ongoing challenge. This session will address these interactions between natural and socio-economic issues in the context of ecosystem-based management. Specifically, it will consider: (1) What are the criteria to determine relevant socio-economic indicators of human well-being related to marine issues for PICES member countries? (2) What are appropriate indicators to monitor changes in management objectives and human well-being relevant to changing ecosystem structure and production? (3) How might decisions that are made to enhance human well-being likely to impact (positively or negatively) the nature and functions of marine ecosystems? This session theme will continue to explore the many ways that humans interact with marine ecosystems and the scientific efforts to quantify and predict human impacts on the dynamics of such systems.

Summary of presentations

Ten oral (including 1 invited) and 13 posters were presented in this session. After the introduction of this session from Mr. Fluharty (U.S.A) on behalf of the co-convenors, Dr. Makino reviewed the social and ecological conditions of fisheries with respect to management strategies. Then, Dr. Hamilton (Invited, University of New Hampshire, U.S.A.) presented the relationships between ecosystems, fisheries and social changes in western Alaska. Dr. Zhang talked about socio-economic indicators used in ecosystem-based assessments for the Eastern Bering Sea trawl fishery. After the introduction of environmental contaminants in Pacific food webs and their implications for coastal First Nations by Dr. Ross, Dr. Fluharty talked about the use of social science information in marine management processes in the U.S.A. Four more studies were then presented from Korea (by Dr. Park), China (Dr. Chen and Dr. Zhang), and Russia (Dr. Lukyanova). Dr. Pooley reported the results of a related symposium, convened by GLOBEC and co-sponsored by PICES, which was held at FAO headquarters in July 2008, and which was convened by Dr. Perry. Session 12 concluded that we should continue to explore the many ways that humans interact with marine ecosystems and the scientific efforts to quantify and predict human impacts on the dynamics of such systems.

List of papers*Oral presentations***Mitsutaku Makino and Hiroshi Horikawa**

Social-ecological conditions of fisheries and management by ITQs: A global review

Lawrence C. Hamilton (Invited)

Ecosystem, fishery and social changes in western Alaska

Chang Seung and Chang-Ik Zhang

Socio-economic indicators used in ecosystem-based assessment for the eastern Bering Sea trawl fishery

Peter S. Ross, T. Child and N. Turner

Caught in the crossfire: Environmental contaminants in Pacific food webs and implications for coastal First Nations

David L. Fluharty

Developing and using social science information in marine management processes in the United States

Session Summaries-2008

Hee Won Park, Chang-Ik Zhang and Jae Bong Lee

A comparative study on the structure and function of Korean marine ranching ecosystems

Shang Chen, Jian Liu, Tao Xia and Qixiang Wang

Change of ecosystem services of the Yellow River Delta Wetland, China

Olga N. Lukyanova and Ludmila V. Nigmatulina

The value of ecosystem services of Peter the Great Bay (Japan/East Sea)

Samuel G. Pooley, Ian Perry and Mitsutaku Makino

Socio-economic considerations of ecosystem approaches to fisheries management

Zhifeng Zhang

Effects of dredging on internal release of phosphate from marine sediments in Dalian Bay

Posters

Jingfeng Fan, Hongxia Ming, Lijun Wu, Yubo Liang and Jiping Chen

Detection of human enteric viruses in shellfish in China

Peter M. Zhadan and Marina A. Vaschenko

Does pollution change the reproductive strategy of the sea urchin?

Natalia M. Aminina and Lidia T. Kovekovdova

Brown algae metabolism in polluted environments

Zhen Wang, Xindong Ma, Zhongsheng Lin, Guangshui Na, Qiang Wang and Ziwei Yao

Occurrence and congener specific distribution of polybrominated diphenyl ethers in sediments and mussels from the Bo Sea, China

Guangshui Na, Qiang Wang, Zhen Wang, Hongxia Li, Shilan Zhao, Tong Chen, Zhongsheng Lin and Ziwei Yao

Pharmaceuticals and Personal Care Products (PPCPs) in some river and sewage water of Dalian, China

Li Zheng, Xuezheng Lin, Zhisong Cui, Frank S.C. Lee and Xiaoru Wang

Phylogenetic analysis of indigenous marine bacteria with the ability to degrade oil pollutants in Bohai Bay

Liping Jiao, Liqi Chen, Yuanhui Zhang, Gene J. Zheng, Tu Binh Minh and Paul K.S. Lam

Polycyclic aromatic hydrocarbons in remote lake and coastal sediments from Svalbard, Norway: Levels, sources and fluxes

Qixiang Wang, Shang Chen and Xuexi Tang

Preliminary assessment of ecosystem services of the Yellow Sea

Petr V. Lushvin

The impact of anthropogenic activity (regime of hydroelectric power stations and technological explosions) on behaviour and reproduction of fish and crustaceans

Zhang Hongliang, Leng Yu, Xu Zijun and Li Jiye

Research on the generating and vanishing process of *Enteromorpha* bloom and the environmental controlling factors

Zhou Yan-Rong Zhang Wei Tang Wei Zhao Bei and Yang Dong-Fang

Analysis of nutrients and organic pollution in Shuangdao Bay

Ji-Ye Li, Xiu-Qin Sun, Feng-Rong Zheng and Lin-Hua Hao

Screen and effect analysis of immunostimulants for sea cucumber, *Apostichopus japonicus*

Wang Xinping, Sun Peiyan, Zhou Qing, Li Mei, Cao Lixin and Zhao Yuhui

Compounds concentration analysis of oil and its application in oil spill identification

BIO Contributed Paper Session

Co-Convenors: Michael J. Dagg (U.S.A.) and Michio J. Kishi (Japan)

Background

Oral and poster presentations on biological aspects of the PICES XVII theme were welcome, as well as papers on all aspects of biological oceanography in the North Pacific and its marginal seas (except those related to the BIO-sponsored Topic Sessions S2 and S9). Early career scientists were especially encouraged to submit papers to this session.

Summary of presentations

This session received a large number of applications for oral and poster presentations and it ended up with a very full day of talks (19 total) and 16 posters. Presentations were given by members of all PICES

member countries, and 6 of the 19 oral presentations were given by early career scientists. As indicated in the Book of Abstracts, topics ranged widely and all were of interest to the PICES community of Biological Oceanographers. Both morning and afternoon sessions were well attended.

List of papers

Oral presentations

Meibing Jin, Clara Deal, Jia Wang and Peter McRoy

Response of lower trophic level productivity to long-term climate changes in the southeastern Bering Sea

Hui Liu and William T. Peterson

A phase shift in the Northern California Current (NCC) ecosystem?

Kohji Iida, Onishi Yuriko and Tohru Mukai

Regional characteristics of diel vertical migration of the sound scattering layer in the North Pacific

C. Tracy Shaw, Leah R. Feinberg, Hongsheng Bi and William T. Peterson

Upwelling conditions and cohort analysis of the euphausiid *Euphausia pacifica* off Newport, OR, USA

Zhongming Lu, Jianping Gan, Anson Cheung, Minhan Dai, Hongbin Liu and Paul J. Harrison

Biological response to wind-driven upwelling and river plume in the northeastern South China Sea

Atsushi Tsuda and Shinji Shimode

Distribution and life history of a subtropical copepod, *Neocalanus gracilis*: Implication for the northward intrusion by subarctic species

Soo-Jung Chang, Won-Duk Yoon and Suam Kim

Molecular phylogeography of *Nemopilema nomurai* (Class: Scyphozoa) in Korean waters

Jing Dong

Possible origin of *Nemopilema nomurai* in the northern part of the China Sea, and causes of population fluctuations

David L. Mackas

Scale-dependent spatial correlation of zooplankton time series: Biomass, phenology, and species composition

Sergey P. Zakharkov, Tatyana N. Gordeychuk and Elena A. Shtraikhert

Variability of satellite primary production in the Sea of Japan from 2003 to 2007

Pavel A. Salyuk, Oleg A. Bukin, Andrey N. Pavlov, Konstantin A. Shmirko and Denis A. Akmaykin

Estimation of phytoplankton community response to Asian dust forcing in the northwestern Pacific

Suguru Okamoto, Toru Hirawake and Sei-Ichi Saitoh

Interannual variability of the spring, column-integrated chlorophyll-*a* content in the Kuroshio Extension region

Qiang Hao, Xiuren Ning, Chenggang Liu and Fengfeng Le

Primary production in the northern South China Sea – Satellite and *in situ* observations

Pavel Ya. Tishchenko, Vyacheslav B. Lobanov, Alexey M. Koltunov, Anna A. Maryash, Tatyana A. Mikhailik, Galina Yu. Pavlova, Sergey G. Sagalaev, Alexander F. Sergeev, Elena M. Shkirknikova, Mariya G. Shvetsova, Petr P. Tishchenko and Vladimir I. Zvalinsky

Physical and biological mechanisms of Amurskiy Bay re-oxygenation after deep hypoxia events

Meng Zhou, Di Wu, Yiwu Zhu, Stephen D. Pierce, John A. Barth and Timothy Cowles

Zooplankton productivity, trophic dynamics and size spectra in the Oregon shelf areas

Jian Hu, Zhao-Li Xu and De-Di Zhu

Seasonal changes in the ecological characteristics of pelagic molluscs in the Changjiang Estuary

Juyun Lee, Toshiya Katano and Myung-Soo Han

Cell cycle of *Heterosigma akashiwo* with special reference to vertical migration behavior

Oleg N. Katugin, Michael A. Zuev and Gennady A. Shevtsov

Distribution patterns, morphology and taxonomy of the gonatid squid *Gonatus tinro* and *Gonatopsis okutanii* in the Sea of Okhotsk and northwestern Pacific Ocean

Hyunjung Kang, Yeonghye Kim, Seongyeon Kim and Dongwoo Lee

Reproductive ecology of common octopus, *Octopus vulgaris* in the South Sea, Korea

Posters

Alexander V. Zavolokin, Elena A. Zavolokina, Igor I. Glebov, Alexander M. Slabinskiy and Alexander Ya. Efimkin

Food supply of Pacific salmon (*Oncorhynchus* spp.) in the western Bering Sea in 2002-2006

Jia-Jie Chen, Zhao-Li Xu and De-di Zhu

Seasonal abundance and distribution of pelagic euphausiids in the Changjiang Estuary, China

Keiichi Fukushi and Taro Minato

The potential usefulness of recovered jellyfish as fertilizer

Shigenobu Takeda and Y. Kondo

Organic complexation of iron in the Pacific Ocean

Session Summaries-2008

Hiromichi Ueno, William R. Crawford and Hiroji Onishi

Impact of Alaskan Stream eddies on chlorophyll distribution in the western and central subarctic North Pacific

Toru Kobari, Ai Ueda and Yuichiro Nishibe

Development and growth of ontogenetically migrating copepods during the spring phytoplankton bloom in the Oyashio region

Wen-Tseng Lo, Meng-Chen Ke and Hao-Hsien Chang

Effects of temperature and salinity changes on asexual reproduction of *Aurelia aurita* (Cnidaria, Scyphozoa)

Chaewoo Ma, Wongyu Park and Jung Hwa Choi

Long-term variations of sea surface temperature and zooplankton biomass driven by climate changes in the Yellow Sea, western part of Korean peninsula during 1968-2007

Sonia Batten, Dave Mackas and Doug Moore

Changing size with latitude in *Neocalanus plumchrus* and *N. flemingeri*

Elena Smirnova and Natalia P. Fadeeva

Seasonal dynamics of meiofauna community and zonation patterns in (un)disturbed sandy beaches of the Sea of Japan

Natalia P. Fadeeva and Valery I. Fadeev

Indicator role of sublittoral meiofauna in monitoring the status of marine environments

Yuji Okazaki and Kazuaki Tadokoro

Spatial and seasonal variability of euphausiid distribution and community structure in the Oyashio and the Kuroshio-Oyashio transition region

Takumi Nonomura, Jun Nishikawa, Atsushi Tsuda, Ichiro Yasuda and Shuhei Nishida

Practical identification of three sympatric calanoid copepods, *Calanus sinicus*, *C. jashnovi* and *C. pacificus*, in the western North Pacific

Miju Kim, Dong-Jin Kang, Kyung-Ryul Kim, Noriko Nakayama, Toshitaka Gamo, Eun Hee Kim and Jae Seong Lee

Diurnal variation in the concentration and stable isotope composition of dissolved oxygen (O₂) in Lake Shihwa, Korea

Masaya Tovokawa and Jing Dong

Salinity tolerance of planula and polyp stages of Nomura's jellyfish, and their possible natural habitat

Jimin Zhang and Wenzhai Ma

Nutrient distribution and eutrophication assessment for the adjacent waters of the Yellow River Estuary

FIS Contributed Paper Session

Convenor: Gordon H. Kruse (U.S.A.)

Background

Fishery science is a broad field in the PICES region, owing in part to the diversity of species, water masses, and fisheries of the North Pacific Ocean. The FIS Paper Session enhances FIS activities in PICES by fostering participation by more fisheries scientists with different interests in annual meetings. The FIS Paper Session invited papers on topics in fisheries science and fisheries oceanography in the North Pacific and its marginal seas.

Summary of presentations

The FIS Paper Session included 19 oral presentations and 25 posters that covered a wide variety of fish species and topics from all PICES-member countries. Biological and ecological topics presented orally included salmon genetics, new information on the distribution of poachers and lamprey, feeding habits of myctophids and other forage fishes, and effects of long-term exposure to polycyclic aromatic hydrocarbons on the maturation of longfin goby. Studies on population dynamics and fishery oceanography included presentations on density-dependent growth of Japanese sardine, variability in fish species in the Sea of Okhotsk, long-term variability in abundance and recruitment, oceanographic mechanisms regulating recruitment of longfin squid, migration dynamics of Pacific sardine and jack mackerel, and forecasting returns of Pacific salmon based on multiple oceanographic indicators. Other oral presentations developed and applied new methods to estimate the number of fishing vessels based on satellite night-time imagery, an ecological risk assessment approach, and a length-based approach to estimate fish biomass based on a single year of assessment surveys.

Likewise, posters covered a wider variety of species and topics. Biological topics covered in posters included genetics, age, growth, maturity, spawning, abundance and distribution. Species studied included Pacific salmon, walleye pollock, sand lance, herring, chub mackerel, Pacific cod, sardine, squid and snailfish. Process and modelling studies included simulation of diamond squid movements, role of eelgrass on sea bass growth, fishing effects on flounders, variations in climate and fishes in the North Pacific and North Atlantic, the role of sea ice on pollock stocks, and the impacts of seismic activity on fish and fisheries. New methods were reported, including the application of self-organizing maps and k-means clustering to analyze and compare marine ecosystems. Based on the number of oral presentations and posters and the high quality of the presentations, the FIS paper session at PICES 17 was deemed very successful.

List of papers

Oral presentations

Anastasia M. Khrustaleva

Integrated method for sockeye salmon stock differentiation in the West Pacific and the Sea of Okhotsk

Moongeun Yoon, Syuiti Abe and Deuk-Hee Jin

Population genetic structure of chum salmon in the Pacific Rim inferred from mitochondrial and microsatellite DNA analyses

In Joon Hwang and Hea Ja Baek

Assessment of ovarian maturation in *Chasmichthys dolichognathus* after exposure to single polycyclic aromatic hydrocarbons, benzo[a]pyrene

Guoping Zhu, Xuefang Wang, Liuxiong Xu, Xuchang Ye and Chunlei Wang

Comparison on the biological characteristics of skipjack tuna *Katsuwonus pelamis* between the log school and free school caught by purse seine from the Western and Central Pacific Ocean

Alexei M. Orlov, Dmitry V. Pelenev, Vadim F. Savinykh, Natalia V. Klovach and Andrei V. Vinnikov

Pacific lamprey: Some ecological and biological features during their sea life and relationships with host species

Hiroshige Tanaka, Chiyuki Sassa, Seiji Ohshimo and Ichiro Aoki

Feeding habits and diel feeding patterns of two dominant myctophid fishes in the continental shelf region off western Kyushu, Japan

Lei Guo, Robert Foy, Kate Wynne and Lawrence Schaufler

Combining stomach content and fatty acid analyses to assess forage fish diets

Jung Nyun Kim, Heeyong Kim and Kwang Ho Choi

Migration and coastal recruitment of jack mackerel *Trachurus japonicus* in Korean waters

Jake Schweigert, Joanna Hirner and Sean Cox

Predicting Pacific sardine (*Sardinops sagax*) migration into Canadian waters

Jong Hee Lee, Jae Bong Lee and Chang-Ik Zhang

Long-term fluctuation of commercial fished species and their marine environment in Korean waters

Anatoliy Ya. Velikanov

Long-term variability of pelagic fish species composition near the eastern Sakhalin (Sea of Okhotsk): Distribution, fluctuations in abundance, fishery

Alexander I. Glubokov and Alexei M. Orlov

Poachers (Agonidae) of the Russian part of the Bering Sea: Spatial distribution and biology

Jung Jin Kim and Suam Kim

Recruitment mechanisms of common squid (*Todarodes Pacificus*) in the Yellow Sea

Takeshi Okunishi, Shin-ichi Ito, Naoki Yoshie, Taketo Hashioka, Hiroshi Sumata and Yasuhiro Yamanaka

The impact of density-dependent processes on growth of Japanese sardine (*Sardinops melanostictus*)

William Peterson, Edmundo Casillas, Hui Liu and Cheryl Morgan

Forecasting returns of coho and chinook salmon in the northern California Current: A role for high-frequency long-term observations

You-Jung Kwon, Doo-Hae An, Chang-Ik Zhang, Dae-Yeon Moon and Jae Bong Lee

An ecological risk assessment of the effect of the tuna longline fishery in the Western and Central Pacific Ocean

Arata Fukaya, Katsuya Saitoh and Sei-Ichi Saitoh

Estimation of number of Pacific saury fishing vessels using nighttime visible images

Hyeok Chan Kwon and Chang-Ik Zhang

Maturation and spawning of black seabream, *Acanthopagrus schlegeli* in the Jeonnam marine ranching area of Korea

Bernard A. Megrey and Chang-Ik Zhang

Estimating biomass and management parameters from length composition data: A stock assessment method for data-deficient situations

Posters

Guoping Zhu, Liuxiong Xu, Yingqi Zhou and Xiaojie Dai

Age, growth and mortality of bigeye tuna *Thunnus obesus* (Scombridae) in the eastern and central tropical Pacific Ocean

Chiyuki Sassa, Keisuke Yamamoto, Youichi Tsukamoto and Muneharu Tokimura

Distribution and biomass of *Benthoosema pterotum* (Pisces: Myctophidae) in the shelf region of the East China Sea: Mechanisms of population maintenance

Victor F. Bugaev, B.B. Vronsky, L.O. Zavarina and Zh.Kh. Zorbidi

Correlation analysis of interannual variations of length, weight and condition factor of salmon from the Kamchatka River

You-Jung Kwon, Sun-Do Hwang, Yeong-Seung Kim and Dae-Yeon Moon

Recent stock status of fishes on Emperor seamounts in the Pacific Ocean

You-Jung Kwon, Doo-Hae An, Soon-Song Kim, Dae-Yeon Moon and Seon-Jea Hwang

Determinants of bigeye and yellowfin tuna catch rates in the tuna longline fishery

Yukimasa Ishida and Akihiro Yamada

Salmon distribution in the northern Japan during the Jomon Period

Elena Dulepova and Evgeny Ovsyannikov

Productivity of walleye pollock (*Theragra chalcogramma*) in the eastern Okhotsk Sea in 2006-2008

Goh Onitsuka, Naoki Hirose, Kazutaka Miyahara, Taro Ota, Jun Hatayama, Yasushi Mitsunaga and Tsuneo Goto

Lagrangian simulation of diamond squid (*Thysanoteuthis rhombus*) in the southwestern Japan Sea from 2003 to 2005

Nobushige Shimizu, Seiji Oshimo, Ryuji Yukami and Ichiro Aoki

Growth of larvae and juvenile Japanese anchovy *Engraulis japonicus* off the coast of western Kyusyu, Japan

Anastasia M. Khrustaleva, Yury V. Fedotov and Elena N. Kuznetsova

Application of a spectral method of scale-structure analysis for salmon stock differentiation in the Pacific Rim

Andrei S. Krovnin and George P. Moury

Changes in the spatio-temporal structure of climatic variations in the North Pacific and North Atlantic during the last 20 years and their relation to fluctuations in fish stocks

Bernard A. Megrey and Jae Bong Lee

On the utility of self-organizing maps (SOM) and k-means clustering to characterize and compare marine ecosystems

Jin Koo Kim, William Watson, John R. Hyde, Nancy C.H. Lo, Jin Yeong Kim and Sung Kim

Identification of *Ammodytes larvae* using mtDNA COI with morphological descriptions

Jin Koo Kim, Kyeong Dong Park, Dae Soo Chang and Joo Il Kim

Age and growth of *Scartelaos gigas* (Gobiidae) from a mud flat in Korea

Jeong Bae Kim, Jung Hwa Ryu, Sang Yong Lee and Jin Koo Kim

Effect of eelgrass on fish species composition and growth of young sea bass

Jung Hwa Ryu, Jin Koo Kim and Jung Youn Park

Genetic relationship among six horsehead species, *Branchiostegus* (Pisces, Perciformes), and an osteological comparison

Sukgeun Jung, Dong-woo Lee, Young Shil Kang, Young-Sang Suh, Jin-yeong Kim and Yeong Gong

Regime shifts indicated in fishery catch statistics (1968-2007) from Korean coastal waters

Yasunori Sakurai, Mio Osato and Jun Yamamoto

Does the extent of ice cover affect the fate of walleye pollock?

Yeong Gong, Young-Sang Suh, In-Seong Han, Ki-Tack Seong, Woo-Jin Go and Suk-Geun Jung

Year-to-year and inter-decadal fluctuations in abundance of pelagic fish populations in relation to climate-induced oceanic conditions

Sukgeun Jung, Jae Bong Lee and Gyun Heo

Relationship between ship tonnage and catch per haul examined to improve the stock assessment of chub mackerel, *Scomber japonicus*, in Korean sea waters

Woo-Seok Gwak

Population structure of Pacific cod *Gadus macrocephalus* in Korean waters inferred from mtDNA and msDNA markers

Tai Jin Kim, Byung Ki Kim, Chung Youl Park, Byung Eon Choi, Hyung Woon Ju, Hwan Sung Ji, Sang Yong Shin, So Gwang Lee and Woo Seok Gwak

Characteristics of Pacific cod (*Gadus macrocephalus*) during spawning in Jinhae Bay, Korea

Petr V. Lushvin

The impact of seismic activity on development of populations and fishery

Jin Yeong Kim, Jae Bong Lee, Suam Kim, Young Min Choi and Ulf Dieckmann

Changes in patterns of maturation and growth of sardine in Korean waters in relation to fluctuations in abundance and temperature

Hak-Jin Hwang, Inja Yeon, Yang-Jae Im, Myoung-Ho Sohn, Mi-Young Song, Jong-Bin Kim and Heeyong Kim

Spatio-temporal distribution of snailfish, *Liparis tankae* (Gilbert and Burke) in the West Sea of Korea

POC Contributed Paper Session

Co-Convenors: Michael G. Foreman (Canada) and Ichiro Yasuda (Japan)

Background

Papers are invited on all aspects of physical oceanography and climate in the North Pacific and its marginal seas, excluding papers on coastal upwelling (Topic Session S6).

Summary of presentations

The session consisted of 21 oral presentations (Nabiullin's poster was switched to oral after Fan Wang's cancellation) and 28 posters covering a wide range of physical and biogeochemical oceanographic research. Ichiro Yasuda, Steven Bograd and Kyung-Il Chang assisted Mike Foreman in chairing sub-sessions over the 1-day presentation period. The morning portion included interesting talks related to: (1) climate change and variability in the North Pacific (Di Lorenzo, Yeh) and Far-Eastern seas (Ustinova), (2) mixing in Bussol' Strait (Yagi) and the Kuroshio/Oyashio region (Chen), (3) results of a bibliographic search of North Pacific publications (Nabiullin), (4) shifts in the mixed layer development in the Oyashio (Ono), (5) a comparison of CO₂ fluxes in the Southern and Western Arctic Oceans (Chen), (6) heat transfer in the bottom sediment of Amurskii Bay (Ponomarev), and (7) a winter thermal front in South Yellow Sea (Liu).

Apart from one presentation on the selection of climate models for ecosystem projections (Wang), the afternoon talks focused on the western Pacific. They included presentations on (1) eddy (Chang) and SSH (Kaplunenko) variability in the Japan/East Sea, (2) Kuroshio inflow in the East Taiwan Channel (Yan), (3) decadal changes in temperature and salinity around Korea (Jung), (4) seasonal changes in the East Sakhalin Current (Shevchenko), (5) a model for the Pearl River estuary (Zu), (6) nutrient distribution in Bussol' Strait (Kaneko), (7) impact of dam water release in South Korea (Jung), (8) a model for Yellow River sediment transport into the Bohai Sea (Lu), and (9) interannual variations in transport in Tsushima Strait (Andreev).

List of papers

Oral presentations

Lina Ceballos, Emanuele Di Lorenzo and Niklas Schneider

North Pacific Gyre Oscillation synchronizes climate fluctuations in the eastern and western North Pacific

Sang-Wook Yeh, Young-Gyu Park, Hong-Sik Min, Cheol-Ho Kim and Jae-Hak Lee

Changes in the Pacific Decadal Oscillation from observations

Masahiro Yagi and Ichiro Yasuda

Turbulent mixing at the Bussol' Strait in the Kuril Islands using density inversions

Xianyao Chen, Qin Wang, Xiuhong Wang and Fangli Qiao

Lagrangian hydrographic features of the Mixed Water Region in the North Pacific derived from Argo data

Elena I. Ustinova and Yury D. Sorokin

Changes in the relationships between large-scale climatic indices and regional conditions in the Far-Eastern Seas

Ahat A. Nabiullin

North Pacific oceanography: Past, present and the future. A half-century bibliometric survey

Tsuneo Ono and Akira Kusaka

Advanced timing of spring mixed layer development in recent years in the Oyashio region

Liqi Chen, Rik Wanninkhof, Wei-Jun Cai, Zhongyong Gao, Yuanhui Zhang, Suqing Xu, Kavin Sullivan and Yongchen Wang

Comparison of air-sea fluxes of CO₂ in the Southern Ocean and the Western Arctic Ocean

Vladimir I. Ponomarev, Boris A. Burov and Alexander Yu. Lazaryuk

Seasonal heat transfer in the bottom sediment-sea water column of Amurskii Bay

Chuanyu Liu and Fan Wang

An N-shape thermal front in the western South Yellow Sea in winter

Yun-Bae Kim, Kyung-Il Chang and Kuh Kim

Eddy variability from direct current measurements in the southwestern East/Japan Sea

Muyin Wang, James E. Overland and Nicholas A. Bond

Selection of climate models for regional ecosystem projections

Session Summaries-2008

Dmitry D. Kaplunenko, Olga O. Trusenkova and Vyacheslav B. Lobanov
SSH variability in the northern Japan/East Sea from altimetry data

Xiao-Mei Yan, L. Zhang and Che Sun
Analysis of the Kuroshio inflow at the East Taiwan Channel (POC_P-5292)

Yejin Jung, Jong Hee Lee, Chang-Ik Zhang and Jae Bong Lee
Decadal changes in temperature and salinity in Korean waters

Georgy Shevchenko and Valery Chastikov
Seasonal changes of the East Sakhalin Current from CTD data analysis

Tingting Zu and Jianping Gan
Coupled estuarine-coastal circulation in the Pearl River Estuary: Response to the wind and tidal forcing
Hitoshi Kaneko, Ichiro Yasuda, Tohru Ikeya, Jun Nishioka, Takeshi Nakatsuka and Sachihiko Itoh
Nutrient distribution around the Bussol' Strait

Kwang Young Jung, Young Jae Ro and Chung Ho Lee
Impact of dam water release based on a numerical model of the Kangjin Bay, South Sea, Korea

Jing Lu, Fangli Qiao, Yonggang Wang, Changshui Xia and Feng Shan
A numerical study of the sediment transport process from the Yellow River to the Bohai Sea and Yellow Sea

Andrey G. Andreev
Interannual variations of the water transport through the Tsushima Strait and its impact on the chemical parameters and chlorophyll-*a* in the Japan/East Sea

Posters

Vladimir B. Darnitskiy and Maxim A. Ishchenko
Cyclic thermohaline changes in the topographical eddy system above Erimo Seamount

Antonina M. Polyakova
Atmospheric activity types over the Northern Pacific

Antonina M. Polyakova
Especially dangerous wave heights in the Northern Pacific

Antonina M. Polyakova
Extreme distribution of floating ice in the NW Pacific

Antonina M. Polyakova
Destructive tsunamis near the coast of Primorye

Vladimir V. Plotnikov
Change in seasonal cycles of ice formation in the Far East Seas of Russia in the second half of the 20th and beginning of the 21st centuries

Valentina V. Moroz and K.T. Bogdanov
The Kuril-Kamchatka and Oyashio Currents system water structure and circulation variability

Valentina V. Moroz
Oyashio and Kuroshio Currents water characteristic variability in the area of their interaction and formation zones

Anastasiya A. Abrosimova, Igor A. Zhabin, Luiza N. Propp and Vyacheslav A. Dubina
Hydrographic and hydrochemical conditions near the Amur River mouth

Larissa S. Muktepavel and Tatyana A. Shatilina
Mechanisms determining the formation of extremely low-ice winters in the Okhotsk Sea

Elena.V. Dmitrieva and Vladimir. I. Ponomarev
Sea surface temperature aggregation from different sources to study multiple scale variability in the Japan/East Sea

Olga I. Kursova and Ahat A. Nabiullin
Bibliometric analysis of oceanographic research: A case of Kuroshio literature, a half-century bibliographic survey

Gennady I. Yurasov
Climatic characteristics of water masses, fronts, and currents in the Japan/East Sea

Ahat A. Nabiullin
North Pacific oceanography: Past, present and the future. A half-century bibliometric survey

Talgat R. Kilmatov
Calculation of entropy flux through the World Ocean surface

Alexander N. Man'ko and Vera A. Petrova
Temporal variability of heat exchange between the ocean and atmosphere in the North Pacific

Nadezda M. Dulova and Vadim V. Novotryasov
Free oscillations of the Japan/East Sea in Posyet Bay

Zheng Xian Yang
Monitoring and assessing atmospheric deposition of pollutants to the Bohai Sea

Jinwen Zhang, Wenjing Fan, Jinkun Yang, Ruguang Yin, Wenxi Xiang, Yongshou Cheng, Dongsheng Zhang, Jingxin Luo and Guanghao Wei

Harmonic analysis of and predictive methods for some marine hydrometeorological elements

Natalia Rudykh and Vladimir Ponomarev

Cluster analyses of temperature and salinity in the Japan/East Sea pycnocline

Masatoshi Sato and Tokihiro Kono

The 1000 km-scale variability of the dynamic height revealed by Argo CTD data at 40°N in the North Pacific

Oleg A. Bukin, Andrey N. Pavlov, Konstantin A. Shmirko, Pavel A. Salyuk and Sergey Yu. Stolyarchuk

Aerosols and ozone dynamics in the atmosphere over Peter the Great Bay

Alexander Yu. Lazaryuk and Vladimir Ponomarev

Matching of Mark-III CTD data

Petr V. Lushvin

Spectral characteristics seismogenic clouds

Emi Shiraishi, Risako Sakai, Tokihiro Kono and Sachiko Oguma

Density inversion in the Soya Current on the Hokkaido coast in the Okhotsk Sea

Tomowo Watanabe, Makoto Okazaki and Hideki Akiyama

Long-term changes of the wintertime coastal water temperature around Japan in the 20th century

Nobuo Tsurushima, Masahiro Suzumura, Namiha Yamada and Koh Harada

Dissolution rate change of calcite in seawater due to acidification by CO₂

Xing Wang, Maochong Shi, Zhenhui Gao and Lunyu Wu

The oceanic general circulation and transport in the Bohai Sea

MEQ Workshop and laboratory demonstration (W1)

Review of selected harmful algae in the PICES region: IV. Karenia and Prorocentrum

Co-Convenors: Vera L. Trainer (U.S.A.) and Ming-Yuan Zhu (China)

Background

This workshop was the fourth of an annual series in which harmful algal bloom (HAB) species that impact all or most countries in the North Pacific were discussed in detail. In 2008, the focus was on two fish-killing species *Karenia* and *Prorocentrum*. *Karenia mikimotoi* is known to kill both wild and cultured fish in China, Korea and Japan. Although this species was absent, to date, in the eastern Pacific, other species from the genus *Karenia* are known to kill fish in the southeastern U.S. *Prorocentrum* is a “red tide” species that forms dense, colored blooms in China, Korea and Japan, resulting in economic loss to fisheries due to reduced consumer confidence. *Prorocentrum* blooms are relatively rare in the eastern Pacific, but have been documented occasionally in areas of the U.S. and Canada. The integration of information from each country has advanced our understanding of these organisms.

Topics for the workshop included modes of toxicity, distribution, impact (differences between toxic and nontoxic strains), as well as physiology and ecology in each of the member countries. In particular, we wanted to identify additional studies needed specifically to understand the difference in occurrence and toxicity of these organisms in the eastern and western Pacific. The workshop produced a list of recommendations to help guide collaborative HAB research priorities in PICES member countries over the next 5 years. The workshop was preceded by a ½-day laboratory demonstration on *Karenia* and *Prorocentrum* identification and detection methods.

Summary of presentations

For the laboratory demonstration, Dr. Jacob Larsen gave an overview of the features used to distinguish *Prorocentrum* and *Karenia* species by light microscope. He discussed recent taxonomic changes. An emphasis was placed on the need to look at unarmored *Gymnodiniales* live. He suggested using flash photography and focusing into the cell, taking several pictures to be able to distinguish morphological features later from photographs. Lab demo participants had a chance to view the distinguishing characteristics of several species that Dr. Larsen has collected from scientists around the world.

For the workshop, summary of taxonomy helped to clarify some recent changes in nomenclature among *Prorocentrum* and *Karenia* species and will assist with identification of some morphologically similar species. Dr. Charles Trick gave a presentation about “getting there, being there and staying there”. Getting there focuses on the correct physiological condition available for a HAB species in the area. For example, is the temperature right for survival. Being there includes the presence of the right physical conditions to allow a HAB to remain at a given location. Staying there is represented by effective competition for nutrients and resistance to grazers, among other factors. An interesting finding of this workshop was the presence of *Trichodesmium* blooms prior to *Karenia* spp. HABs in both the Gulf of Mexico (Florida, U.S.A.) and in the East China Sea (noted in Songhui Lu’s presentation given by Mingyuan Zhu). It is thought that atmospheric iron is effectively able to provide nitrogen to *Karenia* blooms via nitrogen fixation, a process that requires iron. Because *Trichodesmium* forms surface blooms, it is a cell that can efficiently assimilate iron from atmospheric sources. In the East China Sea, *Karenia mikimotoi* blooms are followed by *Noctiluca* blooms, not typical to the Florida *K. brevis* blooms. This showed the value of continuous monitoring, allowing the characterization of phytoplankton assemblages prior to, during and following HAB events. *Karenia* species are problematic primarily in the western Pacific. *K. brevis* and *K. mikimotoi* are known to be present in Russian waters although no toxin monitoring is done. *K. mikimotoi* and

K. brevis have caused fish kills in Japan, Korea, and China. Shiguru Itakura (Japan) described the ability of *K. mikimotoi* to grow well in low light, suggesting that this species does well during the rainy season in both eurythermal and euryhaline environments. Ruixiang Li (China) described *K. mikimotoi* blooms in the Bohai Sea, S. China Sea, Yangtze River estuary, East China Sea and the coastal waters of Tianjin City. Other *Karenia* species have been identified around the world, but these are the two major problem species in PICES member countries.

Prorocentrum spp. HABs were described primarily for the western Pacific where they pose the greatest problem. Tatiana Morozova described over 9 planktonic species of *Prorocentrum* on the coastline of eastern Russia, with 10 additional benthic species known from Peter the Great Bay. Douding Lu described *Prorocentrum* spp. blooms in the E. China Sea as a major species causing red tides in Asian waters. He noted that species identification was important as there are many mistaken species descriptions in the literature. Weol Ae Lim showed that *Prorocentrum* blooms are spreading in geographical area since the 1970s, primarily to areas of increased anthropogenic nutrients. Mingyuan Zhu described situations where *Karenia* and *Prorocentrum* can co-occur in Chinese coastal waters.

List of papers

Oral presentations

Laboratory demonstrations on detection techniques for algal toxins

Jacob Larsen

Microscopic Observations and detailed analysis of *Karenia* and *Prorocentrum* taxonomy

Workshop

Jacob Larsen (Invited)

Karenia and *Prorocentrum*: Review

Yutao Qin, Jinhui Wang, Yanqing Wu, Mingyuan Zhu and Lingyun Xiang

Blooms of *Karenia mikimotoi* and *Prorocentrum* sp. in the East China Sea

Charles G. Trick

A historical overview of *Karenia* and *Prorocentrum* occurrences in North American coastal waters

Tatiana V. Morozova, Tatiana Yu. Orlova, Marina S. Selina and Inna V. Stonik

Species of the genera *Karenia* and *Prorocentrum* from the east coast of Russia

Douding Lu

The species complex *Prorocentrum donghaiense* (“*dentatum*”) in East Asian waters

Mineo Yamaguchi, Shigeru Itakura and Ichiro Imai

Ecophysiological characteristics of the harmful dinoflagellate *Karenia mikimotoi* in Japanese coastal waters

Yang-Soon Kang, Youngtae Park, Kyung Suk Seo and Yoon Lee

Karenia spp. and *Prorocentrum* spp. blooms in Korean coastal waters

Ruixiang Li, Mingyuan Zhu and Jianqiang Yang

The formation of *Karenia mikimotoi* blooms in the Bohai Sea, China

Songhui Lu

An ecological study of a *Karenia mikimotoi* bloom in the East China Sea in 2005

Mingyuan Zhu, Ruixiang Li and Zongling Wang

Study on growth of macro green algae *Enteromorpha prolifera*

David G. Foley

Data integration to help identify and monitor harmful algal blooms along the West Coast of North America

Takafumi Yoshida and Hidemasa Yamamoto

HAB-related Activities of NOWPAP CEARAC in the NOWPAP Region

Posters

Yasuhiro Yamasaki, Masayuki Tameishi, Sou Nagasoe, Yohei Shimasaki, Yuji Oshima, Kenichi Yamaguchi, Tatsuya Oda and Tsuneo Honjo

Allelopathic effects of the dinophyte *Prorocentrum minimum* on the growth of the bacillariophyte *Skeletonema costatum*

Jong-Gyu Park, Weol Ae Lim, Yang-Soon Kang, Kyung Suk Seo and Yoon Lee

Pseudo-nitzschia in Korean coastal waters

Tae-Gyu Park, Yang-Soon Kang, Youngtae Park, Heon Meen Bae and Yoon Lee

Fish killing dinoflagellate *Cochlodinium polykrikoides* (Dinophyceae) blooms in Korea in 2007

BIO Workshop (W2)

Oceanic ecodynamics comparison in the subarctic Pacific

Co-Convenors: Charles B. Miller (U.S.A.) and Atsushi Yamaguchi (Japan)

Background

OECOS (Oceanic Ecodynamics COmparison in the Subarctic Pacific) is a PICES project, originally aiming to advance our understanding of the dynamics of lower trophic levels in the pelagic systems of the subarctic Pacific through a comparison of the east–west regions at a new level of detail. The first OECOS workshop was held in May 2005, at Oregon State University (U.S.A.), and participants from Japan (western Pacific region) and the U.S. and Canada (eastern Pacific region) discussed gaps in our knowledge about ecosystem dynamics of both eastern and western sectors of the subarctic Pacific, and new coordinated approaches for future research activities (PICES Scientific Report No. 32, 2006). In March–April 2007, the western group (OECOS WEST) conducted two cruises to the Oyashio region before and during massive spring phytoplankton blooms. In both cruises, high-frequency samplings were made of various biological components (bacteria, phytoplankton, micro-, meso- and macrozooplankton, and micronekton) and nutrients (including iron). To aid analysis of the origin and history of water masses at the study sites, frequent CTD casts and satellite monitoring of SST and water color were made. Drifting sediment traps were tracked to collect setting particles from the upper layers. At this workshop, recent achievements of OECOS WEST were presented and discussed along with new OECOS West and East research prospects.

Summary of presentations

All registered participants were able to attend the workshop, which proceeded exactly to the schedule on page 241 of the 17th Annual Meeting program.

- 1) Dr. Atsushi Yamaguchi reviewed the history of the successful Japanese expeditions to the Oyashio from March 8–15, 2007 (T/S *Oshoro Maru*) and from April 5–May 1, 2007 (R/V *Hakuho Maru*). He reported that the Japanese team of ‘OECOS-West’ has held two conferences after the expeditions to discuss the results.
- 2) Dr. Tokihiro Kono described the hydrographic circumstances during the cruises. Stations occupied were along the A-line extending southeast from Hokkaido’s east coast, with much of the station work concentrated at station A4. Frequent CTD casts during both cruises showed strongly shifting proportions of offshore Oyashio Water (OYW) – a northern influence, coastal Oyashio water (COW) from over the Hokkaido shelf, and modified Kuroshio water (MKW) that appeared in satellite images as a Kuroshio loop or boundary eddy. MKW was most prevalent at station A5, but mixtures of all

- three types were present throughout the April work. Greatest chlorophyll concentrations were associated with greater proportions of COW. The importance of advective variation was evident in all variables (T, S, chlorophyll and other biology).
- 3) Dr. Kenshi Kuma reported measures of dissolved and total (including particulate) iron concentration. Dissolved iron values were remarkably similar between prebloom and bloom periods, 0.3–0.5 nM and 0.4–0.6 nM, respectively. However, total iron shifted sharply upward from the March values of 3–5 nM during strong, deep vertical mixing to 10–25 nM during the intrusions with highest chlorophyll (10–23 µg/l) in April. At stations along the A-line, iron supply appeared to vary with the sources of advection.
 - 4) Mr. Tomonori Isada detailed the ambitious set of phytoplankton observations completed during the cruises. Flora in the bloom period was strongly dominated by diatoms, shifting from *Thalassiosira* species initially to *Chaetoceros* species. There were several species of each in the two bloom phases. Nano- and picophytoplankton became progressively more important toward the end of the cruise. There were signs in the physiology of diatoms (F_v/F_m and flavodoxin/ferrodoxin ratio) that iron stress was significant despite high total iron and abundant macronutrients.
 - 5) Results of dilution experiments to measure phytoplankton growth and microzooplankton grazing rates were presented by Dr. Takashi Ota. Grazing rates were very low mostly 5–15% of initial chlorophyll stock per day, or 10–30% of primary production. Phytoplankton growth rates were high during the events with highest chlorophyll stocks, up to 0.52 d^{-1} .
 - 6) Dr. Yamaguchi described the time-series sampling for mesozooplankton with three different net systems. Most of the *Neocalanus* stock was in the upper water column with no discernible vertical migration, while *Metridia pacifica* migrated in early April but stopped (except for C6-females) toward the end of the cruise, staying during night at the daytime depth. The reason was not clear. Developmental progression was clear for *Neocalanus flemingeri* (C1–C4) and for *N. cristatus* (C2–C4). Only part of the *Eucalanus bungii* population migrated into surface layers at night, with females producing eggs near the surface. Spawning rates were determined for that species only.
 - 7) Dr. Toru Kobari reported that gut content chlorophyll of *N. cristatus* and *E. bungii* varied with water column chlorophyll levels, with extreme amounts in the diets associated with the highest bloom levels. The overall copepod community feeding rate was estimated as $0.1\text{--}1.2\text{ gC m}^{-2}\text{ d}^{-1}$. This was a significant fraction of the primary production, reported by Mr. Isada as $0.5\text{--}3.5\text{ gC m}^{-2}\text{ d}^{-1}$. Obviously, copepod grazing was not sufficient to prevent further development of the bloom at any point, but phytoplankton must have been the major constituent of the copepod diet, unlike the situation in continuously oligotrophic areas farther seaward. Establishing this point was a major goal of OECOS.
 - 8) Doctoral candidate, Hye Seon Kim, reported on the metabolism and growth of two species of euphausiid abundant in the Oyashio: *Euphausia pacifica* and *Thsanoessa inspinata*. Euphausiid abundance varied with the chlorophyll concentration, suggesting that supply to the A-line stations was affected by the varying water sources. Length distributions of both species suggested only slight growth during the April cruise. It was noted that all *T. inspinata* less than the modal size were male, all those larger were female. This suggests protandrous hermaphroditism, a unique finding for euphausiids but occurring in some decapod crustacean. Metabolic rates did not vary much with the temperature or food availability during the two-cruise series, even though chlorophyll levels were very different between March and April.
 - 9) Midwater trawl and acoustic estimates of mesopelagic fish were reported by Mr. Tadanori Fujino. Scattering layers at 200 m appeared to stay in that vicinity day and night. Dominant species captured with a 16 m^2 trawl were *Diaphus theta* and *Stenobrachius leucopsaurus*. Mr. Fujino characterized the estimated abundance of the two species, 6.9 g m^{-2} , as less than typical for the region.
 - 10) Three papers were presented by participants in the failed attempt to obtain funding for a parallel study in the Gulf of Alaska. Drs. Michael Dagg and Suzanne Strom reported results from the GLOBEC Northeast Pacific program work on the Alaskan shelf. In apparently iron-limited waters at the shelf edge, Dr. Dagg found that grazing by *Neocalanus* spp. could be (1) keeping large phytoplankton from blooming – balancing their slow growth rate with grazing, and (2) releasing nano- and picophytoplankton from predation by microherbivores. Dr. Strom reported on the lower trophic level community composition shelf-edge waters, showing the parallel to definitively iron-limited communities farther seaward. Events are observed in which iron limitation is relieved at and beyond the shelf edge by both riverine discharges laden with sediment and by wind-borne dust plumes. Dr. Charles Miller reviewed the original OECOS-East plan to investigate the likely causal correlates of

subseasonal variation in phytoplankton stock abundance at Station P. He stressed that detailed evaluation of relations at the lowest trophic levels in *without* supplementing the iron availability is a key to understanding the function of HNLC ecosystems. The key is to determine the phase relations of physics, nutrients, floristics, microherbivores and macrozooplankton to the subseasonal variation of chlorophyll (and likely to more explicit measure of phytoplankton biomass).

It is clear from the reports that OECOS-West produced excellent results and valuable insights about ecosystem function during the Oyashio spring bloom. Another attempt at such a time series should consider moving farther away from Hokkaido and from the Kuroshio–Oyashio frontal region. Such a project might well be undertaken under Russian auspices someplace well offshore from Sakalin or southern Kamchatka.

List of papers

Oral presentations

Atsushi Yamaguchi and Charles B. Miller

OECOS Workshop, PICES XVII, Dalian, China: Physical, chemical and biological dynamics of the Oyashio spring bloom

Tokihiro Kono and Masatoshi Sato (Invited)

Effect of water mass structure on the spring bloom in the Oyashio region revealed by sequential observations

Kenshi Kuma, Koji Sugie, Satoshi Fujita and Yuta Nakayama

Temporal variability and bioavailability of iron and nutrient during spring phytoplankton bloom in the Oyashio region

Tomonori Isada, Ai Hattori, Koji Suzuki, Mitsuhide Sato and Ken Furuya

Community structure, productivity and photosynthetic physiology of phytoplankton in the Oyashio region of the NW subarctic Pacific during spring 2007

Takashi Ota, Toru Kobari, Mutsuo Ishinomiya, Yasushi Gomi and Yasumasa Oikawa

Grazing activity of microzooplankton during a diatom bloom in the Oyashio region

Atsushi Yamaguchi, Yuka Onishi, Aya Omata, Mariko Kaneda, Momoka Kawai and Tsutomu Ikeda

Vertical distribution and population structure of large grazing copepods during spring phytoplankton bloom in the Oyashio region

Toru Kobari, Yumi Inoue, Yosuke Nakamura, Hidemi Okamura, Takashi Ota, Yuichiro Nishibe and Mutsuo Ichinomiya

Feeding impacts of ontogenetically migrating copepods on the spring phytoplankton bloom in the Oyashio region

Hye Seon Kim, Atsushi Yamaguchi and Tsutomu Ikeda

Abundance, metabolic rate and body composition of the euphausiid *Euphausia pacifica* and *Thysanoessa inspinata* during spring phytoplankton bloom in the Oyashio region

Tadanori Fujino, Yusuke Ito, Hiroki Yasuma and Kazushi Miyashita

Abundance and distribution of micronektonic, mesopelagic fish at the 2007 OECOS observation site (Northwest Pacific)

Michael Dagg, S. Strom and H. Liu

Phytoplankton community structure in the HNLC subarctic Pacific Ocean is determined by *Neocalanus flemingeri* and *N. plumchrus*

Suzanne L. Strom, K.A. Fredrickson, F. Perez, M.B. Olson and E.L. Macri

Lower trophic level responses to gradients in iron availability in the eastern subarctic Pacific

Charles B. Miller

OECOS Workshop: Open issues in production ecology of the oceanic Gulf of Alaska

MONITOR/ESSAS Workshop (W3)

Status of marine ecosystems in the sub-Arctic and Arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008

Co-Convenors: Ken Drinkwater (Norway), George Hunt, Jr. (U.S.A.), Sei-Ichi Saitoh (Japan), and Jin Ping Zhao (China)

Background

The sub-Arctic and Arctic seas have distinct marine ecosystems that are affected by seasonal sea ice. During the summer, the water column is stratified by melt water from retreating sea ice, and phytoplankton are found near

the sea surface where the incoming sunlight is sufficient for photosynthesis. These summer conditions result in the highest primary production in the world's oceans and support high levels of fishery resources. Algae that live on the bottom of sea ice also play an important role in maintaining fishery resources by falling and decomposing on the sea floor in summer. Recently, global climate change has become a cause for concern. The greenhouse effect, produced by increasing anthropogenic CO₂ emissions, has induced increases in atmospheric and seawater temperatures. The effect of such increases on the cryosphere of the Arctic is already visible, and understanding its direct and indirect effects on the physical and chemical environments and the responses of marine ecosystems is critical. However, the knowledge of most aspects and responses of marine ecosystems to global climate change is still inadequate. PICES member countries conducted several field programs in these regions during the International Polar Year (IPY) 2007–2008. This workshop discussed the features and mechanisms of the responses of marine ecosystems to global climate change in the Arctic and sub-Arctic seas, based on results from the IPY cruises in 2007 and 2008.

Summary of presentations

A total of 17 presentations and 4 posters were given as part of this IPY workshop. The primary objective was to provide updates on what data have been collected and some initial results. The workshop began with the invited talk by Dr. Bob Dickson from Lowestoft in the UK who discussed the integrated Arctic Ocean Observing System (IAOOS). He provided a synthesis of the physical oceanographic data collected around the Arctic and subarctic within IPY and how they fit with earlier data. He stressed that the concentrated efforts of the various nations under IPY are allowing us to view the Arctic ocean–atmosphere–cryosphere system as a complete unit for the first time. Of particular importance was the close connection and interaction between the Arctic and the sub-Arctic.

ESSAS is coordinating the international consortium, Ecosystem Studies of Subarctic and Arctic Regions (ESSAR) that includes 11 projects lead by 8 different nations and one internationally funded project. An overview of the work being carried out within ESSAR was presented. All but a few of the presentations and posters during the workshop represented results from the ESSAR consortium. This included studies undertaken by China, Japan, the U.S. and Norway as well as the international project, Trans North Atlantic Sightings Survey (T-NASS), which focuses on cetaceans. The survey during IPY is being compared with earlier surveys begun in the late 1980s and conducted approximately every 5 years. IPY has resulted in the first coordinated North Atlantic-wide survey with coverage in the Northwest Atlantic supplementing the surveys carried out in the central and Northeast Atlantic.

China reported on retrospective analyses related to its IPY work as well as some recent data collected on their 2008 cruise across the Bering Sea reaching into the Arctic to over 80°N. They showed the importance of this work was the flow of Bering Sea water in modifying the water mass conditions and structure in the Arctic, including the double halocline structure and the sub-surface warm water in the Canada Basin. Also, this flow supplies significant quantities of heat that appears to have played a role in the rapid melting of Arctic ice in recent years. Data also suggested an important nutrient flux into the Arctic by the Bering Strait inflow. Seasonal variability and trends in sea level elevations using historical data indicate wind forcing dominates the seasonal variability, although steric effects also contribute. Interannual sea level changes revealed a weak increasing trend of about 1 mm y⁻¹ over the Arctic. Hydrographic data collected by China during 2008 in the Bering Sea indicated a large quantity of cold water below 40 m on the northern Bering Shelf between the 40–100 m isobaths that extended south to the continental shelf. It was speculated that this cold water formed in Anadyr Bay or south of St. Lawrence Island. Dr. Kohei Mizobata, another invited speaker, presented observations taken by Japan in the Western Arctic during IPY cruises in 2008 that extended north to 71°N. He discussed the role of the circulation, and especially eddies, in transporting shelf water into the deep basin in the Arctic. The role of heat fluxes through the Bering Strait on the ice retreat in the Arctic was also presented and was consistent with the Chinese observations. Other speakers showed evidence of increased primary production in the open waters of the Arctic that were previously ice covered. The biodiversity of fish species in the northern Bering and Arctic was also investigated, with evidence that Arctic cod might have decreased in abundance and moved farther north in 2007 compared to data collected in the early 1990s. Another Japanese study found that the continental shelf waters in the Sea of Okhotsk are an important source of iron to the western subarctic Pacific. In Norway, their IPY ecosystem program is focusing upon the fronts between the cold Arctic waters and warm Atlantic waters. Results from both the Barents and the Norwegian seas were presented

and show that the hydrography of the front seems to structure the biology, including the fish and its feeding patterns. Dr. Lee Cooper of the U.S. was the third invited speaker and he discussed the approaches in the two IPY programs, the Bering Sea Ecosystem Study (BEST) and the Bering Sea Integrated Ecosystem Research Program (BSIERP). He highlighted the large changes in the benthic biomass and community structure in the Bering since 1970 and discussed changes in the primary production and biomass under different oceanographic conditions.

A short discussion at the end of the workshop focused on the need for scientists to meet to compare and contrast their data and should not only be between NESSAR projects but with other IPY programs as well. This is especially important as the data analysis progresses beyond its present preliminary stage. ESSAS is looking forward to further promoting comparative studies within the PICES community and between ICES and PICES.

List of papers

Oral presentations

Robert R. Dickson (Invited)

The integrated Arctic Ocean Observing System (iAOOS)

Ling Du, Jia Wang and Juncheng Zuo

Sea level variation and its contributing factors in the Arctic Ocean and sub-Arctic region

Yong Cao and Jinping Zhao

A study of the subsurface warm water and its formation mechanism in the Canada Basin

Jie Su, Dong Xu, Shujiang Li and Jinping Zhao

Interannual variations of sea ice in the Pacific side of the Arctic and its relation with the Pacific Inflow

Kohei Mizobata, Koji Shimada, Sei-ichi Saitoh, Toru Hirawake and Masahiro Hori (Invited)

Japanese IPY activities in the western Arctic Ocean and the Bering Sea

Jinping Zhao and Jiuxin Shi

Study of the extension of Pacific warm water under sea ice of the Chukchi Sea

Liqi Chen and Zhongyong Gao

Differences of water masses in Bering Strait throughflow and mixing on their way to the Arctic Ocean

Sei-Ichi Saitoh and Toru Hirawake

Preliminary results from the Oshoro-Maruru IPY cruises in summer 2007 and 2008

Jiuxin Shi, Jinping Zhao and Shujiang Li

The double haloclines in the Canada Basin under the warming climate

Lee W. Cooper and Jacqueline M. Grebmeier (Invited)

Results from BEST, BSIERP and other IPY-relevant research in the northern Bering Sea

Nikolay S. Vanin

The summer hydrography of the west Chukchi Sea shelf during opposite patterns of atmospheric circulation in 2007 and 2003

Sei-Ichi Saitoh, I Nyoman Radiarta, Toru Hirawake, Yasunori Sakurai, Mamoru Yabe, Yoshihiko Kamei and Shogo Takagi

Change in the biodiversity of the demersal fish community in the northern Bering and Chukchi Seas

Kenneth F. Drinkwater

A frontal attack – Norwegian IPY studies of the Arctic Front in the Norwegian and Barents Seas

Jun Nishioka, Takeshi Nakatsuka, Kenshi Kuma, Yutaka W. Watanabe, Tsuneo Ono and Kay I. Ohshima

The importance of sea-ice formation in the Sea of Okhotsk for supplying iron to the western subarctic Pacific

Kenneth F. Drinkwater

The Ecosystem Studies of Subarctic and Arctic Regions (ESSAR) Consortium

Geneviève Desportes, Daniel Pike, Mario Acquarone, Igor Golyak, Jean François Gosselin, Thorvaldur Gunnlaugsson, Sverrir D. Halldórsson, Mads Peter Heide-Jørgensen, Jack Lawson, Christina Lockyer, Bjarni Mikkelsen, Droplaug Ólafsdóttir and Malene Simon

From the Barents Sea to the St. Lawrence: A Trans North Atlantic Sightings Survey (T-NASS)

George L. Hunt, Jr.

Hotspots in cold seas

Posters

Wen Yu, Liqi Chen, Jianping Cheng, Jianhua He, Zhongyong Gao and Heng Sun

Western Arctic Ocean POC flux derived by the small volume 234Th method

Eduard A. Spivak, Nina I. Savelieva and Anatoliy N. Salyuk

Session Summaries-2008

Winter oceanographic conditions in the coastal waters of the Laptev Sea (Buor-Khaya Bay) – Results of IPY field monitoring in 2007

Shinya Nagashima, Hideaki Kudo and Masahide Kaeriyama

Spatial comparison of the feeding ecology of Pacific salmon in the North Pacific Ocean during summer of 2007 IPY (Preliminary results)

Hongli Fu, Jinping Zhao and Jie Su

Study of polynya processes in the Bering Sea using a high resolution dynamic-thermodynamic sea ice model

CCCC/POC/FIS Workshop (W4)

Climate scenarios for ecosystem modeling (II)

Co-Convenors: Michael G. Foreman (Canada), Anne B. Hollowed (U.S.A.), Suam Kim (Korea) and Gordon McFarlane (Canada)

Background

Members of the Climate Forcing and Marine Ecosystem Task Team (CFAME), the Working Group on Evaluations of Climate Change Projections (WG 20), and the FIS Committee presented the results of their research on developing and applying the output of regional and global climate scenarios to ecosystem and fish stock forecasts. These groups have been developing conceptual and empirical models of the mechanisms that link climate variation to the dynamics of marine ecosystems and their commercially important species. Their work has focused on comparisons among a diversity of North Pacific ecosystems with differing dominant physical processes. WG 20 is developing higher resolution regional coupled atmosphere–ocean models forced by IPCC global or regional models to provide forecasts of regional parameters (such as SST, sea ice cover, and river discharge) that are relevant to ecosystem processes. This workshop provided an opportunity to discuss the results, present them to the PICES community, and describe their potential for the FUTURE Program.

List of papers

Oral presentations

Thomas A. Okey, Anne B. Hollowed, Michael J. Schirripa and Richard J. Beamish (Invited)

The 2035 modelling challenge for forecasting climate impacts on marine biota and fisheries: A collaboration emerging from an international workshop

James E. Overland, Muyin Wang and Nicholas A. Bond

Utility of climate models for regional ecosystem projections

Young Shil Kang and Sukgeun Jung

Regional differences in responses of meso-zooplankton to long-term oceanographic changes in Korean sea waters

Yasuhiro Yamanaka et al.

(WG 20 update): Recent results connecting climate change to fish resources using the high resolution model, COCO-NEMURO

Emanuele Di Lorenzo, N. Schneider, K.M. Cobb, K. Chhak, P.J.S. Franks, A.J. Miller, J.C. McWilliams, S.J. Bograd, W.J. Arango, H. Sydeman, E. Curchister, T.M. Powell and P. Rivere

(WG 20 update): North Pacific Decadal Variability in the FUTURE

James Christian

(WG 20 update): Canadian Earth System Model scenarios for the North Pacific

Qigeng Zhao, Qingquan Li, Jianglong Li and Fanghua Wu

A simulation of acidification in the Pacific Ocean

Enrique Curchitser, William Large, Jon Wolfe and Kate Hedstrom

(WG 20 update): Downscaling climate scenarios with a fully coupled global-to-regional model

Michael G. Foreman, William J. Merryfield, Badal Pal and Eric Salathé

An update of regional climate modelling along the British Columbia Shelf

Vadim Navrotsky

(WG20 update): On the role of ocean and land living matter in Global Climate Change

Anne B. Hollowed, Teresa A'mar, Richard J. Beamish, Nicholas A. Bond, James E. Overland, Michael Schirripa and Tom Wilderbuier

Fish population response to future climate drivers: A next step forward

Gordon H. Kruse, Jie Zheng and James E. Overland

A scenario approach to forecast potential impacts of climate change on red king crabs in the Eastern Bering Sea

Sukyung Kang, Jae Bong Lee, Anne B. Hollowed, Nicholas A. Bond and Suam Kim

Techniques for forecasting climate-induced variation in the distribution and abundance of mackerels in the northwestern Pacific

Michio J. Kishi, Yasunori Sakurai and Masahide Kaeriyama

What affects on the growth and stock of chum salmon, walleye pollack, and common squid in the Northern Pacific

Richard J. Beamish

A tail of two sockeyes

Richard J. Beamish

Evidence that the carrying capacity of local marine ecosystems can regulate the productivity of chinook salmon

Poster

Leonid Klyashutorin and Alexey Lyubushin

Cyclic climate changes and salmon production in the North Pacific

CCCC/ESSAS Workshop (W5)

Marine ecosystem model inter-comparisons

Co-Convenors: Masahiko Fujii (Japan), Shin-ichi Ito (Japan) and Bernard A. Megrey (U.S.A.)

Background

Comparative analysis is a valuable scientific activity because the size and complexity of marine ecosystems precludes conducting controlled *in situ* experiments. It is also a powerful technique for understanding the important similarities and differences between and among ecosystems. Modelling is a central approach to comparative analyses of ecosystem structure, function and responses. It is important to understand whether inter-relationships among physical, chemical and biological variables vary geographically, and the extent to which any particular conclusions depend on the model used to derive them. The model inter-comparison project will use different models to develop forecasts of different ecosystems and will use different models to compare forecasts of the same location/species. The intention of the project is to develop ensemble model forecasts to compare predicted and observed responses of marine ecosystem types to global changes—similar to the widely-accepted approach used by the IPCC to evaluate alternative climate models. The project will implement the same model evaluation process with marine ecosystem models rather than climate prediction models.

A major goal of the workshop was to begin planning the work of the project. Workshop activities included: (1) nomination and discussion of potential models (and their data needs) to compare (the EurOceans Model Shopping Tool, http://www.eur-oceans.eu/WP3.1/shopping_tool/about.php, which provides a large array of documented models from which to choose); (2) nominating location(s) for comparisons; (3) identifying comparison protocols to compare model performance, given data needs against location data availability and compatibility; (4) identifying the most appropriate indicator species on which to base comparisons, such as krill, as the “metric” for correct model behavior; and (5) planning “pseudo-controlled” experiments. Workshop participants were advised have at least one of the following characteristics: (a) be familiar with ecosystem models from beyond the PICES region; (b) be knowledgeable about running models; (c) be an expert on the life histories of selected organisms and data associated with them; and (d) have a broad perspective on marine ecosystems.

Summary of presentations

The PICES working group on Marine Ecosystem Model Inter-Comparison met for the first time in Dalian China. The session opened with a brief introduction. Then, the audience (40–55 people) listened to several stimulating presentations. These included the benefit of performing model inter-comparisons, methods of assessing model skill assessment, and three presentations on krill and copepod biology and ecology. A lengthy discussion took place on five main questions which were intended to frame the preparation of a work plan: (1) identifying the objective of the models used for inter-comparison, (2) which models to

Session Summaries-2008

compare, (3) identifying location(s) for comparison, (4) identifying comparison protocols (model skill assessment), and (5) identifying indicator species.

Plans were being developed to solicit active participation and contribution of models. The objective of the inter-comparison was to apply several models to one location in order to identify important mechanisms that control secondary production abundance and variability as well as bounding the levels of uncertainty in model predictions by calculating ensemble statistics. This approach could be applied to several places simultaneously as an extension. However, it was necessary to discuss the selection of locations where the model was to be applied.

A schedule of activities was proposed and accepted. This meeting report was presented at the Science Board meeting in Dalian. Participants were contacted via email to get confirmation of their willingness to participate and be active (November–December 2008), a work plan was to be prepared (November 2008–April 2009), and the work plan was to be presented at inter-sessional Science Board meeting (April 2009) along with a proposal to hold a modeling workshop at PICES-2009 to compile observational data and begin model construction, parameterization (October 2009).

List of papers

Oral presentations

Fei Chai, Masahiko Fujii and Marjorie Friedrichs (Keynote)

A regional ecosystem modeling intercomparison project

J. Icarus Allen (Invited)

Some thoughts on assessing the skill of marine ecosystem models

William T. Peterson, Tracy Shaw, Jennifer Menkel and Leah Feinberg (Invited)

An overview of the ecology and population dynamics of euphausiids around the Pacific Rim

Harold (Hal) P. Batchelder (Invited)

Copepods as indicator species for comparing pelagic marine ecosystem models

Toru Kobari, Tsutomu Ikeda, Michael Dagg and Atsushi Yamaguchi (Invited)

Neocalanus copepods are useful for inter-comparison of marine ecosystem models in the PICES region

Best Presentations for Committee/Program-sponsored Topic Sessions or Workshops at PICES XVII

Science Board Best Oral Presentation

Emanuele Di Lorenzo (School of Earth and Atmospheric Sciences, Georgia Institute of Technology, U.S.A.) on “*North Pacific decadal variability in the future*” co-authored with Jason Furtado and Niklas Schneider

Best Oral Presentation by an early career scientist for the BIO-sponsored Workshop on “Oceanic ecodynamics comparison in the subarctic Pacific” (W2)

Tomonori Isada (Graduate School of Environmental Science and Faculty of Environmental Earth Science, Hokkaido University, Japan) on “Community structure, productivity and photosynthetic physiology of phytoplankton in the Oyashio region of the NW subarctic Pacific during spring 2007” co-authored with Ai Hattori, Koji Suzuki, Mitsuhide Sato and Ken Furuya

Best Poster for the BIO-sponsored Topic Session on “End-to-end food webs: Impacts of a changing ocean” (S9)

Russell W. Bradley (PRBO Conservation Science, U.S.A.) on “How effective are Cassin’s auklets as environmental monitors in Central California?” co-authored with Peter Warzybok, Meredith L. Elliot, Benjamin L. Saenz, Nina J. Karnovsky and Jaime Jahncke

Best Oral Presentation by an early career scientist for the FIS-sponsored Contributed Paper Session

Anastasia M. Khrustaleva (Russian Federal Research Institute of Fisheries and Oceanography, VNIRO, Russia) on “Integrated method for sockeye salmon stock differentiation in the West Pacific and the Sea of Okhotsk”

Best Poster for the FIS-sponsored Contributed Paper Session

Chivuki Sassa (Seikai National Fisheries Research Institute, Fisheries Research Agency, Japan) on “Distribution and biomass of *Benthosema pterotum* (Pisces: Myctophidae) in the shelf region of the East China Sea: Mechanisms of population maintenance” co-authored with Keisuke Yamamoto, Youichi Tsukamoto and Munecharu Tokimura

Best Oral Presentation by an early career scientist for the MEO-sponsored Topic Session on “Connecting the human and natural dimensions of marine ecosystems and marine management in the PICES context”(S12)

Shang Chen (Research Center for Marine Ecology, First Institute of Oceanography, SOA, China) on “Change of ecosystem services of the Yellow River Delta Wetland, China” co-authored with Jian Liu, Tao Xia and Qixiang Wang

Best Poster for the MEO-sponsored Topic Session on “Mariculture technology and husbandry for alternate and developing culture species”(S5)

Yubo Liang (National Marine Environmental Monitoring Center, China) on “Spatial distribution of *Perkinsus olseni* in the Manila clam *Ruditapes philippinarum* along Chinese coast” co-authored with Dongmei Li, Sa Liu, Xingbo Wang, Tao Song, Xing Miao, Guanhua Chen and Guize Liu

Best Oral Presentation by an early career scientist for the POC-sponsored Contributed Paper Session

Chuanyu Liu (Institute of Oceanology, Chinese Academy of Sciences, China) on “An N-shape thermal front in the western South Yellow Sea in winter” co-authored with Fan Wang

Best Poster for the POC-sponsored Contributed Paper Session

Masatoshi Sato (Unified Graduate School of Earth and Environmental Science, Tokai University, Japan) on “The 1000 km-scale variability of the dynamic height revealed by Argo CTD data at 40°N in the North Pacific” co-authored with Tokihiro Kono

Best Oral Presentation by an early career scientist for the MONITOR-sponsored Workshop on “Status of marine ecosystems in the sub-Arctic and Arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008 (W3)

Kohei Mizobata (Department of Ocean Sciences, Tokyo University of Marine Science and Technology, Japan) on “Japanese IPY activities in the western Arctic Ocean and the Bering Sea” co-authored with Koji Shimada, Sei-ichi Saitoh, Toru Hirawake and Masahiro Hori

Best Poster for the MONITOR -sponsored Workshop on “Status of marine ecosystems in the sub-Arctic and Arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008 (W3)

Hongli Fu (Key Laboratory of Polar Oceanography and Global Ocean Change, Ocean University of China, China) on “Study of polynya processes in the Bearing Sea using a high resolution dynamic-thermodynamic sea ice model” co-authored with Jinping Zhao and Jie Su

Best Oral Presentation by an early career scientist for the TCODE-sponsored Topic Session on “Linking biology, chemistry, and physics in our observational systems – present status and FUTURE needs”(S2)

Hao Ma (Key Laboratory of Global Change and Marine-Atmospheric Chemistry, Third Institute of Oceanography, SOA, China) on “Upper ocean export of particulate organic carbon in the Bering Sea estimated from thorium-234” co-authored with Mingduan Yin, Liqi Chen, Jianhua He, Wen Yu and Shi Zeng

Best Poster for the TCODE-sponsored Topic Session on “Linking biology, chemistry, and physics in our observational systems – present status and FUTURE needs” (S2)

In-Seong Han (National Fisheries Research and Development Institute, Korea) on “Behavior of a low salinity water mass during summer in the South Sea of Korea using *in-situ* observations” co-authored with Takeshi Matsuno, Tomoharu Senjyu, Young-Sang Suh and Ki-Tack Seong

Best Oral Presentation by an early career scientist for the CCCC Program-sponsored Topic Session on “Marine system forecast models: Moving forward to the FUTURE”(S7)

Xunqiang Yin (First Institute of Oceanography, China) on “Ensemble adjustment Kalman filter study for Argo data” co-authored with Fangli Qiao, Yongzeng Yang and Chagshui Xia

Best Poster for the CCCC Program-sponsored Topic Session on “Marine system forecast models: Moving forward to the FUTURE”(S7)

Yasumasa Mivazawa (Frontier Research Center for Global Change, JAMSTEC, Japan) on “Toward a data-assimilation system for marginal seas in the SEA-WP region” co-authored with Yoshikazu Sasai and Kazuo Nadoaka

PARTICIPANTS

Australia

John Keesing

Marine and Atmospheric Research
CSIRO
Private Bag 5
Wembley, Western Australia 6913
Australia
john.keesing@csiro.au

Steve Kennelly

NSW Fisheries Centre of Excellence
NSW Department of Primary Industries
202 Nicholson Pde
Cronulla, 2230
Australia
steve.kennelly@dpi.nsw.gov.au

Kedong Yin

Australian Rivers Institute
Griffith University
170 Kessels Rd.
Nathan/Brisbane, Queensland 4111
Australia
k.yin@griffith.edu.au

Canada

Sonia D. Batten

Sir Alister Hardy Foundation for Ocean Science
4737 Vista View Crescent
Nanaimo, BC V9V 1N8
Canada
soba@sahfos.ac.uk

Michael G. Foreman

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
mike.foreman@dfo-mpo.gc.ca

Richard J. Beamish

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC V9T 6N7
Canada
Richard.Beamish@dfo-mpo.gc.ca

Caihong Fu

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC V9T 6N7
Canada
Caihong.Fu@dfo-mpo.gc.ca

Robin Brown

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC V8L 1J6
Canada
robin.brown@dfo-mpo.gc.ca

Graham E. Gillespie

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC V9T 6N7
Canada
Graham.Gillespie@dfo-mpo.gc.ca

Ingrid Burgetz

Fisheries and Oceans Canada
200 Kent St.
Ottawa, ON K1A 0E6
Canada
ingrid.burgetz@dfo-mpo.gc.ca

Gouqi Han

Fisheries and Oceans Canada
Biological and Physical Oceanography Section
P.O. Box 5667
St. John's, NL A1C 5X1
Canada
hang@dfo-mpo.gc.ca

James Christian

Fisheries and Oceans Canada
Canadian Centre for Climate Modelling and Analysis
c/o University of Victoria, P.O. Box 3065, STN CSC
Victoria, BC V8W 3V6
Canada
jim.christian@ec.gc.ca

Participants-2008

Glen Jamieson

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC V9T 6N7
Canada
Glen.Jamieson@dfo-mpo.gc.ca

Serge Labonté

Fisheries and Oceans Canada
200 Kent St., Office 8W135
Ottawa, ON K1A 0E6
Canada
serge.labonte@dfo-mpo.gc.ca

Maurice Levasseur

Biologie (Québec-Océan)
Université Laval
Pavillon Alexandre-Vachon
Québec, QC G1K 7P4
Canada
Maurice.levasseur@bio.ulaval.ca

David L. Mackas

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
Dave.Mackas@dfo-mpo.gc.ca

Tom Okey

Pew Fellow / UVic / Bamfield Marine Station
P.O. Box 100
Bamfield, BC V0R 1B0
Canada
Thomas.Okey@gmail.com

Jake Curtis Rice

Fisheries and Oceans Canada
Ecosystem Science Branch
200 Kent St.
Ottawa, ON K1A 0E6
Canada
Jake.Rice@dfo-mpo.gc.ca

Laura Richards

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC V9T 6N7
Canada
Laura.Richards@dfo-mpo.gc.ca

Peter S. Ross

Fisheries and Oceans Canada
Institute of Ocean Sciences, Marine Environmental Quality
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
peter.s.ross@dfo-mpo.gc.ca

Jake Schweigert

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC V9T 6N7
Canada
Jake.Schweigert@dfo-mpo.gc.ca

Darlene Loretta Smith

Fisheries and Oceans Canada
Federal Government of Canada
200 Kent St., STN 8W133
Ottawa, ON K1A 0E6
Canada
darlene.smith@dfo-mpo.gc.ca

Thomas W. Therriault

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC V9T 6N7
Canada
Thomas.Therriault@dfo-mpo.gc.ca

Charles Trick

Schulich School of Medicine
University of Western Ontario
N. Campus Bldg., 1151 Richmond Street N.
London, ON N6A 5B7
Canada
trick@uwo.ca

China-Taipei

Chih-hao Hsieh

Institute of Oceanography
National Taiwan University
No. 1, Sec. 4, Roosevelt Rd.
Taipei, Taiwan, 10617
China-Taipei
chsieh@ntu.edu.tw

Wen-Tseng Lo

Institute of Marine Biotechnology and Resources
National Sun Yat-Sen University
70 Lien-Hai Rd.
Kaohsiung, Taiwan, 80424
China-Taipei
lowen@mail.nsysu.edu.tw

Denmark

Geneviève Desportes
NAMMCO
c/o Gdnatur, Stejlestræde 9
Kerteminde, DK-5300
Denmark
genevieve@gdnatur.dk

Adolf Karl Kellermann
Science Programme
International Council for the Exploration of the Sea (ICES)
H.C. Andersens Boulevard 44-46
Copenhagen V, DK-1553
Denmark
adi@ices.dk

Jacob Larsen
Biological Institute
University of Copenhagen
IOC Science and Communication Centre on Harmful Algae
Copenhagen, DK-1165
Denmark
jacobl@bio.ku.dk

Hong Kong

Jianping Gan
Department of Mathematics
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon
Hong Kong
magan@ust.hk

Paul J. Harrison
AMCE Program
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon
Hong Kong
harrison@ust.hk

Hongbin Liu
Biology Department
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon
Hong Kong
liuhb@ust.hk

Zhongming Lu
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon
Hong Kong,
luzm@ust.hk

Rudolf S. Wu
Centre for Coastal pollution and Conservation
City University of Hong Kong
Tat Chee Avenue, Kowloon
Hong Kong
bhswu@cityu.edu.hk

Ting Zu
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon
Hong Kong
zutt@ust.hk

Japan

Katsuyuki Abo
Aquaculture Systems Division
National Research Institute of Aquaculture, FRA
422-1 Nakatsu
Minami-ise, Mie, 516-0193
Japan
abo@fra.affrc.go.jp

Maki Noguchi Aita
Ecosystem Change Research Program
Frontier Research Center for Global Change, JAMSTEC
3173-25 Showa-machi, Kanazawa-ku
Yokohama, Kanagawa, 236-0001
Japan
macky@jamstec.go.jp

Participants-2008

Ichiro Aoki

Department of Aquatic Bioscience
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo, 113-8657
Japan
aoki@mail.ecc.u-tokyo.ac.jp

Masahiko Fujii

Graduate School of Environmental Science
Hokkaido University
N10W5 Kita-ku
Sapporo, Hokkaido, 060-0810
Japan
mfujii@ees.hokudai.ac.jp

Tadanori Fujino

Japan Sea Fisheries Resources Division
Japan Sea National Fisheries Research Institute, FRA
1-5939-22 Suido-cho
Niigata, Niigata, 951-8121
Japan
fnori@affrc.go.jp

Arata Fukaya

Satellite Oceanography
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
fukaya@salmon.fish.hokudai.ac.jp

Keiichi Fukushi

Kobe University Graduate School of Maritime Sciences
5-1-1 Fukaeminami-machi, Higashinada-ku
Kobe, 658-0022
Japan
fukushi@maritime.kobe-u.ac.jp

Toshio Furota

Environmental Science
Toho University
2-2-1 Miyama
Funabashi, Chiba, 274-8510
Japan
furota@env.sci.toho-u.ac.jp

Takeaki Hanyuda

Kobe University
Research Center for Inland Seas
Rokkodai 1-1, Nada-ku
Kobe, 657-8501
Japan
hanyut@kobe-u.ac.jp

Toyomitsu Horii

Fisheries Research Agency
National Research Institute of Fisheries Science, FRA
31-1 Nagai, 6-chome
Yokosuka, Kanagawa, 238-0316
Japan
thorii@fra.affrc.go.jp

Kohji Iida

Faculty of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
iidacs@fish.hokudai.ac.jp

Tomonori Isada

Graduate School of Environmental Science
Hokkaido University
North 10, West 5, Kita-ku
Sapporo, Hokkaido, 060-0810
Japan
t-isada@ees.hokudai.ac.jp

Yoichiro Ishibashi

Environmental Risk Assessment Unit
Japan NUS Co., Ltd.
8F Loop-X Bldg., 9-15 Kaigan 3-chome, Minato-ku
Tokyo, 108-0022
Japan
ishibashi@janus.co.jp

Yukimasa Ishida

Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
ishiday@fra.affrc.go.jp

Masao Ishii

Geochemical Research Department
Meteorological Research Institute
1-1 Nagamine
Tsukuba, Ibaraki, 305-0052
Japan
mishii@mri-jma.go.jp

Joji Ishizaka

Faculty of Fisheries
Nagasaki University
1-14 Bunkyo-machi
Nagasaki, Nagasaki, 852-8521
Japan
ishizaka@nagasaki-u.ac.jp

Shigeru Itakura

Resources Enhancement Promotion Department
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo, 100-8907
Japan
itakura@affrc.go.jp

Shin-ichi Ito

Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
goito@affrc.go.jp

Masahide Kaeriyama

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
salmon@fish.hokudai.ac.jp

Hitoshi Kaneko

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo, 164-8639
Japan
kaneko@ori.u-tokyo.ac.jp

Takaomi Kaneko

Graduate School of Agricultural and Life Sciences
The University of Tokyo
1-1-1 Yayoi
Bunkyo, Tokyo, 113-8657
Japan
aa077061@mail.ecc.u-tokyo.ac.jp

Chieko Kato

Graduate School of Agricultural and Life Sciences
The University of Tokyo
37-1-103 Angyoujirin
Kawaguchi, 334-0071
Japan
aa076174@mail.ecc.u-tokyo.ac.jp

Hidehiro Kato

Laboratory of Cetaceans and Marine Mammals
Faculty of Marine Science
Tokyo University of Marine Science and Technology
4-5-7 Konan, Minato-ku
Tokyo, 108-8477
Japan
katohide@kaiyodai.ac.jp

Masaya Katoh

Seikai National Fisheries Research Institute
Ishigaki Tropical Station
Fisheries Research Agency
148-446 Fukai-Ohta
Ishigaki, Okinawa, 907-0451
Japan
mkatoh@fra.affrc.go.jp

Hiroshi Kawai

Research Center for Inland Seas
Kobe University
1-1 Rokkodai, Nada-ku
Kobe, Hyogo, 657-8501
Japan
kawai@kobe-u.ac.jp

Hye Seon Kim

Plankton Laboratory, Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
khs99@fish.hokudai.ac.jp

Michio J. Kishi

Graduate School of Environmental Science
Hokkaido University
N10W5 Kita-ku
Sapporo, Hokkaido, 060-0810
Japan
mjkishi@nifty.com

Toru Kobari

Fisheries Biology and Oceanography, Faculty of Fisheries
Kagoshima University
4-50-20 Shimoarata
Kagoshima, Kagoshima, 890-0056
Japan
kobari@fish.kagoshima-u.ac.jp

Kunio Kohata

Water and Soil Environment Division
National Institute for Environmental Studies (NIES)
16-2 Onogawa
Tsukuba, Ibaraki, 305-8506
Japan
kohata@nies.go.jp

Toikihiro Kono

Marine Biology and Sciences
Tokai University
Minamisawa 5jo 1chome
Sapporo, Hokkaido, 005-8601
Japan
tkono@tspirit.tokai-u.jp

Kenshi Kuma

Faculty of Fisheries Sciences
Hokkaido University
N10W5 Kita-ku
Sapporo, Hokkaido, 060-0810
Japan
kuma@fish.hokudai.ac.jp

Mitsutaku Makino

National Research Institute of Fisheries Science, FRA
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa, 236-8648
Japan
mmakino@affrc.go.jp

Kazushi Miyashita

Laboratory of Marine Ecosystem Change Analysis
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
miyashi@fish.hokudai.ac.jp

Participants-2008

Yasumasa Miyazawa

Frontier Research Center for Global Change
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)
3173-25 Showa-machi, Kanazawa-ku
Yokohama, Kanagawa, 236-0001
Japan
miyazawa@jamstec.go.jp

Kohei Mizobata

Department of Ocean Sciences
Tokyo University of Marine Science and Technology
4-5-7 Kounan
Minato-ku, Tokio, 108-8477
Japan
mizobata@kaiyodai.ac.jp

Akihiko Murata

Institute of Observational Research for Global Change
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC), FRA
2-15 Natsushima-cho
Yokosuka, Kanagawa, 237-0061
Japan
murataa@jamstec.go.jp

Akira Nakadate

Global Environment and Marine Department
Japan Meteorological Agency
1-3-4 Ote-machi, Chiyoda-ku
Tokyo, 100-8122
Japan
a_nakadate@met.kishou.go.jp

Jun Nishioka

Institute of Low Temperature Science
Hokkaido University
N19W8 Kita-ku
Sapporo, Hokkaido 060-0819
Japan
nishioka@lowtem.hokudai.ac.jp

Takumi Nonomura

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo, 164-8639
Japan
nonomura@ori.u-tokyo.ac.jp

Tatsuya Oda

Biochemistry, Faculty of Fisheries
Nagasaki University
1-14 Bunkyo-machi
Nagasaki, 852-8521
Japan
t-oda@nagasaki-u.ac.jp

Suguru Okamoto

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
oka@salmon.fish.hokudai.ac.jp

Yuji Okazaki

Mixed Water Region Fisheries Oceanography Division
Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
okazakiy@affrc.go.jp

Takeshi Okunishi

Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
okunishi@affrc.go.jp

Goh Onitsuka

Department of Fishery Science and Technology
National Fisheries University
2-7-1 Nagata-Hon-machi
Shimonoseki, Yamaguchi, 759-6595
Japan
onizuka@fish-u.ac.jp

Tsuneo Ono

Subarctic Fisheries Oceanography Division
Hokkaido National Fisheries Research Institute, FRA
116 Katsurakoi
Kushiro, Hokkaido, 085-0802
Japan
tono@fra.affrc.go.jp

Takashi Ota

Biological Engineering
Ishinomaki Senshu University
1 Minamisakai
Ishinomaki, Miyagi, 986-8580
Japan
otakashi@isenshu-u.ac.jp

Toshiro Saino

IORG, JAMSTEC
Global Warming Observational Research Program
2-15 Natsushima-cho
Yokosuka 237-0061
Japan
tsaino@jamstec.go.jp

Hiroaki Saito

Biological Oceanography Section
Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
hsaito@affrc.go.jp

Sei-Ichi Saitoh

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
ssaitoh@salmon.fish.hokudai.ac.jp

Yasunori Sakurai

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
sakurai@fish.hokudai.ac.jp

Hiroko Sasaki

Satellite Oceanography
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-0822
Japan
hiro_sasaki@salmon.fish.hokudai.ac.jp

Chiyuki Sassa

Seikai National Fisheries Research Institute, FRA
1551-8 Taira-machi
Nagasaki, 851-2213
Japan
csassa@fra.affrc.go.jp

Masatoshi Sato

Unified Graduate School of Earth and Environmental
Science
Tokai University
Kotobuki 105, 26-7-2-5 Kawazoe, Minamiku
Sapporo, Hokkaido, 005-0805
Japan
8atgd001@mail.tokai-u.jp

Mitsuhide Sato

Graduate School of Agricultural and Life Sciences
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo, 113-8657
Japan
asatom@mail.ecc.u-tokyo.ac.jp

Nobushige Shimizu

Graduate School of Agricultural and Life Sciences
The University of Tokyo
1-1-1 Yayoi
Bunkyo, Tokyo, 113-8657
Japan
retawraelc17@msn.com

Emi Shiraishi

Graduate School of Science and Technology
Tokai University Graduate School
Rumieru Kawazoe #202, 6-3-6-18 Kawazoe
Sapporo, Hokkaido, 005-0806
Japan
8asim005@mail.tokai-u.jp

Takashige Sugimoto

School of Marine Science and Technology
Tokai University
3-20-1 Orido, Shimizu-ku
Shizuoka, Shizuoka Prefecture, 424-8610
Japan
sugimoto@scc.u-tokai.ac.jp

Hiroya Sugisaki

National Research Institute of Fisheries Science, FRA
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa, 236-8648
Japan
sugisaki@affrc.go.jp

Hiroshi Sumata

Graduate School of Environmental Science
Hokkaido University
N10W5 Kita-ku
Sapporo, Hokkaido, 060-0810
Japan
su@ees.hokudai.ac.jp

Shigenori Suzuki

Minamiizu Station, National Center for Stock Enhancement
Fisheries Research Agency
183-2 Irouzaki
Minami-Izu, Shizuoka, 415-0156
Japan
sshige@affrc.go.jp

Toru Suzuki

Marine Information Research Center (MIRC)
Japan Hydrographic Association
6F Daiichi Sogo Bldg., 1-6-6 Hanedakuko, Ota-ku
Tokyo, 144-0041
Japan
suzuki@mirc.jha.jp

Kazuaki Tadokoro

Stock Productivity Section
Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
den@affrc.go.jp

Shigenobu Takeda

Department of Aquatic Bioscience
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo, 113-8657
Japan
atakeda@mail.ecc.u-tokyo.ac.jp

Hiroshige Tanaka

Seikai National Fisheries Research Institute, FRA
1551-8 Taira-machi
Nagasaki, 851-2213
Japan
tanakahs@affrc.go.jp

Participants-2008

Yongjun Tian

Japan Sea Fisheries Resources Division
Japan Sea National Fisheries Research Institute, FRA
1-5939-22 Suido-cho
Niigata, 951-8121
Japan
yjtian@fra.affrc.go.jp

Masaya Toyokawa

Marine Productivity Division
National Research Institute of Fisheries Science, FRA
2-12-4 Fuku-ura Kanazawa-ku
Yokohama, Kanagawa, 236-8648
Japan
mtoyokaw@affrc.go.jp

Atsushi Tsuda

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo, 164-8639
Japan
tsuda@ori.u-tokyo.ac.jp

Nobuo Tsurushima

Institute for Environmental Management Technology
National Institute of Advanced Industrial Science and
Technology
Onogawa, 16-1
Tsukuba, Ibaraki 305-8569
Japan
tsurushima-n@aist.go.jp

Mitsuo Uematsu

Center for International Cooperation
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo, 164-8639
Japan
uematsu@ori.u-tokyo.ac.jp

Hikomichi Ueno

Institute of Observational Research for Global Change
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC), FRA
2-15 Natsushima-cho
Yokosuka, Kanagawa, 237-0061
Japan
uenohiro@jamstec.go.jp

Eitaro Wada

Frontier Research Center for Global Change
Yokohama Institute for Earth Sciences
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC), FRA
3173-25 Showa-machi, Kanazawa-ku
Yokohama, Kanagawa, 236-0001
Japan
wadaei@jamstec.go.jp

Tokio Wada

National Research Institute of Fisheries Engineering
(NRIFE)
Fisheries Research Agency
7620-7 Hazaki, Kamisu-shi
Ibaragi, 314-0408
Japan
wadat@affrc.go.jp

Tomowo Watanabe

National Research Institute of Fisheries Science, FRA
2-12-4 Fukuura, Kanazawa-ku
Yokohama, 236-8648
Japan
wattom@affrc.go.jp

Yasunori Watanabe

National Research Institute of Fisheries and Environment of
Inland Sea, FRA
2-17-5 Maruishi
Hatsukaichi, Hiroshima, 739-0452
Japan
ywat@affrc.go.jp

Masahiro Yagi

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo, 164-8639
Japan
yagi@ori.u-tokyo.ac.jp

Harumi Yamada

Resources Enhancement Promotion Department
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo, 100-8907
Japan
hyamada@affrc.go.jp

Atsushi Yamaguchi

Marine Biology Laboratory (Plankton)
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, 041-8611
Japan
a-yama@fish.hokudai.ac.jp

Orio Yamamura

Hokkaido National Fisheries Research Institute, FRA
116 Katsurakoi
Kushiro, Hokkaido 085-0802
Japan
orioy@affrc.go.jp

Yasuhiro Yamanaka

Faculty of Environmental Earth Science
Hokkaido University
N10W5 Kita-ku
Sapporo, Hokkaido, 060-0810
Japan
galapen@ees.hokudai.ac.jp

Yasuhiro Yamasaki

Biochemistry, Faculty of Fisheries
Nagasaki University
1-14 Bunkyo-machi
Nagasaki, Nagasaki, 852-8521
Japan
f2076@cc.nagasaki-u.ac.jp

Ichiro Yasuda

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo, 164-8639
Japan
ichiro@ori.u-tokyo.ac.jp

Akihiko Yatsu

Seikai National Fisheries Research Institute, FRA
1551-8 Taira-machi
Nagasaki, 851-2213
Japan
yatsua@fra.affrc.go.jp

Takafumi Yoshida

CEARAC (Special Monitoring and Coastal Environmental
Assessment Regional Activity Centre)
Northwest Pacific Action Plan
5-5 Ushijima Shin-machi
Toyama, 930-0856
Japan
yoshida@npec.or.jp

Norway

Ken Drinkwater

Institute of Marine Research
P.O. Box 1870, Nordnes, 33 Nordnesgaten
Bergen, N-5817
Norway
ken.drinkwater@imr.no

People's Republic of China

Shen Anglv

300 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China
shenanglv@163.com

Rongshuo Cai

Third Institute of Oceanography, SOA
178 Daxue Rd.
Xiamen, Fujian, 361005
People's Republic of China
rscai@163.com

Yong Cao

238 SongLing Rd., LaoShan District
Qingdao, 266100
People's Republic of China
caoyong@ouc.edu.cn

Dake Chen

Second Institute of Oceanography, SOA
36 Baochu Bei Rd.
Hangzhou, Zhejiang, 310012
People's Republic of China
dchen@sio.org.cn

Jia-Jie Chen

East China Sea Fisheries Research Institute, Chinese
Academy of Fishery Sciences
300 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China
clhjjcjjcjj@hotmail.com

Jinrui Chen

Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 266100
People's Republic of China
chenjinrui0@163.com

Liqi Chen

Key Lab of Global Change and Marine-Atmospheric
Chemistry
(GCMAC)
Third Institute of Oceanography, SOA
178 Daxue Rd.
Xiamen, Fujian, 361005
People's Republic of China
lqchen@soa.gov.cn

Participants-2008

Shang Chen

Research Center for Marine Ecology
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
qdc@163.com

Xianyao Chen

First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
chenxy@fio.org.cn

Yaqu Chen

East China Sea Fisheries Research Institute, CAFS
300 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China
yaquchen@yahoo.com.cn

Pifu Cong

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
transco@sohu.com

Jing Dong

Marine Fisheries Resources
Marine and Fisheries Science Institute of Liaoning
50 Heishijiao St.
Dalian, Liaoning, 116023
People's Republic of China
dj660228@mail.dlptt.ln.cn

Ling Du

College of Physical and Environmental Oceanography
Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 266100
People's Republic of China
duling@ouc.edu.cn

Xiuning Du

Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 266100
People's Republic of China
duxn1982@163.com

Rizalita Rosalejos Edpalina

Laboratory of Biology and Germplasm Research in
Aquaculture
East China Sea Fisheries Research Institute,
Chinese Academy of Fisheries Science
300 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China

Jingfeng Fan

Department of Marine Environmental Ecology
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
fanjingfeng@163.com

Hongli Fu

Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, 266100
People's Republic of China
fuhongli@ouc.edu.cn

Jia Gao

Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 19851015
People's Republic of China
gaojia109@163.com

Zhongyong Gao

Key Lab of Global Change and Marine-Atmospheric
Chemistry (GCMAC)
Third Institute of Oceanography, SOA
178 Daxue Rd.
Xiamen, Fujian, 361005
People's Republic of China
ZhongyongGAO@gmail.com

Chunjiang Guan

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
fb4680@people.com.cn

Jianfeng He

Polar Research Institute of China
451 Jinqiao Rd.
Pudong, Shanghai, 200136
People's Republic of China
hejianfeng@pric.gov.cn

Jian Hu

East China Sea Fisheries Research Institute, Chinese
Academy of Fisheries Science
300 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China
hujian485@yahoo.com.cn

Chuanlin Huo

Planning and Management Department
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
clhuo@nmemc.gov.cn

Dong Jing

Marine Fishery Resources Division
Liaoning Ocean and Fisheries Science Research Institute
50 Heishijiao St.
Dalian, 116023
People's Republic of China
dj660228@mail.dlptt.ln.cn

Dongmei Li

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
ldmcat@sina.com

Hongbo Li

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
marinepico@126.com

Ruixiang Li

Key Lab for Marine Ecology
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
liruixiang@fio.org.cn

Bin Liang

Department of Marine Environmental Ecology
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
bbiron@126.com

Yubo Liang

Marine Ecological Department
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
ybliang835@126.com

Feng-ao Lin

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
falin316@126.com

Chuanyu Liu

Institute of Oceanology
Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong, 266071
People's Republic of China
liuchuanu@ms.qdio.ac.cn

Renyan Liu

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
ryliu@nmemc.gov.cn

Shu-Xi Liu

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
rathead@sina.com

Xin Liu

State Key Laboratory of Marine Environmental Science
Xiamen University
Si Ming Nan Rd.
Xiamen, Fujian, 361005
People's Republic of China
liuxin1983@xmu.edu.cn

Jing Lu

First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 0086 266061
People's Republic of China
lujing@fio.org.cn

Songhui Lu

Research Center for Harmful Algae and Aquatic
Environment
Jinan University
Tianhe
Guangzhou, Guangdong, 510632
People's Republic of China
lusonghui1963@163.com

Xingang Lü

Key Lab of Marine Science and Numerical Modeling
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
lxg@fio.org.cn

Hao Ma

Department of Engineering Physics
Tsinghua University
Room 14#1414B Building Zijing
Beijing, 100084
People's Republic of China
mahaothu@gmail.com

Xindong Ma

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
mxd007007@163.com

Participants-2008

Guangshui Na

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
gsna@dl.cn

Yong Ni

Lab. of Fishery Environment
East China Sea Fisheries Research Institute
300 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China
shenanglv@163.com

Xiuren Ning

Marine Ecosystem and Biogeochemistry
Second Institute of Oceanography, SOA
36 Baochu Bei Rd.
Hangzhou, Zhejiang, 310012
People's Republic of China
ning_xr@126.com

Fangli Qiao

First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
qiaofl@fio.org.cn

Weimin Quan

East China Sea Fisheries Research Institute, CAFS
300 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China
quanweim@163.com

Jiuxin Shi

Lab of Polar Oceanography and Global Ocean Change
Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 266100
People's Republic of China
shijiuxin@ouc.edu.cn

Qi Shu

State Oceanic Administration
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
shuqiemail@163.com

Zhenya Song

Key Lab of Marine Science and Numerical Modeling
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
songroy@fio.org.cn

Jie Su

College of Physical and Environmental Oceanography
Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 266100
People's Republic of China
sujie@ouc.edu.cn

Song Sun

Key Lab of Marine Ecology and Environmental Sciences
Institute of Oceanology, Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong, 266071
People's Republic of China
sunsong@ms.qdio.ac.cn

Gongke Tan

International Cooperation Office
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
gongke_tan@fio.org.cn

Yong Tang

Ocean Engineering
Dalian Fisheries University
52 Heishijiao St. Shahekou
Dalian, Liaoning, 116023
People's Republic of China
tang@dlfu.edu.cn

Jinhui Wang

Marine Ecological Lab
East China Sea Environmental Monitoring Center, SOA
630 Dongtang Rd., Pudong New District
Shanghai, 200137
People's Republic of China
wfisherd@online.sh.cn

Lijun Wang

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
ljwang@nmemc.gov.cn

Qixiang Wang

Marine Ecological Center
Ocean University of China
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
wqxbx@163.com

Yuheng Wang

College of Physical and Environmental Oceanography
Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 266003
People's Republic of China
yuheng.w@gmail.com

Zhen Wang

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
z_wang@163.com

Hao Wei

Laboratory of Physical Oceanography
Ocean University of China
238 SongLing Rd., LaoShan District
Qingdao, Shandong, 266100
People's Republic of China
shijiehd00@yahoo.com.cn

Zheng Wei

First Institute of Oceanography, SOA
6 Xianxialing Road, Laoshan District
Qingdao, 266061
People's Republic of China
susan0537@163.com

Qilun Yan

Marine Environmental Ecology
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
qilunyan@hotmail.com

Xiaomei Yan

Institute of Oceanology, Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong, 266071
People's Republic of China
yanxiaomei@ms.qdio.ac.cn

Xiuhua Yan

178 Daxue Rd.
Xiamen, Fujian 361005
People's Republic of China
xiufancat@163.com

Jin-Kun Yang

Marine Data Center
National Marine Data and Information Service, SOA
93 Liuwei Rd.
Tianjin, Hedong District, 300171
People's Republic of China
newyjk@126.com

Ziwei Yao

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
zwyao@hotmail.com

Xunqiang Yin

Department of Physical Oceanography
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
yinxq@fio.org.cn

Xiutang Yuan

Department of Marine Environmental Ecology
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
xtyuan7229@126.com

Zhi Zeng

Dept. of Engineering Physics
Tsinghua University
Tsinghua University
Beijing, 100084
People's Republic of China
zengzhi@tsinghua.edu.cn

Jinwen Zhang

Marine Data Center
National Marine Data and Information Service, SOA
93 Liuwei Rd.
Tianjin, Hedong District, 300171
People's Republic of China
zhjw@mail.nmdis.gov.cn

Zhendong Zhang

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
zdzhang@nmemc.gov.cn

Zhifeng Zhang

Marine Environmental Chemistry Division
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
zffzhang@nmemc.gov.cn

Huade Zhao

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning, 116023
People's Republic of China
zhd_v@163.com

Jinping Zhao

238 SongLing Rd., LaoShan District
Qingdao, 266100
People's Republic of China
kjjcowboy@126.com

Participants-2008

Li Zheng

First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
zhengli@fio.org.cn

Guoping Zhu

College of Marine Sciences
Shanghai Ocean University
334 Jungong Rd., Yangpu District
Shanghai, 200090
People's Republic of China
gpzhu@shou.edu.cn

Mingyuan Zhu

Key Lab of Marine Ecology
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
zhumingyuan@fio.org.cn

Philippines

Maria Rebecca Alviar Campos

Southeast Asian Regional Center for Graduate Studies and Research in Agriculture (SEARCA)
10996 Campos Compound, Faculty Village
College, Laguna 4031
Philippines
cmaribec@yahoo.com

Poland

Marta Gluchowska

Marine Ecology
Institute of Oceanology, Polish Academy of Sciences
Powstancow Warszawy 55
Sopot, 81-721
Poland
mgluchowska@iopan.gda.pl

Katarzyna Malgorzata Zmudczyńska

Dept. of Vertebrate Ecology and Zoology
University of Gdańsk
Al. Legionów 9
Gdańsk, 80-441
Poland
kzmud@op.pl

Republic of Korea

Heui Chun An

Department of Fisheries Engineering
National Fisheries R&D Institute, MIFAFF
152-1 Haeanro, Gijang-up, Gijang-gun
Busan, 619-705
Republic of Korea
anhc1@nfrdi.go.kr

Kyung-II Chang

School of Earth and Environmental Sciences
Seoul National University
San 56-1 Shillim-dong, Kwanaka-ku
Seoul, 151-742
Republic of Korea
kichang@snu.ac.kr

Jin-Ho Chae

Korea Environmental Research Center for Hydrosphere
(KEtCH)
634-1 Yi-dong, Sangrok-gu
Ansan, Gyeonggi-do 426-857
Republic of Korea

Soo-Jung Chang

Marine Ecology Research Division
National Fisheries R&D Institute, MIFAFF
408-1 Sirang-ri, Kijang
Busan, 619-902
Republic of Korea
sjchang@nfrdi.go.kr

Joong-Ki Choi

Department of Oceanography
Inha University
253 Yonghyun-dong, Nam-gu
Incheon, 402-751
Republic of Korea
jkchoi@inha.ac.kr

Jung Hwa Choi

National Fisheries R&D Institute, MIFAFF
151-1 Haeam-ro, Gijang-up, Gijang-gun
Busan, 619-705
Republic of Korea
choijh@nfrdi.go.kr

Seok-Gwan Choi

Cetacean Research Institute
National Fisheries R&D Institute, MIFAFF
139-29 Maeam-dong, Nam-gu
Ulsan, 680-050
Republic of Korea
sgchoi@nfrdi.go.kr

Ik-Kyo Chung

Division of Earth Environmental System
Pusan National University
San 30, Jangjun-dong, Geumjung-gu
Busan Metro City, 609-735
Republic of Korea
ikchung@pusan.ac.kr

Woo-Seok Gwak

Division of Marine Bioscience
Gyeongsang National University
Tongyeong, Gyeongnam, 650-160
Republic of Korea
gwakws@yahoo.com

In-Seong Han

Ocean Research Division
National Fisheries R&D Institute, MIFAFF
408-1 Shirang-ri, Gijang-up, Gijang-gun
Busan, 619-902
Republic of Korea
hisjamstec@naver.com

Hyung-Tack Huh

Korea Ocean R&D Institute (KORDI)
1241 Bangbae-dong, Seocho-gu
Seoul, 137-060
Republic of Korea
hthuh@kordi.re.kr

Sik Huh

International Cooperation Division
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul, 425-600
Republic of Korea
spring@kordi.re.kr

In Joon Hwang

Department of Marine Biology
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
fire-joon@hanmail.net

Doan Jeong

Marine Research and Development Team
Ministry of Land, Transport, and Maritime Affairs (MLTM)
88, Gwanmun-ro
Gwacheoun, Gyeonggi-do 427-712
Republic of Korea
doan@mltm.go.kr

Hee-Dong Jeong

Marine Environment Research Team
South Sea Fisheries Research Institute, NFRDI, MIFAFF
347 Anpo-ri, Hwayang-myeon
Yeosu, Cheolanam-do 556-823
Republic of Korea
hdjeong@nfrdi.go.kr

Hyun Do Jeong

Department of Aquatic Life Medicine
Pukyong National University
599-1 Dae Yeon Dong, Nam Ku
Busan, 608-737
Republic of Korea
jeonghd@pknu.ac.kr

Kwang Young Jung

Oceanography & Ocean Environmental Sciences
Chungnam National University
220 Gung-dong, Yuseong-gu
Daejeon, 305-764
Republic of Korea
kyjung@cnu.ac.kr

Kyu-Kui Jung

South Sea Fisheries Research Institute
National Fisheries R&D Institute, MIFAFF
347 Anpo-ri, Hwayang-myeon
Yeosu, Jeollanam-do 556-823
Republic of Korea
kkjung@nfrdi.go.kr

Yejin Jung

Department of Marine Production Management
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 620-6124
Republic of Korea
coromdeo16@hanmail.net

Chang-Keun Kang

Department of Biology
Pusan National University
30 Jangjeon-dong, Geumjeong-gu
Busan, 609-735
Republic of Korea
ckkang@pusan.ac.kr

Participants-2008

Hyung-Ku Kang

Marine Living Resources Research Department
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul, 425-600
Republic of Korea
kanghk@kordi.re.kr

Hyun-Jung Kang

National Fisheries R&D Institute, MIFAFF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan, 619-902
Republic of Korea
khj820214@nate.com

Young-Shil Kang

Marine Ecology Research Team
National Fisheries R&D Institute, MIFAFF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan, 619-705
Republic of Korea
yskang@nfrdi.go.kr

Hak-Gyoon Kim

Department of Oceanography
Pukyong National University
Lotte Nakchondae Apt. 102 Dong, 1405 Ho, Jung-1-dong, H
Busan, 612-870
Republic of Korea
hgkim7592@yahoo.co.kr

Hongsun Kim

GeoSystem Research Co.
306, 1-40 HanlimHuman Tower, Geumjung-dong
Gunpo, Kunggi-do, 435824
Republic of Korea
hskim@geosr.com

Hyun Woo Kim

Department of Marine Biology
Pukyong National University
559-1 Daeyeon 3-dong, Nam-gu
Busan, 608 737
Republic of Korea
orcinus@pknu.ac.kr

Jeonghwa Kim

Marine Research and Development Division
Ministry of Land, Transport, and Maritime Affairs (MLTM)
88, Gwanmun-ro
Gwacheon-City, Gyeonggi-do 427-712
Republic of Korea
goodpo@mltm.go.kr

Jin Koo Kim

Department of Marine Biology
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
taengko@hanmail.net

Jin-Yeong Kim

Fisheries Resources Division
National Fisheries R&D Institute, MIFAFF
408-1 Shirang-ri, Gijang-up, Gijang-gun
Busan, 619-705
Republic of Korea
jiykim@nfrdi.go.kr

Ju Heon Kim

Department of Aquatic Life Medicine
Pukyong National University
599-1 Dae Yeon Dong, Nam Ku
Busan, 608-737
Republic of Korea
3867house@hanmail.net

Jung Nyun Kim

Fisheries Research Division
National Fisheries R&D Institute, MIFAFF
151-1 Haeon-ro, Gijang-up, Gijang-gun
Busan, 619-705
Republic of Korea
crangonk@nfrdi.go.kr

Jung-Jin Kim

Department of Marine Biology
Pukyong National University
559-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
theocean81@hotmail.com

Kwang Hoon Kim

Marine Production Management
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
kh_kim@pknu.ac.kr

Kwang Il Kim

Department of Aquatic Life Medicine
Pukyong National University
599-1 Dae Yeon Dong, Nam Ku
Busan, 608-737
Republic of Korea
epinep@hanmail.net

Kyung-Ryul Kim

School of Earth and Environmental Sciences
Seoul National University
San 56-1 Shillim-dong, Kwanaka-ku
Seoul, 151-747
Republic of Korea
krkim@snu.ac.kr

Miju Kim

School of Earth and Environmental Sciences
Seoul National University
Gwanak-ro 599, Shillim9-dong, Gwanak-gu
Seoul, 151-742
Republic of Korea
lovely0@snu.ac.kr

Suam Kim

Department of Marine Biology
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
suamkim@pknu.ac.kr

Young Jin Kim

Department of Aquatic Life Medicine
Pukyong National University
599-1 Dae Yeon dong, Nam-ku
Busan, 608-737
Republic of Korea
dusk37@hanmail.net

Hyeok Chan Kwon

Department of Fisheries Physics
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-093
Republic of Korea
hckwon98@pknu.ac.kr

You-Jung Kwon

Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
youjungkwon@gmail.com

Chungho Lee

Chungnam National University
220 Gung-dong, Youseong-gu
Daejeon, 305-764
Republic of Korea
chungholee@cnu.ac.kr

Hye-Eun Lee

National Fisheries R&D Institute, MIFAFF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan, 619-705
Republic of Korea
helee@nfrdi.go.kr

Jong Hee Lee

Marine Production Management
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
francis@pknu.ac.kr

Jyun Lee

Department of Life Science
Hanyang University
Haengdang-dong Seongdong-gu
Seoul, 133-791
Republic of Korea
jylee0409@hotmail.com

Tongsup Lee

Department of Marine Science
Pusan National University
Changjeon-2 dong,
Busan, 609-735
Republic of Korea
tlee@pusan.ac.kr

Hyun-Jeong Lim

Researching Planning Team
National Fisheries R&D Institute, MIFAFF
408-1 Shirang-ri, Gijang-eup, Gijang-gun
Busan, 619-902
Republic of Korea
hjlim@nfrdi.go.kr

Jung Hyun Lim

Department of Fisheries Physics
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
ljh1113@hanmail.net

Wol-Ae Lim

Aquaculture Environment Institute
National Fisheries R&D Institute, MIFAFF
361-Yeongun-ri, Sanyang-up
Tongyeong, 650-943
Republic of Korea
limwa@nfrdi.go.kr

Jeong Hee Nam

Department of Aquatic Life Medicine
Pukyong National University
599-1 Dae Yeon Dong, Nam Ku
Busan, 608-737
Republic of Korea
girini2000@hanmail.net

Chung Youl Park

Division of Marine Bioscience
Gyeongsang National University
Inpyeong-dong
Tongyeong, 650-160
Republic of Korea
cndduf@nate.com

Hee Won Park

Marine Production Management
Pukyong National University
559-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
hwpark@pknu.ac.kr

Jeung-Sook Park

Northwest Pacific Action Plan
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan, 619 902
Republic of Korea
jeungsook.park@nowpap.org

Participants-2008

Kyeong Dong Park

Marine Biology
Pukyong National University
599-1, Daeyeon 3-Dong, Nam-gu
Busan, 608-737
Republic of Korea
bluejuve@daum.net

Young-Jae Ro

College of Natural Sciences
Chungnam National University
220 Gung-dong, Yuseong-gu
Daejeon, 305-764
Republic of Korea
royoungj@cnu.ac.kr

Jung Hwa Ryu

RJH Marine Research Institute
444-10, Gaya 3-dong
Busan, 614-803
Republic of Korea
okdom-ryu@hanmail.net

Jiho Seo

Department of Oceanography
Inha University
253 Yonghyun-dong, Nam-gu
Incheon, 402-751
Republic of Korea
seojiho@inhaian.net

Young-II Seo

Fisheries Resources Division
South Sea Fisheries Research Institute, NFRDI, MIFAFF
347 Anpo-ri, Hwayang-myeon
Yeosu, 556-823
Republic of Korea
seoyi@nfrdi.go.kr

Ki Won Shin

Department of Aquatic Life Medicine
Pukyong National University
599-1 Dae Yeon Dong, Nam Ku
Busan, 608-737
Republic of Korea
okbody77@pknu.ac.kr

Kyung-Jun Song

Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
kjsong329@hanmail.net

Young-Sang Suh

Ocean and Marine Environment Department
National Fisheries R&D Institute, MIFAFF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan, 619-900
Republic of Korea
yssuh@nfrdi.go.kr

Eun-Jin Yang

Marine Environment Research Division
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Ansan, 425-600
Republic of Korea
ejyang@kordi.re.kr

Sang-Wook Yeh

Ocean Climate and Environment
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Ansan, 425-600
Republic of Korea
swyeh@kordi.re.kr

In-Ja Yeon

Fishery Resources Division
West Sea Fisheries Research Institute, NFRDI, MIFAFF
707 Eulwang-dong, Jung-gu
Incheon, 400-420
Republic of Korea
ijyeon@nfrdi.go.kr

Sinjae Yoo

Marine Living Resources Division
Korea Ocean R&D Institute (KORDI)
1270 Sa-dong
Ansan, 426-170
Republic of Korea
sjyoo@kordi.re.kr

Moongeun Yoon

Faculty of Marine Bioscience and Technology
Kangnung National University
123 Jhibyeon-dong
Gangneung, 210-702
Republic of Korea
mgyoon5@hotmail.com

Sang Chul Yoon

Fisheries Resources Research
East Sea Fisheries Research Institute, NFRDI, MIFAFF
30-6, Dongdeok-Ri, Yeonkon-Myeon
Gangnung, Gangwon-do 210-861
Republic of Korea
yoonsc@mltm.go.kr

Chang-Ik Zhang

Marine Production Management
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan, 608-737
Republic of Korea
cizhang@pknu.ac.kr

Russia**Anastasiya A. Abrosimova**

General Oceanology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
amber84@bk.ru

Andrey G. Andreev

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
andreev@poi.dvo.ru

Evgeniy I. Barabanshchikov

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
barabanshchikov@tinro.ru

Lev N. Bocharov

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
bocharov@tinro.ru

Victor Bugaev

Kamchatka Research Institute of Fisheries and
Oceanography
(KamchatNIRO)
18 Naberezhnaya St.
Petropavlovsk-Kamchatsky 683600
Russia
bugaevv@kamniro.ru

Alexey V. Bulanov

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
lotar85@gmail.com

Elena Dmitrieva

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
e_dmitrieva@poi.dvo.ru

Valeriy Fadeev

Institute of Marine Biology, FEB RAS
17 Palchevskogo Street
Vladivostok, Primorsky Krai 690041
Russia
vfadeev@mail.primorye.ru

Natalia P. Fadeeva

Department of Ecology
Far Eastern State University
27 Oktyabrskaya St., Room 404
Vladivostok, Primorsky Krai 690950
Russia
nfadeeva@mail.primorye.ru

Larissa A. Gayko

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
gayko@yandex.ru

Alexander I. Glubokov

Russian Federal Research Institute of Fisheries and
Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow, 107140
Russia
glubokov@vniro.ru

Dmitry D. Kaplunenko

Department of Satellite Oceanology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
dimkap@poi.dvo.ru

Oleg N. Katugin

Fisheries Resources of the Far Eastern Seas
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
katugin@tinro.ru

Fedor F. Khrapchenkov

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
fedi@poi.dvo.ru

Participants-2008

Anastasia M. Khrustaleva

Russian Federal Research Institute of Fisheries and Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow, 107140
Russia
mailfed@mail.ru

Talgat R. Kilmatov

Pacific State Economics University
19 Okeansky Pr.
Vladivostok, Primorsky Krai 690950
Russia
talgat_k@mail.ru

Nikoliona Petkova Kovatcheva

Laboratory of Crustacean Reproduction
Russian Federal Research Institute of Fisheries and Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow, 107140
Russia
nikolinak@mail.ru

Andrei S. Krovnin

Laboratory of Climatic Bases of Bioproductivity
Russian Federal Research Institute of Fisheries and Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow, 107140
Russia
akrovnin@vniro.ru

Olga I. Kursova

Informational Technology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
kursova@poi.dvo.ru

Victor I. Kuzin

Mathematical Modeling of the Atmosphere and Ocean Physics
Siberian Division of the Russian Academy of Sciences
6 Lavrentieva Ave.
Novosibirsk, 630090
Russia
kuzin@sscc.ru

Vyacheslav S. Labay

Hidrobiological Laboratory
Sakhalin Research Institute of Fisheries and Oceanography (SakhNIRO)
196 Komsomolskaya St.
Yuzhno-Sakhalinsk, Sakhalin 693023
Russia
Labay@sakhniro.ru

Svetlana Yu. Ladychenko

Physical Oceanology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
svemos@poi.dvo.ru

Vyacheslav B. Lobanov

Deputy Director
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
lobanov@poi.dvo.ru

Olga N. Lukyanova

Laboratory of Applied Ecology and Ecotoxicology
Pacific Research Institute of Fisheries and Oceanography (TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
onlukyanova@tinro.ru

Ludmila I. Mezentceva

Long Range Weather Forecast
FERHRI
24 Fontannaya St.
Vladivostok, Primorsky Krai 690091
Russia
lmezenceva@ferhri.ru

Georgiy S. Moiseenko

Information Systems Laboratory
Russian Federal Research Institute of Fisheries and Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow, 107140
Russia
georgem@vniro.ru

Valentina V. Moroz

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
moroz@poi.dvo.ru

Tatiana Vladimirovna Morozova

Institute of Marine Biology, FEB RAS
17 Palchevskogo St.
Vladivostok, 690041
Russia
tatiana_morozova@mail.ru

Ahat A. Nabiullin

Informational Technology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
ahatnabi@poi.dvo.ru

Vadim V. Navrotsky

General Oceanology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
navrotskyv@poi.dvo.ru

Alexei M. Orlov

Russian Federal Research Institute of Fisheries and
Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow, 107140
Russia
orlov@vniro.ru

Vladimir I. Ponomarev

Physical Oceanography
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
pvi711@yandex.ru

Vasily Radashevskiy

Russian Academy of Sciences
Institute of Marine Biology, FEB RAS
17 Palchevskogo St.
Vladivostok, Primorsky Krai 690041
Russia
radashevskiy@hotmail.com

Natalia I. Rudykh

Laboratory of Ocean Information and Ocean Monitoring
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
64 Kirov St., Apt. 338
Vladivostok, Primorsky Krai 690068
Russia
rudykh@poi.dvo.ru

Pavel Salyuk

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
pavel.salyuk@gmail.com

Nina I. Savelieva

V.I. Il'ichev Pacific Oceanological Institute (POI), FEB
RAS
43 Baltiyskaya Street
Vladivostok, Primorsky Krai 690041
Russia
nina@poi.dvo.ru

Tatyana Semenova

Interdept
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
interdept@tinro.ru

Georgy Shevchenko

Russian Academy of Sciences
Institute of Marine Geology and Geophysics
1-b Nauki St.
Yuzhno-Sakhalinsk, Sakhalin 693022
Russia
shevchenko@imgg.ru

Igor I. Shevchenko

Department of Information Technology
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
igor@tinro.ru

Elena A. Shtraikhert

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
straj@poi.dvo.ru

Mikhail Simokon

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
scheglov@tinro.ru

Eduard Spivak

Laboratory of Arctic Research
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
stilo@poi.dvo.ru

Mikhail Stepanenko

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
stepanenko@tinro.ru

Dmitry S. Strobykin

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
doom46@yandex.ru

Evgeniya A. Tikhomirova

Laboratory of Hydrology Processes and Climate
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
tikhomirova@poi.dvo.ru

Participants-2008

Pavel Ya. Tishchenko

Head, Hydrochemistry Laboratory
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
tpavel@poi.dvo.ru

Petr P. Tishchenko

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
talib@hotmail.ru

Tatyana I. Tolstyak

Kamchatka Research Institute of Fisheries and
Oceanography
(KamchatNIRO)
18 Naberezhnaya St.
Petropavlovsk-Kamchatsky, Kamchatka 683000
Russia
bugaevv@kamniro.ru

Olga Yu. Tyurneva

Institute of Marine Biology, FEB RAS
98-65 Oceanskiy Pr.
Vladivostok, Primorsky Krai 690002
Russia
olga-tyurneva@yandex.ru

Elena I. Ustinova

Laboratory of Fisheries Oceanography
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
eustinova@mail.ru

Anatoliy Velikanov

State Committee for Fisheries of the Russian Federation
Sakhalin Research Institute of Fisheries and Oceanography
(SakhNIRO)
196 Komsomolskaya St.
Yuzhno-Sakhalinsk, Sakhalin 693023
Russia
velikanov@sakhniro.ru

Elena Vilyanskaya

Laboratory of Hydrology Processes and Climate
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
vily05@mail.ru

Gennady I. Yurasov

General Oceanography
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
yug@poi.dvo.ru

Sergei P. Zakharkov

General Oceanology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Krai 690041
Russia
zakharkov@poi.dvo.ru

Yury I. Zuenko

Japan Sea and North-West Pacific Oceanography
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Krai 690950
Russia
zuenko@tinro.ru

Spain

Monica Lion

IOC-IEO Science and Communication Centre on Harmful Algae
Instituto Español de Oceanografía, Centro Oceanográfico
Vigo, Pontevedra 36200
Spain

U.S.A.

Kevin H. Amos

Aquaculture Program
NOAA Fisheries/NOAA Aquaculture Program
8924 Libby RD NE
Olympia, WA 98506
U.S.A.
kevin.amos@noaa.gov

Jack A. Barth

College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR 97331-5503
U.S.A.
barth@coas.oregonstate.edu

Harold (Hal) P. Batchelder

College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR 97331-5503
U.S.A.
hbatchelder@coas.oregonstate.edu

Hongsheng Bi

Hatfield Marine Science Center, CIMRS
Oregon State University
2030 SE Marine Science Dr.
Newport, OR 97365
U.S.A.
hongsheng.bi@oregonstate.edu

George W. Boehlert

Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR 97365-5296
U.S.A.
george.boehlert@oregonstate.edu

Steven J. Bograd

Environmental Research Division
Southwest Fisheries Science Center, NMFS, NOAA
1352 Lighthouse Ave.
Pacific Grove, CA 93950
U.S.A.
steven.bograd@noaa.gov

Russell Bradley

Marine Ecology Division
PRBO Conservation Science
3820 Cypress Dr. #11
Petaluma, CA 94954
U.S.A.
rbradley@prbo.org

Fei Chai

School of Marine Sciences
University of Maine
5706 Aubert Hall
Orono, ME 04469
U.S.A.
fchai@maine.edu

William P. Cochlan

Romberg Tiburon Center for Environmental Studies
San Francisco State University
3152 Paradise Dr.
Tiburon, CA 94920-1205
U.S.A.
cochlan@sfsu.edu

Lee William Cooper

Chesapeake Biological Laboratory
University of Maryland Center for Environmental Science
1 Williams St., PO Box 38
Solomons, MD 20688
U.S.A.
cooper@cbl.umces.edu

Keith R. Criddle

Fisheries Division--SFOS
University of Alaska Fairbanks
11120 Glacier Hwy
Juneau, AK 99801
U.S.A.
k.criddle@uaf.edu

Enrique N. Curchitser

Institute for Marine and Coastal Sciences
Rutgers University
71 Dudley Rd.
New Brunswick, NJ 08901
U.S.A.
enrique@marine.rutgers.edu

Michael J. Dagg

Louisiana Universities Marine Consortium
8124 Hwy 56
Chauvin, LA 70344
U.S.A.
mdagg@lumcon.edu

Emanuele Di Lorenzo

School of Earth and Atmospheric Sciences
Georgia Institute of Technology
311 Ferst Dr.
Atlanta, GA 30332
U.S.A.
edl@gatech.edu

Tal Ezer

Center for Coastal Physical Oceanography
Old Dominion University
4111 Monarch Way
Norfolk, VA 23508
U.S.A.
tezer@odu.edu

Blake Edward Feist

Environmental Conservation Division
Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA 98112
U.S.A.
Blake.Feist@noaa.gov

David Lincoln Fluharty

School of Marine Affairs
University of Washington
3707 Brooklyn Ave. NE
Seattle, WA 98105
U.S.A.
fluharty@u.washington.edu

David Foley

Joint Institute for Marine and Atmospheric Research
University of Hawaii at Manoa
1352 Lighthouse Ave.
Pacific Grove, CA 93950
U.S.A.
dave.foley@noaa.gov

Participants-2008

Marsha L. Gear

University of California
California Sea Grant
9500 Gilman Dr., Dept. 0232
La Jolla, CA 92093-0232
U.S.A.
mgear@ucsd.edu

Rolf Grading

School of Fisheries and Ocean Sciences
245 O'Neill Bldg.
Fairbanks, AK 99775-7220
U.S.A.
rgrading@ims.uaf.edu

Edwin DeHaven Grosholz

Environmental Science and Policy
University of California, Davis
One Shields Ave.
Davis, CA 95616
U.S.A.
tedgrosholz@ucdavis.edu

Lei Guo

University of Alaska Fairbanks
118 Trident Way
Kodiak, AK 99615-7401
U.S.A.
guo@sfos.uaf.edu

Lawrence C. Hamilton

Sociology Department
University of New Hampshire
Horton Social Science Center
Durham, NH 03824
U.S.A.
Lawrence.Hamilton@unh.edu

Paul Heimowitz

U.S. Fish and Wildlife Service, Region 1
911 NE 11th Ave.
Portland, OR 97232-4181
U.S.A.
paul_heimowitz@fws.gov

Albert J. Hermann

Joint Institute for the Study of Atmosphere and Ocean
(JISAO)
University of Washington
7600 Sand Point Way NE, NOAA/PMEL
Seattle, WA 98115
U.S.A.
Albert.J.Hermann@noaa.gov

Anne B. Hollowed

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA 98115-6349
U.S.A.
Anne.Hollowed@noaa.gov

Evan A. Howell

Ecosystems and Oceanography
Pacific Islands Fisheries Science Center, NMFS, NOAA
2570 Dole St.
Honolulu, HI 96822
U.S.A.
evan.howell@noaa.gov

George L. Hunt, Jr.

School of Aquatic and Fishery Sciences
University of Washington
P.O. Box 355020
Seattle, WA 98195
U.S.A.
geohunt2@u.washington.edu

Jaime Jahncke

Marine Ecology Division
PRBO Conservation Science
3820 Cypress Dr. #11
Petaluma, CA 94954
U.S.A.
jjahncke@prbo.org

Meibing Jin

International Arctic Research Center
University of Alaska Fairbanks
930 Koyukuk Dr.
Fairbanks, AK 99775-7340
U.S.A.
ffjm@uaf.edu

Alexander Kozyr

Carbon Dioxide Information Analysis Center (CDIAC)
Env. Sci. Div., Oak Ridge National Lab.,
U.S. Dept. of Energy
Bldg. 1509, MS 6335
Oak Ridge, TN 37831-6335
U.S.A.
kozyra@ornl.gov

Gordon H. Kruse

School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
17101 Point Lena Loop Rd.
Juneau, AK 99801
U.S.A.
Gordon.Kruse@uaf.edu

Henry Lee II

Pacific Coastal Ecology Branch
U.S. EPA
2111 SE Marine Science Dr.
Newport, OR 97365
U.S.A.
lee.henry@epa.gov

Hui Liu

Cooperative Institute for Marine Resources Studies, HMSC
Oregon State University
2030 SE Marine Science Dr.
Newport, OR 97365
U.S.A.
hui.liu@oregonstate.edu

Patricia Livingston

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA 98115-6349
U.S.A.
Pat.Livingston@noaa.gov

Stewart Allen Macklin

Ocean Environment Research Division
Pacific Marine Environmental Laboratory, OAR/NOAA
7600 Sand Point Way NE
Seattle, WA 98115-6349
U.S.A.
allen.macklin@noaa.gov

Bernard A. Megrey

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA 98115-6349
U.S.A.
Bern.Megrey@noaa.gov

Jennifer L. Menkel

Cooperative Institute for Marine Resources Studies, HMSC
Oregon State University
2030 SE Marine Science Dr.
Newport, OR 97365
U.S.A.
jennifer.menkel@oregonstate.edu

Charles B. Miller

College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR 97331-5503
U.S.A.
cmiller@coas.oregonstate.edu

Franz Josef Mueter

School of Fisheries and Ocean Sciences, Juneau Center
University of Alaska Fairbanks
17101 Point Lena Loop Rd.
Juneau, AK 99801
U.S.A.
franz.mueter@uaf.edu

Phillip R. Mundy

Auke Bay Laboratories/TSMRI
Alaska Fisheries Science Center, NMFS, NOAA
17109 Point Lena Loop Rd.
Juneau, AK 99801
U.S.A.
Phil.mundy@noaa.gov

Jeffrey M. Napp

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA 98115-6349
U.S.A.
Jeff.Napp@noaa.gov

James E. Overland

Pacific Marine Environmental Laboratory
Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA 98115-6349
U.S.A.
James.E.Overland@noaa.gov

Minling Pan

NOAA Fisheries
Pacific Islands Fisheries Science Center, NMFS, NOAA
2570 Dole St.
Honolulu, HI 96822
U.S.A.
Minling.Pan@noaa.gov

Judith Pederson

MIT Sea Grant College Program
Massachusetts Institute of Technology
252 Main St., Room E38-300
Cambridge, MA 02139
U.S.A.
jpederso@mit.edu

William T. Peterson

NOAA-Fisheries, Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR 97365
U.S.A.
Bill.Peterson@noaa.gov

Jeffrey J. Polovina

Ecosystems and Oceanography Division
Pacific Islands Fisheries Science Center, NMFS, NOAA
2570 Dole St.
Honolulu, HI 96822
U.S.A.
Jeffrey.Polovina@noaa.gov

Samuel G. Pooley

NOAA Fisheries Service
Pacific Islands Fisheries Science Center, NMFS, NOAA
2570 Dole St.
Honolulu, HI 96822-2396
U.S.A.
samuel.pooley@noaa.gov

Deborah Ann Reusser

USGS-Western Fisheries Research Center at Marine
Hatfield
Science Center
2111 SE Marine Science Dr.
Newport, OR 97365
U.S.A.
dreusser@usgs.gov

Participants-2008

Steve Rumrill

Department of Biology
University of Oregon
63466 Boat Basin Dr.
Charleston, OR 97420
U.S.A.
Steve.Rumrill@state.or.us

Jarrold Santora

Farallon Institute for Advanced Ecosystem Research
P.O. Box 750756
Petaluma, CA 10314
U.S.A.
jasantora@gmail.com

Caroline Tracy Shaw

Cooperative Institute for Marine Resources Studies, HMSC
Oregon State University
2030 SE Marine Science Dr.
Newport, OR 97365
U.S.A.
tracy.shaw@noaa.gov

John E. Stein

Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA 98112-2097
U.S.A.
John.E.Stein@noaa.gov

Suzanne Strom

Shannon Point Marine Center
Western Washington University
1900 Shannon Point Rd.
Anacortes, WA 98221-4042
U.S.A.
Suzanne.Strom@wwu.edu

George Sugihara

Scripps Institution of Oceanography, University of California
San Diego
UCSD MC0202, 9500 Gilman Dr.
La Jolla, CA 92093-0202
U.S.A.

William Sunda

Beaufort Laboratory
National Ocean Service, NOAA
101 Pivers Island Rd.
Beaufort, NC 28516
U.S.A.
bill.sunda@noaa.gov

William J. Sydeman

President/Senior Scientist
Farallon Institute for Advanced Ecosystem Research
P.O. Box 750756
Petaluma, CA 94975
U.S.A.
wsydeman@comcast.net

Vera L. Trainer

Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA 98112
U.S.A.
Vera.L.Trainer@noaa.gov

Brian Voss

NOAA Seattle Library
E/OC43 - Bldg.3, 7600 Sand Point Way NE
Seattle, WA 98115-6349
U.S.A.
brian.voss@noaa.gov

Thomas C. Wainwright

Northwest Fisheries Science Center
NOAA Fisheries
2032 SE OSU Dr.
Newport, OR 97365-5296
U.S.A.
thomas.wainwright@noaa.gov

Muyin Wang

Joint Institute for the Study of Atmosphere and Ocean (JISAO)
University of Washington
7600 Sand Point Way NE
Seattle, WA 98115
U.S.A.
muyin.wang@noaa.gov

Mark L. Wells

School of Marine Sciences
University of Maine
5741 Libby Hall
Orono, ME 04469
U.S.A.
mlwells@maine.edu

Stephani G. Zador

REFM
NOAA Alaska Fisheries Science Center
7600 Sand Point Way NE, Bldg. 4
Seattle, WA 98115
U.S.A.
stephani.zador@noaa.gov

Jie Zheng

Division of Commercial Fisheries
Alaska Department of Fish and Game
P.O. Box 115526
Juneau, AK 99811-5526
U.S.A.
jie.zheng@alaska.gov

Meng Zhou

Environmental, Earth and Ocean Sciences
University of Massachusetts Boston
100 Morrissey Blvd.
Boston, MA 02125
U.S.A.
meng.zhou@umb.edu

United Kingdom

Julian Icarus Allen
Plymouth Marine Laboratory
Prospect Place
Plymouth, PL1 3DH
United Kingdom
jia@pml.ac.uk

Robert Royds Dickson
AEP3
CEFAS
The Laboratory, Pakefield Rd.
Lowestoft, Suffolk NR33 0HT
United Kingdom
r.r.dickson@cefas.co.uk

Manuel Barange
GLOBEC International Project Office
Plymouth Marine Laboratory
Prospect Place
Plymouth, Devon PL1 3DH
United Kingdom
m.barange@pml.ac.uk

Organizations

Representatives of organizations who are primarily involved in PICES scientific activities are listed here by name only. Their contact information can be found under their respective countries.

AOOS

Phillip R. Mundy
Alaska Fisheries Science Center, NMFS, NOAA
17109 Point Lena Loop Rd.
Juneau, AK, 99801
U.S.A.
Phil.mundy@noaa.gov

APEC-MRC

Gongke Tan
First Institute of Oceanography, SOA
6 Xian-Xia Ling Road, Hi-Tech Park, LaoShan District
Qingdao, Shandong, 266061
People's Republic of China
gongke_tan@fio.org.cn

Argo

Dake Chen
Second Institute of Oceanography, SOA
36 Baochu Bei Rd.
Hangzhou, Zhejiang, 310012
People's Republic of China
dchen@sio.org.cn

BEST

George L. Hunt, Jr.
School of Aquatic and Fishery Sciences
University of Washington
P.O. Box 355020
Seattle, WA, 98195
U.S.A.
geohunt2@u.washington.edu

CLIVAR/WCRP

Dongxiao Wang
South China Sea Inst. of Oceanography
Chinese Academy of Sciences
164 west Xingang Road
Guangzhou, 510301
People's Republic of China
dxwang@scsio.ac.cn

ESSAS

Kenneth Drinkwater
Institute of Marine Research
Box 1870, Nordnes
Bergen, N-5817
Norway
ken.drinkwater@imr.no

GLOBEC

Manuel Barange
GLOBEC International Project Office
Plymouth Marine Laboratory
Prospect Place
Plymouth, Devon PL1 3DH
United Kingdom
m.barange@pml.ac.uk

GESAMP

Rudolf Wu
City University of Hong Kong
Centre for Coastal Pollution and Conservation
Tat Chee Avenue, Kowloon, Hong Kong
bhrrswu@cityu.edu.hk

Participants-2008

IMBER

Hiroaki Saito

Biological Oceanography Section
Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
hsaito@affrc.go.jp

IOC of UNESCO

Patricio Bernal

IOC-UNESCO
1, rue Miollis
Paris, Cedex 15, 75015
France
p.bernal@unesco.org

IAMSLIC

Brian Voss

NOAA Seattle Library
E/OC43 - Bldg.3, 7600 Sand Point Way NE
Seattle, WA, 98115
U.S.A.
brian.voss@noaa.gov

ICES

Adolf Kellermann

International Council for the Exploration of the Sea
Science Programme
H.C. Andersens Blvd. 44-46
Copenhagen V, DK-1553
Denmark
adi@ices.dk

IWC

Hidehiro Kato

Laboratory of Cetaceans and Marine Mammals, Faculty of
Marine Science
Tokyo University of Marine Science and Technology
4-5-7 Konan, Minato-ku
Tokyo, 108-8477
Japan
katohide@kaiyodai.ac.jp

NPAFC

Yukimasa Ishida

Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi, 985-0001
Japan
ishiday@fra.affrc.go.jp

NANOOS

Jack Barth

College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR, 97331-5503
U.S.A.
barth@coas.oregonstate.edu

NOWPAP

Jeung Sook Park

Northwest Pacific Action Plan
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan, 619 902
Republic of Korea
jeungsook.park@nowpap.org

PaCOOS

John Stein

Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA, 98112-2097
U.S.A.
John.E.Stein@noaa.gov

PAG

Sandy Shan

Polar Research Institute of China
Planning and Science Division
Shanghai, 200136
People's Republic of China
syy@pric.gov.cn

SAHFOS

Sonia Batten

Sir Alister Hardy Foundation for Ocean Science
4737 Vista View Crescent
Nanaimo, BC, V9V 1N8
Canada
soba@sahfos.ac.uk

SOLAS

Shigenobu Takeda

Department of Aquatic Bioscience
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo, 113-8657
Japan
atakeda@mail.ecc.u-tokyo.ac.jp

PICES

Tokio Wada

PICES Chairman
Fisheries Research Agency
Queen's Tower B 15F
2-3-3 Minato Mirai, Nishi-ku
Yokohama, 220-6115
Japan
wadat@affrc.go.jp

John E. Stein

Science Board Chairman
Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA, 98112-2097
U.S.A.
John.E.Stein@noaa.gov

Alexander Bychkov

Executive Secretary
PICES Secretariat
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
bychkov@pices.int

Christina Chiu

Deputy Executive Secretary on Administration
PICES Secretariat
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
christina@pices.int

Stewart (Skip) M. McKinnell

Deputy Executive Secretary
PICES Secretariat
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
mckinnell@pices.int

Rosalie Rutka

PICES Administrative Assistant
PICES Secretariat
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
rrutka@pices.int

Julia Yazvenko

Database and Web Administrator
PICES Secretariat
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
secretariat@pices.int

Keyseok Choe

PICES Intern
PICES Secretariat
P.O. Box 6000
Sidney, BC V8L 4B2
Canada
Choe@pices.int

MEMBERSHIP

(as of October 2008)

Canada

Barbara Adams (SG-COM)

Fisheries and Oceans Canada
Strategic Science Outreach
200 Kent St.
Ottawa, ON
Canada K1A 0E6
E-mail: AdamsB@dfo-mpo.gc.ca

Sonia D. Batten (CPR-AP)

Sir Alister Hardy Foundation for Ocean Science
4737 Vista View Crescent
Nanaimo, BC
Canada V9V 1N8
E-mail: soba@sahfos.ac.uk

Richard J. Beamish (FIS, CCCC)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: BeamishR@pac.dfo-mpo.gc.ca

Robin Brown (F&A, TCODE)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 1J6
E-mail: robin.brown@dfo-mpo.gc.ca

James Christian (POC, CC-S, WG-20)

CC-S Co-Chairman
Fisheries and Oceans Canada
Canadian Centre for Climate Modelling and Analysis
c/o University of Victoria
P.O. Box 3065, STN CSC
Victoria, BC
Canada V8W 3V6
E-mail: jim.christian@ec.gc.ca

William R. Crawford (CCCC, CFAME, WG-22)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: CrawfordB@pac.dfo-mpo.gc.ca

Michael G. Foreman (SB, POC, WG-20, SG-FISP, IP-WT)

POC Committee Chairman, WG-20 Co-Chairman
Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: mike.foreman@dfo-mpo.gc.ca

Moirá Donald Galbraith (WG-23)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: galbraithm@pac.dfo-mpo.gc.ca

Graham E. Gillespie (WG-21)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: Graham.Gillespie@dfo-mpo.gc.ca

John Holmes (TCODE)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: holmesj@pac.dfo-mpo.gc.ca

Glen Jamieson (SB, MEQ, WGEBM)

MEQ Chairman, WGEBM Co-Chairman
Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: JamiesonG@pac.dfo-mpo.gc.ca

Sophia Johannessen (CC-S)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: Johannessen@pac.dfo-mpo.gc.ca

Membership-2008

Jacquelynn R. King (CFAME, SP-WT)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Road
Nanaimo, BC
Canada V9T 6N7
E-mail: King.Jac@pac.dfo-mpo.gc.ca

Serge Labonté (GC, F&A)

Fisheries and Oceans Canada
200 Kent St., Office 8W135
Ottawa, ON
Canada K1A 0E6
E-mail: serge.labonte@dfo-mpo.gc.ca

Maurice Levasseur (WG-22)

Biologie (Québec-Océan)
Université Laval
Pavillon Alexandre-Vachon
Québec, QC
Canada G1K 7P4
E-mail: Maurice.levasseur@bio.ulaval.ca

David L. Mackas (BIO, MONITOR, WG-23, CPR-AP)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: Dave.Mackas@dfo-mpo.gc.ca

Jennifer Martin (HAB-S)

Fisheries and Oceans Canada
St. Andrews Biological Station
531 Brandy Cove Rd.
St. Andrews, NB
Canada E5B 2L9
E-mail: martinjl@mar.dfo-mpo.gc.ca

Gordon Alexander McFarlane (CFAME)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: mcfarlanes@pac.dfo-mpo.gc.ca

Lisa Miller (CC-S)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: millerli@pac.dfo-mpo.gc.ca

Robert O'Boyle (WGEBM)

1042 Shore Drive
Bedford, NS
Canada B4A 2E5
E-mail: bcubed@accesswave.ca

Evgeny Pakhomov (MIE-AP)

MIE-AP Co-Chairman
Earth and Ocean Sciences
University of British Columbia
6339 Stores Rd.
Vancouver, BC
Canada V6T 1Z4
E-mail: epakhomov@eos.ubc.ca

Angelica Peña (BIO)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: PenaA@pac.dfo-mpo.gc.ca

Ian Perry (WGEBM)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: PerryI@pac.dfo-mpo.gc.ca

Ted Perry (FIS)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: perryted@pac.dfo-mpo.gc.ca

Jake Rice (SG-FISP)

Fisheries and Oceans Canada
Ecosystem Science Directorate
Station 12S014, 200 Kent St.
Ottawa, ON
Canada K1A 0E6
E-mail: RiceJ@dfo-mpo.gc.ca

Laura Richards (GC, F&A, FIS)

F&A Committee Chairman, SG-SC Chairman
Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: Laura.Richards@dfo-mpo.gc.ca

Jake Schweigert (MODEL)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: Jake.Schweigert@dfo-mpo.gc.ca

Darlene Loretta Smith (MEQ, WG-21)
WG-21 Co-Chairman

Fisheries and Oceans Canada
Federal Government of Canada
200 Kent St., STN 8W133
Ottawa, ON
Canada K1A 0E6
E-mail: darlene.smith@dfo-mpo.gc.ca

Thomas W. Therriault (WG-21)

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Rd.
Nanaimo, BC
Canada V9T 6N7
E-mail: Thomas.Therriault@dfo-mpo.gc.ca

Charles Trick (HAB-S, WG-22)

Schulich School of Medicine
University of Western Ontario
N. Campus Bldg., 1151 Richmond St. N.
London, ON
Canada N6A 5B7
E-mail: trick@uwo.ca

Andrew W. Trites (MBM-AP)

Marine Mammal Research Consortium
University of British Columbia
Room 247, AERL, 2202 Main Mall
Vancouver, BC
Canada V6T 1Z4
E-mail: trites@zoology.ubc.ca

Chi Shing (C.S.) Wong (POC, WG-22)

Fisheries and Oceans Canada
Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: WongCS@pac.dfo-mpo.gc.ca

Julia Yazvenko (SG-COM)

Ex-officio member SG-COM
PICES Secretariat
P.O. Box 6000
Sidney, BC
Canada V8L 4B2
E-mail: secretariat@pices.int

Japan

Sanae Chiba (CFAME)

Ecosystem Change Research Program
Frontier Research Center for Global Change, JAMSTEC
3173-25 Showa-machi, Kanazawa-ku
Yokohama, Kanagawa
Japan 236-0001
E-mail: chibas@jamstec.go.jp

Toshio Furota (WG-21)

Faculty of Science
Toho University
Miyama 2-2-1
Funabashi, Chiba
Japan 274-8510
E-mail: furota@bio.sci.toho-u.ac.jp

Toshitaka Gamo (CREAMS-AP)

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan 164-8639
E-mail: gamo@ori.u-tokyo.ac.jp

Hiroyasu Hasumi (WG-20)

Center for Climate System Research
University of Tokyo
5-1-5 Kashiwanoha
Kashiwa, Chiba
Japan 277-8568
E-mail: hasumi@ccsr.u-tokyo.ac.jp

Toyomitsu Horii (FIS)

National Research Institute of Fisheries Science, FRA
31-1 Nagai, 6-chome
Yokosuka, Kanagawa
Japan 238-0316
E-mail: thorii@fra.affrc.go.jp

Naoki Iguchi (CREAMS-AP)

Japan Sea National Fisheries Research Institute, FRA
1-5939-22 Suido-cho
Niigata
Japan 951-8121
E-mail: iguchi@affrc.go.jp

Takaji Iida (GC)

Resources Enhancement Promotion Department
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo
Japan 100-8907
E-mail: takaji@affrc.go.jp

Ichiro Imai (HAB-S)

Graduate School of Agriculture
Kyoto University
Oiwakecho, Kitashirakawa, Sakyo
Kyoto
Japan 606-8502
E-mail: imai1ro@kais.kyoto-u.ac.jp

Membership-2008

Yukimasa Ishida (SG-FISP)

Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi
Japan 985-0001
E-mail: ishiday@fra.affrc.go.jp

Shigeru Itakura (MEQ, HAB-S)

Resources Enhancement Promotion Department
Fisheries Agency
1-2-1 Kasumigaseki
Chiyoda-ku, Tokyo
Japan 100-8907
E-mail: itakura@affrc.go.jp

Shin-ichi Ito (POC, MODEL)

Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi
Japan 985-0001
E-mail: goito@affrc.go.jp

Masahide Kaeriyama (FIS, CFAME, IP-WT)

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan 041-8611
E-mail: salmon@fish.hokudai.ac.jp

Hidehiro Kato (MBM-AP)

MBM Co-Chairman

Laboratory of Cetaceans and Marine Mammals
Faculty of Marine Science
Tokyo University of Marine Science and Technology
4-5-7 Konan, Minato-ku
Tokyo
Japan 108-8477
E-mail: katohide@kaiyodai.ac.jp

Masaya Katoh (WG-21)

Seikai National Fisheries Research Institute
Ishigaki Tropical Station, FRA
148-446 Fukai-Ohta
Ishigaki, Okinawa
Japan 907-0451
E-mail: mkatoh@fra.affrc.go.jp

Hiroshi Kawai (WG-21)

Research Center for Inland Seas
Kobe University
1-1 Rokkodai, Nada-ku
Kobe, Hyogo
Japan 657-8501
E-mail: kawai@kobe-u.ac.jp

Jun Nishioka (WG-22)

Institute of Low Temperature Science
Hokkaido University
N19W8 Kita-ku
Sapporo, Hokkaido
Japan 060-0819
E-mail: nishioka@lowtem.hokudai.ac.jp

Michio J. Kishi (SB, BIO, CCCC, MODEL, WG-23)

CCCC Program Co-Chairman

Graduate School of Environmental Science
Hokkaido University
N10W5 Kita-ku
Sapporo, Hokkaido
Japan 060-0810
E-mail: mjkishin@nifty.com

Kunio Kohata (MEQ)

Water and Soil Environment Division
National Institute for Environmental Studies (NIES)
16-2 Onogawa
Tsukuba, Ibaraki
Japan 305-8506
E-mail: kohata@nies.go.jp

Mitsutaku Makino (WGEBM)

National Research Institute of Fisheries Science, FRA
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa
Japan 236-8648
E-mail: mmakino@affrc.go.jp

Kazushi Miyashita (MIE-AP)

Laboratory of Marine Ecosystem Change Analysis
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan 041-8611
E-mail: miyashi@fish.hokudai.ac.jp

Hideaki Nakata (WGEBM)

Faculty of Fisheries
Nagasaki University
1-14 Bunkyo-machi
Nagasaki
Japan 852-8521
E-mail: nakata@nagasaki-u.ac.jp

Yuji Okazaki (WG-23)

Mixed Water Region Fisheries Oceanography Division
Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi
Japan 985-0001
E-mail: okazakiy@affrc.go.jp

Goh Onitsuka (MODEL)

Department of Fishery Science and Technology
National Fisheries University
2-7-1 Nagata-Hon-machi
Shimonoseki, Yamaguchi
Japan 759-6595
E-mail: onizuka@fish-u.ac.jp

Tsuneo Ono (CC-S)

Subarctic Fisheries Oceanography Division
Hokkaido National Fisheries Research Institute, FRA
116 Katsurakoi
Kushiro, Hokkaido
Japan 085-0802
E-mail: tono@fra.affrc.go.jp

Toshiro Saino (CC-S)

CC-S Co-Chairman

IORGC, JAMSTEC
Global Warming Observational Research Program
2-15 Natsushima-cho
Yokosuka
Japan 237-0061
E-mail: tsaino@jamstec.go.jp

Hiroaki Saito (WG-22, SG-FISP, IP-WT)

IP-WT Co-Chairman

Biological Oceanography Section
Tohoku National Fisheries Research Institute, FRA
3-27-5 Shinhama-cho
Shiogama, Miyagi
Japan 985-0001
E-mail: hsaito@affrc.go.jp

Sei-Ichi Saitoh (MONITOR)

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan 041-8611
E-mail: ssaitoh@salmon.fish.hokudai.ac.jp

Yasunori Sakurai (CCCC, CREAMS-AP)

CREAMS-AP Co-Chairman

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan 041-8611
E-mail: sakurai@fish.hokudai.ac.jp

Takashige Sugimoto (CPR-AP)

School of Marine Science and Technology
Tokai University
3-20-1 Orido, Shimizu-ku
Shizuoka, Shizuoka Prefecture
Japan 424-8610
E-mail: sugimoto@scc.u-tokai.ac.jp

Hiroya Sugisaki (SB, MONITOR)

MONITOR Chairman

National Research Institute of Fisheries Science, FRA
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa
Japan 236-8648
E-mail: sugisaki@affrc.go.jp

Toru Suzuki (TCODE, CC-S)

Marine Information Research Center (MIRC)
Japan Hydrographic Association
6F Daiichi Sogo Bldg., 1-6-6 Hanedakuko, Ota-ku
Tokyo
Japan 144-0041
E-mail: suzuki@mirc.jha.jp

Shigenobu Takeda (WG-22)

Department of Aquatic Bioscience
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo
Japan 113-8657
E-mail: atakeda@mail.ecc.u-tokyo.ac.jp

Kenji Taki (WG-23)

Oceanic Resources Division
National Research Institute of Far Seas Fisheries, FRA
2-12-4, Fukuura, Kanazawa
Yokohama, Kanagawa
Japan 236-8648
E-mail: takisan@affrc.go.jp

Mitsuo Uematsu (WG-22)

Center for International Cooperation
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan 164-8639
E-mail: uematsu@ori.u-tokyo.ac.jp

Tokio Wada (GC)

PICES Chairman

National Research Institute of Fisheries Engineering
(NRIFE)
Fisheries Research Agency
7620-7 Hazaki, Kamisu-shi
Ibaragi
Japan 314-0408
E-mail: wadat@affrc.go.jp

Shuichi Watanabe (CC-S)

Mutsu Research Group, Mutsu Institute for Oceanography
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC), FRA
690 Kitasekine
Sekine, Mutsu
Japan 035-0022
E-mail: swata@jamstec.go.jp

Tomowo Watanabe (TCODE)

National Research Institute of Fisheries Science, FRA
2-12-4 Fukuura, Kanazawa-ku
Yokohama
Japan 236-8648
E-mail: wattom@affrc.go.jp

Yasunori Watanabe (MEQ, HAB-S)

National Research Institute of Fisheries and Environment
of Inland Sea, FRA
2-17-5 Maruishi
Hatsukaichi, Hiroshima
Japan 739-0452
E-mail: ywat@affrc.go.jp

Membership-2008

Yutaka Watanabe (CC-S)

Faculty of Earth Environmental Science
Hokkaido University
N10W5, Kita-ku
Sapporo, Hokkaido
Japan 060-0810
E-mail: yywata@ees.hokudai.ac.jp

Yoshiro Watanabe (CFAME)

Living Marine Resources, Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan 164-8639
E-mail: ywatanab@ori.u-tokyo.ac.jp

Yutaka Watanuki (MBM-AP)

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan 040-8611
E-mail: ywata@fish.hokudai.ac.jp

Harumi Yamada (F&A, BIO, SG-COM)

Resources Enhancement Promotion Department
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo
Japan 100-8907
E-mail: hyamada@affrc.go.jp

Atsushi Yamaguchi (BIO)

Marine Biology Laboratory (Plankton)
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan 041-8611
E-mail: a-yama@fish.hokudai.ac.jp

Orio Yamamura (IP-WT, MIE-AP)

MIE-AP Co-Chairman

Hokkaido National Fisheries Research Institute, FRA
116 Katsurakoi
Kushiro, Hokkaido
Japan 085-0802
E-mail: orioy@affrc.go.jp

Yasuhiro Yamanaka (WG-20, WG-22)

WG-20 Co-Chairman

Faculty of Environmental Earth Science
Hokkaido University
N10W5 Kita-ku
Sapporo, Hokkaido
Japan 060-0810
E-mail: galapen@ees.hokudai.ac.jp

Jun Yanagi (GC, F&A)

International Science Cooperation Division
Foreign Policy Bureau
Ministry of Foreign Affairs of Japan
2-2-1, Kasumigaseki, Chiyoda-ku
Tokyo
Japan 100-8919
E-mail: jun.yanagi@mofa.go.jp

Ichiro Yasuda (POC, IP-WT)

POC Vice-Chairman

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan 164-8639
E-mail: ichiro@ori.u-tokyo.ac.jp

Akihiko Yatsu (FIS, CFAME)

Seikai National Fisheries Research Institute, FRA
1551-8 Taira-machi
Nagasaki
Japan 851-2213
E-mail: yatsua@fra.affrc.go.jp

Hisashi Yokoyama (WG-21)

National Research Institute of Aquaculture, FRA
422-1 Nakatsushima-ura Minami-Ise
Watarai-gun Mie
Japan 516-0193
E-mail: hyoko@fra.affrc.go.jp

People's Republic of China

Paul J. Harrison (WG-22)

AMCE Program
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon
Hong Kong 00000
E-mail: harrison@ust.hk

Rongshuo Cai (CFAME)

Third Institute of Oceanography, SOA
178 Daxue Rd.
Xiamen, Fujian
People's Republic of China 361005
E-mail: rscai@163.com

Dake Chen (POC)

Second Institute of Oceanography, SOA
36 Baochu Bei Rd.
Hangzhou, Zhejiang
People's Republic of China 310012
E-mail: dchen@sio.org.cn

Liqi Chen (CCCC, CC-S)

Chinese Arctic and Antarctic Administration (CAA)
Third Institute of Oceanography, SOA
178 Daxue Rd.
Xiamen, Fujian
People's Republic of China 361005
E-mail: lchen203@263.net

Yaqu Chen (BIO)

East China Sea Fisheries Research Institute, CAFS
300 Jungong Rd., Yangpu District
Shanghai
People's Republic of China 200090
E-mail: yaquchen@yahoo.com.cn

Jiahua Cheng (FIS)

East China Sea Fisheries Research Institute, CAFS
300 Jungong Rd.
Shanghai
People's Republic of China 200090
E-mail: ziyuan@sh163.net

Zhongyong Gao (WG-22)

Key Lab of Global Change and Marine-Atmospheric
Chemistry
Third Institute of Oceanography, SOA
178 Daxue Rd.
Xiamen, Fujian
People's Republic of China 361005
E-mail: zgao@263.net

Handi Guo (F&A)

Department of International Cooperation
Division of American and Ocean Affairs
Ministry of Agriculture, 11 Nongzhanguan Nanli
Beijing
People's Republic of China 100026
E-mail: guohandi@agri.gov.cn

Hao Guo (WG-21)

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning
People's Republic of China 116023
E-mail: hguo@nmemc.gov.cn

Daji Huang (MODEL, CFAME)

Second Institute of Oceanography, SOA
36 Baochubei Rd.
Hangzhou, Zhejiang
People's Republic of China 310012
E-mail: djhuang@sio.zj.edu.cn

Hongliang Huang (WG-23)

Chinese Academy of Fisheries Sciences
East Sea Fisheries Institute
300 Jungong Rd.
Shanghai
People's Republic of China 200090
E-mail: ecshhl@163.com

Chuanlin Huo (MEQ)

Planning and Management Department
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning
People's Republic of China 116023
E-mail: clhuo@nmemc.gov.cn

Xianshi Jin (FIS, CFAME, WGEEM, IP-WT)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Road
Qingdao, Shandong
People's Republic of China 266071
E-mail: jin@ysfri.ac.cn

Jie Kong (FISP-WT, SG-MAR)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: kongjie@ysfri.ac.cn

Dongfeng Xu (CREAMS-AP)

Second Institute of Oceanography, SOA
36 Baochubei Rd.
Hangzhou, Zhejiang
People's Republic of China 310012
E-mail: dfxu@sio.zj.edu.cn

Qiufen Li (HAB-S)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: liqf@ysfri.ac.cn

Zhengdong Li (GC)

Department of International Cooperation
Ministry of Agriculture
11 Nongzhanguan Nanli
Beijing
People's Republic of China 100026
E-mail: lizhengdong@agri.gov.cn

Rurong Lin (WG-21)

Third Institute of Oceanography, SOA
178 Daxue Rd.
Xiamen, Fujian
People's Republic of China 361005
E-mail: linrulong@yahoo.com

Membership-2008

Xuezheng Lin (WG-21)

First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong
People's Republic of China 266061
E-mail: linxz@fio.org.cn

Sumei Liu (CREAMS-AP)

College of Chemistry and Chemical Engineering
Ocean University of China
5 Yushan Rd.
Qingdao, Shandong
People's Republic of China 266003
E-mail: sumeilu@mail.ouc.edu.cn

Xiuren Ning (CC-S, WG-22)

Marine Ecosystem and Biogeochemistry
Second Institute of Oceanography, SOA
36 Baochu Bei Rd.
Hangzhou, Zhejiang
People's Republic of China 310012
E-mail: ning_xr@126.com

Fangli Qiao (SB, WG-20, SG-FISP, IP-WT)

First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong
People's Republic of China 266061
E-mail: qiaofl@fio.org.cn

Xinqiang Shen (MEA)

East China Sea Fisheries Research Institute, CAFS
300 Jungong Rd.
Shanghai
People's Republic of China 200090
E-mail: esrms@public2.sta.net.cn

Shengzhi Sun (F&A)

Bureau of Fisheries
Division of International Cooperation
Ministry of Agriculture, 11 Nongzhanguan Nanli
Beijing
People's Republic of China 100026
E-mail: inter-coop@agri.gov.cn

Song Sun (BIO, CCCC, WG-23, IP-WT, CPR-AP) WG-23 Co-Chairman

Key Lab of Marine Ecology and Environmental Sci.
Institute of Oceanology, Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: sunsong@ms.qdio.ac.cn

Gongke Tan (SG-COM)

International Cooperation Office
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong
People's Republic of China 266061
E-mail: gongke_tan@fio.org.cn

Ling Tong (TCODE)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: tongling@ysfri.ac.cn

Fan Wang (POC, WG-20)

Key Lab of Ocean Circulation and Waves
Institute of Oceanology, Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: fwang@ms.qdio.ac.cn

Lijun Wang (WG-21)

National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning
People's Republic of China 116023
E-mail: ljwang@nmemc.gov.cn

Qingyin Wang (FIS)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: wangqy@ysfri.ac.cn

Rong Wang (CCCC)

Key Lab of Marine Ecology and Environmental Sci.
Institute of Oceanology, CAS
7 Nanhai Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: wangrong@ms.qdio.ac.cn

Zhanggui Wang (POC)

National Marine Environmental Forecasting Center, SOA
8 Dahuisi Rd., Haidian District
Beijing
People's Republic of China 116023
E-mail: zgwang@nmefc.gov.cn

Hao Wei (CCCC, MODEL, WGEBM)

MODEL Task Team Co-Chairman
College of Physical and Environmental Oceanography
Ocean University of China
5 Yushan Rd.
Qingdao, Shandong
People's Republic of China 266003
E-mail: weihao@ouc.edu.cn

Quan Wen (MONITOR)

National Marine Environmental Monitoring Center, SOA
42 Linghe Street, Shahekou District
Dalian, Liaoning
People's Republic of China 116023
E-mail: qwen@nmemc.gov.cn

Dexing Wu (MEQ)

Ocean University of China
5 Yushan Rd.
Qingdao, Shandong
People's Republic of China 266003
E-mail: dxwu@ouc.edu.cn

Lixin Wu (WG-20)

College of Physical and Environmental Oceanography
Ocean University of China
5 Yushan Rd.
Qingdao, Shandong
People's Republic of China 266003
E-mail: lxwu@ouc.edu.cn

Ruguang Yin (TCODE)

National Marine Data and Information Service, SOA
93 Liuwei Rd., Hedong District
Tianjin
People's Republic of China 300171
E-mail: yrg@mail.nmdis.gov.cn

Fei Yu (CREAMS-AP)

Physical Oceanography Division
First Institute of Oceanography, SOA
6 Xianxialing Rd., Hi-Tech Park
Qingdao, Shandong
People's Republic of China 266061
E-mail: yuf@fio.org.cn

Zhanhai Zhang (GC)

Department of International Cooperation
State Oceanic Administration
1 Fuxingmenwai Ave.
Beijing
People's Republic of China 100860
E-mail: tdm@soa.gov.cn

Zhifeng Zhang (MODEL)

Marine Environmental Chemistry Division
National Marine Environmental Monitoring Center, SOA
42 Linghe St., Shahekou District
Dalian, Liaoning
People's Republic of China 116023
E-mail: zfzhang@nmemc.gov.cn

Xianyong Zhao (MONITOR, MIE-AP)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: zhaoxy@ysfri.ac.cn

Li Zheng (WG-21)

First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong
People's Republic of China 266061
E-mail: zhengli@fio.org.cn

Mingyuan Zhu (BIO, HAB-S, IP-WT)

Key Lab for Marine Ecology
First Institute of Oceanography, SOA
6 Xian-Xia Ling Rd., Hi-Tech Park, LaoShan District
Qingdao, Shandong
People's Republic of China 266061
E-mail: zhumingyuan@fio.org.cn

Zhimeng Zhuang (CPR-AP)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: zhuangzm@ysfri.ac.cn

Tao Zuo (WG-23)

Yellow Sea Fisheries Research Institute, CAFS
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China 266071
E-mail: zuotaolinch@yahoo.com.cn

Republic of Korea

Kyung-II Chang (POC)

School of Earth and Environmental Sciences
Seoul National University
San 56-1 Shillim-dong, Kwanaka-ku
Seoul
Republic of Korea 151-742
E-mail: kichang@snu.ac.kr

Hyun-Woo Choi (TCODE)

Ocean Data and Information Division
Korea Ocean R&D Institute (KORDI)
Sa-dong 1270
Ansan-si, Gyeonggi-do
Republic of Korea 426-170
E-mail: hwchoi@kordi.re.kr

Membership-2008

Young-Jean Choi (MONITOR)

Forecast Research Laboratory
Meteorological Research Institute, KMA
460-18 Shindeabang-dong, Dongjak-gu
Seoul
Republic of Korea 156-720
E-mail: yjchoi@metri.re.kr

Jung-Hwa Choi (IP-WT)

Fisheries Resources Research Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-902
Phone: (82-51) 720-2291
E-mail: choijh@momaf.go.kr

Ik-Kyo Chung (MEQ)

Division of Earth Environmental System
Pusan National University
San 30, Jangjun-dong, Geumjung-gu
Busan Metro City
Republic of Korea 609-735
E-mail: ikchung@pusan.ac.kr

Sik Huh (SG-COM)

International Cooperation Division
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul
Republic of Korea 425-600
E-mail: sikhuh@kordi.re.kr

Doan Jeong (GC, F&A)

Marine Research and Development Team
MLTM (Ministry of Land, Transport and Maritime Affairs)
Gungang-Dong
Gwacheoun-City, Gyeonggi-do
Republic of Korea 110-793
E-mail: doan@mltm.go.kr

Hee-Dong Jeong (POC)

Marine Environment Research Team
South Sea Fisheries Research Institute, NFRDI
347 Anpo-ri, Hwayang-myeon
Yeosu, Cheollanam-do
Republic of Korea 556-823
E-mail: hdjeong@nfrdi.re.kr

Se-Jong Ju (WG-23, IP-WT)

Marine Resources Research Department
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul
Republic of Korea 425-600
E-mail: sjju@kordi.re.kr

Kyu-Kui Jung (F&A, TCODE, SG-COM)

TCODE Vice-Chairman
South Sea Fisheries Research Institute
National Fisheries R&D Institute
347 Anpo-ri, Hwayang-myeon
Yeosu, Jeollanam-do
Republic of Korea 556-823
E-mail: kkjung@nfrdi.re.kr

Hyung-Ku Kang (CFAME, CPR-AP)

Marine Living Resources Research Department
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul
Republic of Korea 425-600
E-mail: kanghk@kordi.re.kr

Young-Shil Kang (BIO, CCCC, CFAME, WG-23)

CFAME Co-Chairman
Marine Ecology Research Team
National Fisheries R&D Institute
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-705
E-mail: yskang@nfrdi.go.kr

Dong-Myung Kim (MODEL)

Division of Environmental System Engineering
Pukyong National University
599-1, Daeyon3-Dong, Nam-Gu
Busan
Republic of Korea 608-737
E-mail: dmkim@pknu.ac.kr

Hak-Gyoon Kim (MEQ, HAB-S)

HAB-S Co-Chairman, MEQ Vice-Chairman
Department of Oceanography
Pukyong National University
Lotte Nakchondae Apt. 102 Dong
1405 Ho, Jung-1-dong, Haeundae-gu
Busan
Republic of Korea 612-870
E-mail: hgkim7592@yahoo.co.kr

Jin-Yeong Kim (GC, FIS)

Fisheries Resources Division
National Fisheries R&D Institute
408-1 Shirang-ri, Gijang-up, Gijang-gun
Busan
Republic of Korea 619-705
E-mail: jiykim@nfrdi.re.kr

Kuh Kim (SG-FISP)

School of Earth and Environmental Sciences
Seoul National University
San 56-1 Shillim-dong, Kwanaka-ku
Seoul
Republic of Korea 151-742
E-mail: kuhkim@snu.ac.kr

Chang-Kyu Lee (HAB-S)

Marine Harmful Organisms Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-902
E-mail: cklee@nfrdi.re.kr

**Kyung-Ryul Kim (CC-S, WG-22, CREAMS-AP)
CREAMS-AP Co-Chairman**

School of Earth and Environmental Sciences
Seoul National University
San 56-1 Shillim-dong, Kwanaka-ku
Seoul
Republic of Korea 151-747
E-mail: krkim@snu.ac.kr

Suam Kim (CCCC, SG-FISP, CREAMS-AP)

Department of Marine Biology
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan
Republic of Korea 608-737
E-mail: suamkim@pknu.ac.kr

Woong-Seo Kim (BIO)

Marine Resources Research Department
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul
Republic of Korea 425-600
E-mail: wskim@kordi.re.kr

Yeonghye Kim (CCCC)

Fisheries Resources Research Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-902
E-mail: yhkim@nfrdi.re.kr

Zang-Guen Kim (MBM-AP)

Fisheries Resources Research Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-902
E-mail: zgkim@nfrdi.re.kr

Jae-Bong Lee (WGEBM)

Fisheries Resource Research
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-905
E-mail: leejb@nfrdi.re.kr

Jae-Hak Lee (CREAMS-AP)

Marine Environment Research Department
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul
Republic of Korea 426-170
E-mail: jhlee@kordi.re.kr

Kitack Lee (CC-S, WG-22)

School of Environmental Science and Engineering
Pohang University of Science and Technology
San 31, Hyoja-dong, Nam-gu
Pohang
Republic of Korea 790-784
E-mail: ktl@postech.ac.kr

Sam-Geon Lee (WG-21)

Marine Environment Division
Aquaculture Environment Institute, NFRDI
361 Yeongun-ri, Sanyang-up
Tongyeong, Kyeongnam
Republic of Korea 650-943
E-mail: sglee@nfrdi.re.kr

Tongsup Lee (CC-S)

Department of Marine Science
Pusan National University
Changjeon-2 dong,
Busan, Guemjeong-gu
Republic of Korea 609-735
E-mail: tlee@pusan.ac.kr

Won-Chan Lee (MODEL)

Marine Environment Research Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Gijang-eup, Gijang-gun
Busan
Republic of Korea 619-705
E-mail: wclee@momaf.go.kr

Yoon Lee (WG-21)

Marine Harmful Organisms Research Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-902
E-mail: yoonlee@momaf.go.kr

Dong-Hyun Lim (WG-21)

Marine Harmful Organisms Research Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-902
E-mail: oithona@momaf.go.kr

Hyun-Taik Oh (MODEL)

Marine Environment Research Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Gijang-eup, Gijang-gun
Busan
Republic of Korea 619-705
E-mail: ohtek@nfrdi.re.kr

Jai-Ho Oh (WG-20)

Environmental Atmospheric Sciences
Pukyong National University
559-1 Daeyeon-3-dong, Nam-gu
Busan
Republic of Korea 608-737
E-mail: jhoh@pknu.ac.kr

Membership-2008

Ig-Chan Pang (WG-20)

Ocean Environment
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 609-902
E-mail: pangig@cheju.ac.kr

Young-Gyu Park (POC, WG-20)

Ocean Climate and Environment
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul
Republic of Korea 425-600
E-mail: ypark@kordi.re.kr

Young-Jae Ro (MONITOR)

College of Natural Sciences
Chungnam National University
220 Gung-dong, Yuseong-gu
Daejeon
Republic of Korea 305-764
E-mail: royoungj@cnu.ac.kr

Hyoung-Chul Shin (FIS, WG-23)

Korea Polar Research Institute, KORDI
Songdo Techno-Park, 7-50 Songdo-Dong, Yeonsu-gu
Incheon
Republic of Korea 406-840
E-mail: hcshin@kopri.re.kr

Kyoung-Soon Shin (WG-21)

Southern Coastal Environment
Korea Ocean R&D Institute (KORDI)
391 Jangmok-ri, Jangmok-myon
Geoje
Republic of Korea 656-830
E-mail: ksshin@kordi.re.kr

Young-Sang Suh (MONITOR)

Ocean and Marine Environment Department
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-900
E-mail: yssuh@nfrdi.re.kr

Dong-Beom Yang (MEQ)

Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Seoul
Republic of Korea 425-600
E-mail: dbyang@kordi.re.kr

Joon-Yong Yang (IP-WT)

Headquarters for Marine Environment
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-902
E-mail: yangjy@nfrdi.re.kr

Sang-Wook Yeh (WG-20)

Ocean Climate and Environment
Korea Ocean R&D Institute (KORDI)
Ansan P.O. Box 29
Ansan
Republic of Korea 425-600
E-mail: swyeh@kordi.re.kr

In-Ja Yeon (WGEBM)

Fishery Resources Division
West Sea Fisheries Research Institute, NFRDI
707 Eulwang-dong, Jung-gu
Incheon
Republic of Korea 400-420
E-mail: ijyeon@nfrdi.go.kr

Sinjae Yoo (SB, BIO, CCCC, IP-WT, CREAMS-AP) Science Board Vice-Chairman

Marine Living Resources Division
Korea Ocean R&D Institute (KORDI)
1270 Sa-dong
Ansan, Gyeonggi-do
Republic of Korea 426-170
E-mail: sjyoo@kordi.re.kr

Won-Duk Yoon (MIE)

Ocean Science Team
National Fisheries R&D Institute, MOMAF
408-1 Shirang-ri, Kijang-up, Kijang-gun
Busan
Republic of Korea 619-705
E-mail: wdyoon@nfrdi.re.kr

Chang-Ik Zhang (FIS, CCCC, WGEBM) WGEBM Co-Chairman

Marine Production Management
Pukyong National University
599-1 Daeyeon 3-dong, Nam-gu
Busan
Republic of Korea 608-737
E-mail: cizhang@pknu.ac.kr

Russia**Andrey G. Andreev (CC-S)**

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorskiy Kray
Russia 690041
E-mail: andreev@poi.dvo.ru

Yuri B. Artukhin (MBM-AP)

Far East Department of Russian Academy of Sciences
Kamchatka Research Institute of Fisheries and
Oceanography (KamchatNIRO)
Rybakov pr., 19-a
Petropavlovsk-Kamchatsky, Kamchatka
Russia 683024
E-mail: artukhin@mail.kamchatka.ru

Eygenyi I. Barabanshchikov (WG-21)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: barabanshchikov@tinro.ru

Tatyana A. Belan (MEQ)

Department of Oceanography and Marine Ecology
Far Eastern Regional Hydrometeorological Research
Institute (FERHRI)
24 Fontannaya Street
Vladivostok, Primorsky
Russia 690091
E-mail: Tbelan@ferhri.ru

Galina V. Belova (MIE)

Laboratory of Pelagic Resources
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: belova@tinro.ru

Lev N. Bocharov (GC)**PICES Vice-Chairman**

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: bocharov@tinro.ru

Elena P. Dulepova (FIS, WGEBM)

Laboratory of Applied Bioecology
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorskiy Kray
Russia 690950
E-mail: dep@tinro.ru

Alexander I. Glubokov (FIS)

Russian Federal Research Institute of Fisheries and
Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow
Russia 107140
Phone: (7-495) 264-9143
Fax: (7-495) 264-9021
E-mail: glubokov@vniro.ru

Elena V. Gritsay (MONITOR)

Laboratory of Walleye Pollock
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: gritsay@tinro.ru

Oleg A. Ivanov (WGEBM, MIE-AP)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: oliv@tinro.ru

Gennady A. Kantakov (MODEL, HAB-S)

Administration Department, Biological Oceanography
Sakhalin Research Institute of Fisheries and Oceanography
(SakhNIRO)
196 Komsomolskaya St.
Yuzhno-Sakhalinsk
Russia 693023
E-mail: okhotsk@sakhniro.ru

Oleg N. Katugin (CCCC, IP-WT)

Fisheries Resources of the Far Eastern Seas
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorskiy Kray
Russia 690950
E-mail: katugin@tinro.ru

Nina G. Klochkova (HAB-S)

Kamchatka Research Institute of Fisheries and
Oceanography (KamchatNIRO)
18 Naberezhnaya St.
Petropavlovsk-Kamchatsky, Kamchatka
Russia 683000
E-mail: klochkova@kamniro.ru

Membership-2008

Nikolai V. Kolpakov (WG-21)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: kolpakov@tinro.ru

Sergei Kornev (MBM-AP)

Fishery Agency
Kamchatka Research Institute of Fisheries and
Oceanography (KamchatNIRO)
18 Naberezhnaya St.
Petropavlovsk-Kamchatsky, Kamchatka
Russia 683000
E-mail: kornev@kamniro.ru

Boris N. Kotenev (BIO)

Russian Federal Research Institute of Fisheries and
Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow
Russia 107140
E-mail: orgotdel@vniro.ru

Andrei S. Krovnin (CCCC)

Laboratory of Climatic Bases of Bioproductivity
Russian Federal Research Institute of Fisheries and
Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow
Russia 107140
E-mail: akrovnin@vniro.ru

Vyacheslav B. Lobanov (POC, MONITOR, IP-WT, CREAMS-AP)

V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Kray
Russia 690041
E-mail: lobanov@poi.dvo.ru

Olga N. Lukyanova (MEQ, HAB-S)

Laboratory of Applied Ecology and Ecotoxicology
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky Kray
Russia 690950
E-mail: onlukyanova@tinro.ru

Georgiy S. Moiseenko (TCODE)

Information Systems Laboratory
Russian Federal Research Institute of Fisheries and
Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow
Russia 107140
E-mail: georgem@vniro.ru

Vadim V. Navrotsky (WG-20)

General Oceanology
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorsky Kray
Russia 690041
E-mail: navrotskyv@poi.dvo.ru

Victor A. Nazarov (WG-21, SG-FISP)

International Department
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: nazarov@tinro.ru

Alexei M. Orlov (BIO)

Russian Federal Research Institute of Fisheries and
Oceanography (VNIRO)
17 V. Krasnoselskaya St.
Moscow
Russia 107140
E-mail: orlov@vniro.ru

Tatiana Yu. Orlova (HAB-S)

Department of Hydrobiology
Institute of Marine Biology, FEB RAS
17 Palchevskogo St.
Vladivostok, Primorsky Kray
Russia 690041
E-mail: torlova@whoi.edu

Vasily Radashevsky (WG-21)

WG-21 Co-Chairman
Institute of Marine Biology, FEB RAS
17 Palchevskogo Street
Vladivostok, Primorsky
Russia 690041
E-mail: radashevsky@mail.ru

Vladimir I. Radchenko (BIO, WGEEM, CPR-AP)

Sakhalin Research Institute of Fisheries and Oceanography
(SakhNIRO)
196 Komsomolskaya St.
Yuzhno-Sakhalinsk, Sakhalin
Russia 693023
E-mail: vlad@sakhniro.ru

Vadim F. Savinykh (MIE-AP)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: savinykh@tinro.ru

Igor I. Shevchenko (F&A, TCODE, SG-COM, SG-FISP)

Department of Information Technology
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorskiy Kray
Russia 690950
E-mail: igor@tinro.ru

Vladimir M. Shulkin (WG-22)

Pacific Geographical Institute
Far Eastern Branch of Russian Academy of Science
7 Radio St.
Vladivostok, Primorsky
Russia 690041
E-mail: shulkin@tig.dvo.ru

Vjatcheslav P. Shuntov (MBM-AP)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: interdept@tinro.ru

Mikhail Simokon (HAB-S)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorskiy Kray
Russia 690950
E-mail: scheglov@tinro.ru

Anna Skvortsova (SG-COM)

International Department
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: karulina@tinro.ru

Mikhail Stepanenko (SB, FIS)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: stepanenko@tinro.ru

Pavel Ya. Tishchenko (CC-S, CREAMS-AP)

Hydrochemistry Laboratory
V.I. Il'ichev Pacific Oceanological Institute, FEB RAS
43 Baltiyskaya St.
Vladivostok, Primorskiy Kray
Russia 690041
E-mail: tpavel@poi.dvo.ru

Elena I. Ustinova (POC, WG-20)

Laboratory of Fisheries Oceanography
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorskiy Kray
Russia 690950
E-mail: eustinova@mail.ru

Anatoly F. Volkov (WG-23, CPR-AP)

Laboratory Hydrobiology
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: volkov413@yandex.ru

Igor V. Volvenko (CFAME)

Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorsky
Russia 690950
E-mail: volvenko@tinro.ru

Yury I. Zuenko (POC, MODEL, CREAMS-AP)

Japan Sea and North-West Pacific Oceanography
Pacific Research Institute of Fisheries and Oceanography
(TINRO-Center)
4 Shevchenko Alley
Vladivostok, Primorskiy Kray
Russia 690950
E-mail: zuenko@tinro.ru

U.S.A.

Christopher L. Sabine (CC-S)

Pacific Marine Environmental Laboratory
National Oceanic and Atmospheric Administration
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
E-mail: chris.sabine@noaa.gov

Vera N. Agostini (CFAME)

Global Marine Initiative
The Nature Conservancy
1917 First Ave.
Seattle, WA
U.S.A. 98101
E-mail: vagostini@TNC.ORG

Membership-2008

Vera Alexander (GC)

PICES Past Chairman

School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK
U.S.A. 99775-7220
E-mail: vera@sfos.uaf.edu

Kerim Y. Aydin (CCCC, CFAME)

CFAME Co-Chairman

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-0070
E-mail: Kerim.Aydin@noaa.gov

Jack A. Barth (MONITOR)

College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR
U.S.A. 97331-5503
E-mail: barth@coas.oregonstate.edu

Harold (Hal) P. Batchelder (SB, CCCC, SG-FISP)

CCCC Program Co-Chairman

College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR
U.S.A. 97331-5503
E-mail: hbatchelder@coas.oregonstate.edu

George W. Boehlert (GC)

Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365-5296
E-mail: george.boehlert@oregonstate.edu

Steven J. Bograd (POC)

Environmental Research Division
Southwest Fisheries Science Center, NMFS, NOAA
1352 Lighthouse Ave.
Pacific Grove, CA
U.S.A. 93950
E-mail: steven.bograd@noaa.gov

Richard D. Brodeur (CPR-AP, MIE-AP)

Fish Ecology Division, HMSC
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
E-mail: Rick.Brodeur@noaa.gov

Fei Chai (WG-22)

WG-22 Co-Chairman

School of Marine Sciences
University of Maine
5706 Aubert Hall
Orono, ME
U.S.A. 04469
E-mail: fchai@maine.edu

David M. Checkley (CREAMS-AP)

Integrative Oceanography Division
Scripps Institution of Oceanography, UCSD
9500 Gilman Dr.
La Jolla, CA
U.S.A. 92093-0218
E-mail: dcheckley@ucsd.edu

William P. Cochlan (HAB-S, WG-22)

Romberg Tiburon Center for Environmental Studies
San Francisco State University
3152 Paradise Dr.
Tiburon, CA
U.S.A. 94920-1205
E-mail: cochlan@sfsu.edu

Enrique N. Curchitser (WG-20)

Institute for Marine and Coastal Sciences
Rutgers University
71 Dudley Rd.
New Brunswick, NJ
U.S.A. 08901
E-mail: enrique@marine.rutgers.edu

Michael J. Dagg (SB, BIO, WG-23, SG-FISP)

BIO Committee Chairman

Louisiana Universities Marine Consortium
8124 Hwy 56
Chauvin, LA
U.S.A. 70344
Phone: (1-985) 851-2856
Fax: (1-985) 851-2874
E-mail: mdagg@lumcon.edu

Emanuele Di Lorenzo (WG-20)

School of Earth and Atmospheric Sciences
Georgia Institute of Technology
311 Ferst Dr.
Atlanta, GA
U.S.A. 30332
E-mail: edl@gatech.edu

Andrew G. Dickson (CC-S)

Scripps Institution of Oceanography, UCSD
9500 Gilman Dr.
La Jolla, CA
U.S.A. 92093-0244
E-mail: adickson@ucsd.edu

Steven R. Emerson (CC-S)

School of Oceanography
University of Washington
P.O. Box 357940
Seattle, WA
U.S.A. 98195-6000
E-mail: emerson@u.washington.edu

Richard A. Feely (CC-S)

Ocean Climate Research Division, NOAA/PMEL
Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
E-mail: Richard.A.Feely@noaa.gov

Blake Edward Feist (WG-21)

Environmental Conservation Division
Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA
U.S.A. 98112
E-mail: Blake.Feist@noaa.gov

David Lincoln Fluharty (WGEBM, SG-COM, IP-WT)

SG-COM Chairman

School of Marine Affairs
University of Washington
3707 Brooklyn Ave. NE
Seattle, WA
U.S.A. 98105
E-mail: fluharty@u.washington.edu

Hernan Eduardo Garcia (TCODE, CC-S)

Ocean Climate Laboratory
NOAA-NODC
1315 East West Hwy, SSMC-III, E/OC5, Room 4230
Silver Spring, MD
U.S.A. 20910-3282
E-mail: Hernan.Garcia@noaa.gov

Marsha L. Gear (SG-COM)

University of California Dept 0232
California Sea Grant
9500 Gilman Dr., Dept. 0232
La Jolla, CA
U.S.A. 92093-0232
E-mail: mgear@ucsd.edu

Christopher J. Harvey (WGEBM)

Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd E
Seattle, WA
U.S.A. 98112
E-mail: Chris.Harvey@noaa.gov

Paul Heimowitz (WG-21)

U.S. Fish and Wildlife Service, Region 1
911 NE 11th Ave.
Portland, OR
U.S.A. 97232-4181
E-mail: paul_heimowitz@fws.gov

Anne B. Hollowed (IP-WT)

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
E-mail: Anne.Hollowed@noaa.gov

George L. Hunt, Jr. (CFAME)

School of Aquatic and Fishery Sciences
University of Washington
P.O. Box 355020
Seattle, WA
U.S.A. 98195
E-mail: geohunt2@u.washington.edu

Julie E. Keister (IP-WT)

Ex-officio member IP-WT
School of Oceanography
University of Washington
Box 357940
Seattle, WA
U.S.A. 98195
E-mail: jkeister@u.washington.edu

Alexander Kozyr (CC-S)

Carbon Dioxide Information Analysis Center (CDIAC)
Env. Sci. Div., Oak Ridge National Lab., U.S. Dept. of
Energy
Bldg. 1509, MS 6335
Oak Ridge, TN
U.S.A. 37831-6335
E-mail: kozyra@ornl.gov

Gordon H. Kruse (SB, FIS)

FIS Chairman

Juneau Center, School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
11120 Glacier Hwy
Juneau, AK
U.S.A. 99801-8677
E-mail: Gordon.Kruse@uaf.edu

Henry Lee II (WG-21)

Pacific Coastal Ecology Branch
U.S. EPA
2111 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
E-mail: lee.henry@epa.gov

Patricia Livingston (F&A, WGEBM)

WGEBM Co-Chairman

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
E-mail: Pat.Livingston@noaa.gov

Membership-2008

Elizabeth A. Logerwell (FIS)

Resource Ecology and Fishery Management
Alaska Fisheries Science Center, NMFS, NOAA
P.O. Box 15700 F/AKC2
Seattle, WA
U.S.A. 98115
E-mail: Libby.Logerwell@noaa.gov

Natalie Mahowald (WG-22)

Department of Earth and Atmospheric Sciences
Cornell University
2140 Snee Hall
Ithaca, NY
U.S.A. 14853
E-mail: mahowald@cornell.edu

Nathan Mantua (POC, IP-WT)

School of Aquatic and Fishery Sciences
University of Washington
P.O. Box 355020
Seattle, WA
U.S.A. 98195-5020
E-mail: nmantua@u.washington.edu

Bernard A. Megrey (SB, TCODE, CCCC, MODEL) TCODE Chairman

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
E-mail: Bern.Megrey@noaa.gov

Arthur J. Miller (WG-20)

Climate Research Division
Scripps Institution of Oceanography, UCSD
Nierenberg Hall, Room 439, (SIO-UCSD 0224)
La Jolla, CA
U.S.A. 92093-0224
E-mail: ajmiller@ucsd.edu

Charles B. Miller (CPR-AP)

CPR Advisory Panel Chairman
College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR
U.S.A. 97331-5503
E-mail: cmiller@coas.oregonstate.edu

Bruce C. Mundy (WG-21)

Pacific Islands Fisheries Science Center, NMFS, NOAA
2570 Dole St.
Honolulu, HI
U.S.A. 96822
E-mail: Bruce.Mundy@noaa.gov

Phillip R. Mundy (MONITOR)

MONITOR Vice-Chairman, SG-GOOS Chairman
Auke Bay Laboratories/TSMRI
Alaska Fisheries Science Center, NMFS, NOAA
17109 Point Lena Loop Rd.
Juneau, AK
U.S.A. 99801
E-mail: Phil.mundy@noaa.gov

Jeffrey M. Napp (MONITOR, SG-FISP, CPR-AP)

Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
E-mail: Jeff.Napp@noaa.gov

Brenda L. Norcross (CCCC, CFAME)

School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK
U.S.A. 99775-7220
E-mail: norcross@ims.uaf.edu

James E. Overland (POC, CFAME, IP-WT)

IP-WT Co-Chairman

Pacific Marine Environmental Laboratory
Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
E-mail: James.E.Overland@noaa.gov

William T. Peterson (BIO, CCCC, WG-23)

WG-23 Co-Chairman

NOAA-Fisheries, Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
E-mail: Bill.Peterson@noaa.gov

Alexei Pinchuk (WG-23)

Seward Marine Center
University of Alaska
P.O. Box 730
Seward, AK
U.S.A. 99664
E-mail: ftaip1@uaf.edu

Samuel G. Pooley (GC)

NOAA Fisheries Service
Pacific Islands Fisheries Science Center, NMFS, NOAA
2570 Dole St.
Honolulu, HI
U.S.A. 96822-2396
E-mail: samuel.pooley@noaa.gov

Rolf R. Ream (MBM-AP)

National Marine Mammal Laboratory
Alaska Fisheries Science Center, NMFS, NOAA
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
E-mail: rolf.ream@noaa.gov

Deborah Ann Reusser (WG-21)

USGS-Western Fisheries Research Center at Marine
Hatfield Science Center
2111 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
E-mail: dreusser@usgs.gov

Thomas C. Royer (TCODE)

Ocean, Earth and Atmospheric Sciences
Center for Coastal Physical Oceanography
Old Dominion University
Research Bldg. #1, 4111 Monarch Way
Norfolk, VA
U.S.A. 23529
E-mail: royer@ccpo.odu.edu

Steve Rumrill (MEQ)

Department of Biology
University of Oregon
63466 Boat Basin Dr.
Charleston, OR
U.S.A. 97420
E-mail: Steve.Rumrill@state.or.us

Michael J. Schirripa (FIS)

Fishery Resource Analysis and Monitoring Division
Northwest Fisheries Science Center, NMFS, NOAA
Hatfield Marine Science Center
2032 SE OSU Dr.
Newport, OR
U.S.A. 97365
E-mail: Michael.Schirripa@noaa.gov

Michael P. Seki (MIE-AP)

Pacific Islands Fisheries Science Center, NMFS, NOAA
2570 Dole St.
Honolulu, HI
U.S.A. 96822-2396
E-mail: Michael.Seki@noaa.gov

Caroline Tracy Shaw (WG-23)

Cooperative Institute for Marine Resources Studies, HMSC
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
E-mail: tracy.shaw@noaa.gov

John E. Stein (SB, MEQ, SG-FISP)

Science Board Chairman
Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA
U.S.A. 98112-2097
E-mail: John.E.Stein@noaa.gov

Suzanne Strom (WG-22)

Shannon Point Marine Center
Western Washington University
1900 Shannon Point Rd.
Anacortes, WA
U.S.A. 98221-4042
E-mail: Suzanne.Strom@wwu.edu

William J. Sydeman (MBM-AP)

MBM Co-Chairman
Farallon Institute for Advanced Ecosystem Research
P.O. Box 750756
Petaluma, CA
U.S.A. 94975
E-mail: wsydeman@comcast.net

Mark D. Sytsma (WG-21)

Environmental Science and Resources
Aquatic Bioinvasion Research and Policy Institute
Portland State University
P.O. Box 751
Portland, OR
U.S.A. 97207-0751
E-mail: sytsmam@pdx.edu

Elizabeth J. Tirpak (F&A)

OES/OA, HST Suite 2758
U.S. Department of State
2201 C Street NW
Washington, DC
U.S.A. 20520
E-mail: tirpakej@state.gov

Vera L. Trainer (HAB-S)

HAB-S Co-Chairman
Northwest Fisheries Science Center, NMFS, NOAA
2725 Montlake Blvd. E
Seattle, WA
U.S.A. 98112
E-mail: Vera.L.Trainer@noaa.gov

Thomas C. Wainwright (CCCC, MODEL)

MODEL Task Team Co-Chairman
Northwest Fisheries Science Center
NOAA Fisheries
2032 SE OSU Dr.
Newport, OR
U.S.A. 97365-5296
E-mail: thomas.wainwright@noaa.gov

Muyin Wang (WG-20)

Joint Institute for the Study of Atmosphere and Ocean
(JISAO)
University of Washington
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
E-mail: muyin.wang@noaa.gov

C. Michael Watson (MEQ)

Office of Environmental Assessment
US EPA Region 10
1200 Sixth Ave., OEA-095
Seattle, WA
U.S.A. 98101
E-mail: watson.michael@epa.gov

Mark L. Wells (HAB-S, WG-22)

School of Marine Sciences
University of Maine
5741 Libby Hall
Orono, ME
U.S.A. 04469
E-mail: mlwells@maine.edu

Membership-2008

Francisco E. Werner (MODEL)

Institute of Marine and Coastal Sciences Rutgers
University
71 Dudley Rd.
New Brunswick, NJ
U.S.A. 08901
E-mail: cisco@marine.rutgers.edu

Warren S. Wooster (CPR-AP)

1325 North Allen Place, Apt. 137
Seattle, WA
U.S.A. 98103
E-mail: wooster@u.washington.edu

Patricia A. Wheeler (BIO)

College of Oceanic and Atmospheric Sciences
Oregon State University
104 COAS Admin. Bldg.
Corvallis, OR
U.S.A. 97331
E-mail: pwheeler@coas.oregonstate.edu

LIST OF PICES ACRONYMS

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 –)
AP-NPDB	Advisory Panel on <i>North Pacific Data Buoy</i> (Oct. 2001 – Oct. 2006)
BIO	Biological Oceanography Committee
CCCC	Climate Change and Carrying Capacity Scientific Program (Oct. 1995 –)
F&A	Finance and Administration Committee
FIS	Fishery Science Committee
GC	Governing Council
IP-WT	FUTURE Implementation Plan Writing Team (Jun 2008 –)
MEQ	Marine Environmental Quality Committee
MONITOR	Formerly Task Team on Monitoring (Oct. 1997 – Oct. 2004), renamed to Technical Committee on Monitoring (Oct. 2004 –)
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 –)
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 – 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 –)
SG-GOOS	Study Group to develop a strategy for GOOS (Oct. 2006 – Oct. 2007)
SG-MAR	Study Group on <i>Marine Aquaculture and Ranching in the PICES Region</i> (Oct. 2006 – Oct. 2007)
SG-RAM	Study Group on <i>Restructuring of the PICES Annual Meeting</i> (Oct. 2008 –)
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)
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 –)
TT-CFAME	Climate Forcing and Marine Ecosystem Response Task Team (Oct. 2004 –)
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)

PICES Acronyms-2008

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 – 2008)
WG 20	Working Group on <i>Evaluations of Climate Change Projections</i> (Oct. 2005 –)
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 –)
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 –)