

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

ANNUAL REPORT

THIRTEENTH MEETING
HONOLULU, HAWAII, U.S.A.
OCTOBER 14-24, 2004

June 2005
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

TABLE OF CONTENTS

☪

☪

	Page
Report of Opening Session	1
Report of Governing Council	15
Report of the Finance and Administration Committee	55
Reports of Science Board and Committees	
Science Board Inter-sessional Meeting.....	73
Science Board	83
Biological Oceanography Committee.....	105
Fishery Science Committee	115
Marine Environmental Quality Committee.....	121
Physical Oceanography and Climate Committee.....	127
Technical Committee on Data Exchange.....	133
Reports of Sections, Working and Study Groups	
Harmful Algal Blooms Section.....	139
Working Group 17 on <i>Biogeochemical data integration and synthesis</i>	143
Working Group 18 on <i>Mariculture in the 21st century - The intersection between ecology, socio-economics and production</i>	147
Study Group on <i>Ecosystem-based management science and its application to the North Pacific</i>	157
Reports of the Climate Change and Carrying Capacity Program	
Implementation Panel on the CCCC Program	163
BASS Task Team.....	169
CFAME Task Team.....	177
MODEL Task Team	183
MONITOR Task Team	189
REX Task Team.....	193
Reports of Advisory Panels	
Advisory Panel on <i>Continuous Plankton Recorder Survey in the North Pacific</i>	201
Advisory Panel on <i>Iron Fertilization Experiment in the Subarctic Pacific Ocean</i>	205
Advisory Panel on <i>Marine Birds and Mammals</i>	209
Advisory Panel on <i>Micronekton Sampling Inter-Calibration Experiment</i>	215
Summary of Scientific Sessions and Workshops	219
Membership List	259
List of Participants	275
List of Acronyms	297

REPORT OF OPENING SESSION



The Opening Session was called to order at 8:30 a.m. on October 18, 2004, by the Chairman, Dr. Vera Alexander, who welcomed delegates, observers and researchers to the PICES Thirteenth Annual Meeting.

Welcome addresses on behalf of the host state and the host country

Ms. Yvonne Izu (Deputy Director, Department of Land and Natural Resources, Hawaii) greeted participants on behalf of the host state (*OP Endnote 1*), and Dr. Michael P. Sissenwine (Director of Scientific Programs & Chief Science Advisor, National Marine Fisheries Service, U.S.A.), welcomed participants on behalf of the host country (*OP Endnote 2*).

Remarks by representatives of Contracting Parties and the Chairman of PICES

Dr. Alexander called upon Dr. Laura Richards (Regional Director of Science, Pacific Region, Fisheries & 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 in *OP Endnote 3*.

Dr. Alexander invited Dr. Tokimasa Kobayashi (Director, Seikai National Fisheries Research Institute, Fisheries Research Agency, Japan) to speak on behalf of the Japanese Government. Dr. Kobayashi addressed the session and his remarks are appended to the report in *OP Endnote 4*.

Dr. Alexander then asked Mr. Wen-Xi Zhu (Deputy Division Director, Department of International Cooperation, State Oceanic Administration, People's Republic of China) to make a statement on behalf of the Chinese Government. Mr. Zhu addressed the session and his remarks are appended to the report in *OP Endnote 5*.

Dr. Alexander called upon Dr. Chul Park (Director, Marine Environment Department, National Fisheries Research & Development Institute, Republic of Korea) to speak on behalf of the Korean Government. Mr. Park addressed the session and his remarks are appended to the report in *OP Endnote 6*.

Dr. Alexander asked Dr. Lev N. Bocharov (Director, Pacific Scientific Research Fisheries Center, Federal Agency on Fisheries, Russian Federation) to make a statement on behalf of the Russian Government. Dr. Bocharov addressed the session and his remarks are appended to the report in *OP Endnote 7*.

Dr. Alexander invited Dr. Richard J. Marasco (Director, Resource Ecology & Fisheries Management Division, Alaska Fisheries Science Center, National Marine Fisheries Service, U.S.A.) to speak on behalf of the Government of the United States of America. Dr. Marasco addressed the session and his remarks are appended to the report in *OP Endnote 8*.

Dr. Alexander thanked Ms. Izu, Dr. Sissenwine and all the delegates for their remarks and spoke on behalf of PICES. The text of her address is appended to the report in *OP Endnote 9*.

Wooster Award presentation ceremony

Dr. Alexander and the Science Board Chairman, Dr. Ian Perry, conducted the Wooster Award presentation ceremony.

Dr. Perry quoted the following Science Board citation for the 2004 Wooster Award:

In October 2000, PICES established a new award named in honour 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 criteria for the Wooster Award are summarized as follows:

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 actively involved in PICES activities.*

The late Professor Michael M. Mullin (U.S.A.), Dr. Yutaka Nagata (Japan) and Dr. William Pearcy (U.S.A.) were honoured with the Wooster Award in 2001, 2002 and 2003, respectively.

PICES Science Board is pleased to confirm Dr. Paul H. LeBlond as the recipient of the 2004 Wooster Award.

Dr. Paul LeBlond has had a distinguished scientific, educational and public service career, which has contributed to the marine sciences generally and specifically to many of the goals of PICES. He has authored or co-authored more than 90 primary journal publications, 20 conference proceedings, and two books spanning a wide variety of physical and biological topics, many of which link fisheries research problems with changing physical oceanographic conditions in the North Pacific Ocean. His list of contributions also includes publications under the headings of Science Education, Book Reviews, Cryptozoology, Engineering Studies, Historical, Public Services, Marine Conservation, and Fun. The section under Cryptozoology alone has over 21 publications. Dr. LeBlond has remained one of the world's leading physical oceanographers throughout his distinguished career, and has supervised over 40 graduate students. He has lectured at several universities throughout the world, including onboard a cruise ship traveling the South Pacific. Dr. LeBlond has also served PICES well, as a member and then Chairman of the Physical Oceanography and Climate Committee, Chairman of WG 7 on Modeling of

the Subarctic North Pacific Circulation, and Co-Chairman of the Scientific Steering Committee for the first major inter-sessional international conference organized by PICES entitled "Beyond El Niño". He has been the recipient of several Canadian and international marine science awards, and has been a member or chaired a number of important Canadian public marine science committees. The diversity and excellence of Dr. LeBlond's science, his significant contributions to university education and public awareness of marine problems, the recognition he has received through major awards from his peers, and his unselfish participation in national and international ecology and environmental committees, makes him a deserving candidate for this award.

Then Dr. Alexander invited Dr. Warren Wooster to provide some comments:

I applaud the Science Board selection of Paul LeBlond to receive this award. Their citation makes the case very clear. I would like to comment on two points.

The first point relates to the interdisciplinary nature of marine science. Paul is a physical oceanographer, a species well known for avoiding involvement in messy fishery questions. But he early recognized that changes in ocean circulation and mixing had impact on fish populations and therefore has contributed actively to the work of several Canadian fishery conservation organizations. This is exactly the kind of miscegenation PICES has tried to promote!

Paul's career had been carried out in academia, at the University of British Columbia, where much of his teaching and research had been highly relevant to the work of PICES. As in the case in other member countries, such work is not done exclusively, or even principally, in government laboratories. This is evident in the makeup of delegations to PICES meetings where for example participation from Japan, Korea, and the US has usually been equally divided between government and academic scientists. Academic participation from other members tends to be significantly less. Yet not all wisdom

is to be found in government laboratories – as Paul might say, au contraire! I hope this point can be kept in mind by governments when identifying those to be supported for PICES participation.

Dr. Alexander and Dr. Wooster presented a commemorative plaque to Dr. LeBlond (a permanent plaque identifying Wooster Award winners resides at the PICES Secretariat in Sidney, British Columbia, Canada), who then made his acceptance remarks:

Madame la Presidente, distingues delegates, chers collegues,

It is a great honour for me to receive the Wooster Award and to find myself in the company of previous award recipients, Michael Mullen, Yutaka Nagata and Bill Pearcy, all of whom I met and learned to appreciate at previous PICES meetings. I am also particularly delighted to be more closely associated, through this award, with our founding father, Warren Wooster, who is here with us today. Warren's child, PICES, is now holding its Thirteenth Annual Meeting: PICES is now a teen-ager! Teen-age years are a period of great turmoil in human development. I am happy to say that I can detect no such turmoil in PICES, the institution. More importantly, I detect no evidence of a more common and graver symptom of maturing institutions: the tendency to crystallize into formality, to replace

youthful enthusiasm with routine and protocol. One way for an institution to retain its youthful dynamism is to attract young people to its fold, or at least to ensure that its supporters remain young-at-heart. So, in gratitude for this award, I offer two wishes. To all of you as individuals, I wish that you remain young-at-heart and full of joie-de-vivre: may you all follow in the footsteps of our founding father, who was already past usual retirement age when he gave birth to PICES. To PICES as an institution, I offer the wish of continuing youthful and dynamic success for years and years to come. Thank you again!

PICES “Year-in-Review” 2003

Dr. Perry reviewed PICES’ scientific accomplishments since the Twelfth Annual Meeting (*OP Endnote 10*).

Keynote lecture

The Science Board Chairman introduced the keynote speaker, Dr. Jeffrey J. Polovina (Pacific Islands Fisheries Science Center, National Marine Fisheries Service, United States of America). Dr. Polovina gave a keynote lecture titled “Send out the turtle fleet!”. The abstract of his presentation is appended to the report in *OP Endnote 11*.

The Opening Session closed at 11:00 a.m.

OP Endnote 1

Welcome addresses on behalf of the host state by Ms. Yvonne Izu

Good morning. I am very happy to welcome all of you to our beautiful State of Hawaii and our lovely city of Honolulu.

It is especially gratifying that your Organization, PICES, and the US Government chose Hawaii as the site of its Thirteenth Annual Meeting. Hawaii is literally isolated in the middle of the Pacific Ocean, far from any large land mass. The ocean and ocean resources, therefore, are central to our lives. From the earliest inhabitants of our islands, who crossed a vast expanse of

ocean from the South Pacific, to the tourists who are drawn here by the romance of Waikiki Beach – the ocean has largely defined who we are and how we live here in Hawaii.

The State Department of Land and Natural Resources is charged with the responsibility for protecting and managing the ocean resources that falls within the State of Hawaii’s jurisdiction. In carrying out that responsibility we need to balance many different, and often competing, interests, such as economic,

environmental, social, and cultural interests. But we understand that to adequately protect our ocean resources, we need to rely, first and foremost, on good science.

As resource managers, we have greatly benefited from the fact that many excellent ocean scientists have chosen either to be based here or to conduct their studies here. Hosting this meeting of marine scientists from around the world is further reinforcement that Hawaii is recognized as a leader in the field of marine

science, technology and education. And we thank you for having selected Honolulu as the venue for this meeting.

I wish you great success in your meeting. And I hope that each of you will have the opportunity while you are here in Hawaii to see some of the natural beauty of our island state and to experience some of our very unique culture. Once again, welcome and I hope you have a very enjoyable time while you are here. Thank you.

OP Endnote 2

Welcome address on behalf of the Government of the United States of America by Dr. Michael P. Sissenwine

Madam Chairperson, distinguished delegates, ladies and gentlemen, on behalf of the United States, on behalf of your US PICES Delegates and US members of the PICES community, it is an honor to welcome you to this Thirteenth Annual Meeting of the North Pacific Marine Science Organization, better known as PICES.

As some of you know, I wear more than one hat. Today, I am speaking as the leader of more than twenty marine research laboratories distributed throughout the United States. However, I am also the President of the International Council for the Exploration of the Sea, perhaps PICES' big brother or sister. In my ICES capacity, I recently signed an agreement for collaboration with the Intergovernmental Oceanographic Commission, IOC. Last week, I participated in a meeting of the United Nations Food and Agriculture Organization advising on marine science priorities. I also serve as a US delegate to the Pacific Sciences Association, which stresses marine ecology issues of the Pacific Islands. I feel fortunate to be able to work with all of the major international marine science organizations, now including PICES. Obviously, I believe in international collaboration, and indeed, I think it is essential if we are to advance our understanding of complex marine systems.

Never has the need for international collaboration been greater. I suspect that many

speakers have said this before, but I am sure it is true now. Challenges, such as understanding climate change, cannot be met unless nations work together. Opportunities, such as implementing the Global Ocean Observing System to provide products and services on a routine basis, and opportunities such as Ocean Exploration, including Census of Marine Life, to open a new era of discovery and excitement about the oceans, all require collaboration at the international level. In addition, public interest in the oceans, and expectations for them to be wisely and sustainably used based on objective science, are obvious to anyone exposed to the news media. These challenges, opportunities and expectations, not only require organizations like PICES, but also collaboration among them. This is happening. For example, I note that your Science Board Chairman is a familiar participant at ICES meetings.

I am particularly pleased with PICES' recent study to address the implications of regime shifts in the North Pacific on living marine resources. PICES scientists have been pioneering in describing the phenomena both in terms of the physical drivers, and ecological responses. These scientific findings lead to obvious questions about what managers should do about them. How do they know when a regime shift has occurred? How will the shift affect productivity of the resources that are the subject of conservation and management? For example,

can rebuilding targets and overfishing thresholds be treated as static, as they usually are, or do they need to be dynamic in response to ecosystem dynamics? I think the answer is obvious, but how to create a dynamic management regime that reflects the true dynamics of ecosystems, and not just an excuse for overfishing, is a critical challenge. And of course, managers want to know if future regime shifts can be predicted, and if not, are there early warning signs, and how will they recognize the next shift whenever it occurs? These are difficult, and important scientific questions. They are the epitome of relevance. By answering such questions, PICES is demonstrating that it has an “end-to-end scientific program,” from basic research, to applied research, to advice and products used for decision making. This is certainly the type of scientific enterprise we believe we have created with our six ecosystem-oriented Science Centers in the US, and it is the type of scientific organization we believe is most valuable internationally.

The issue of regime shifts, and what to do about them, broadly falls within the realm of an ecosystem approach. Today, everyone is talking about the ecosystem approach. It has been called for to replace traditional approaches, or “single species” approaches, which are perceived by some to have failed. The World Summit on Sustainable Development in Johannesburg in 2002 called on Nations to apply the ecosystem approach to fisheries by 2010. The US Commission on Ocean Policy recently called for an ecosystem approach for fisheries as well as all of the nation’s coastal and ocean resources. But what is the ecosystem approach? Policy makers face the dilemma of having bought into an approach largely espoused by scientists, yet scientists have either failed to articulate what it is in practical terms (so that managers actually know what to do), or even worse, scientists argue among themselves about what it is. In my opinion, this is an example of the scientific community failing to fulfill the

“end-to-end” model I described a few minutes ago. In this regard, I hope PICES can help to focus the debate on tangible outcomes as it is doing for regime shifts.

For what it is worth, I will offer my opinion about what an ecosystem approach is. I think this is the emerging view of people who both understand the scientific issues, and also have practical experience translating scientific information into scientific advice that decision makers can use. The ecosystem approach is a process that allows broad participation into setting objectives, and it considers all sources of scientific knowledge, and uncertainties. It is not a pre-determined outcome that is necessarily different from the outcome that would have occurred otherwise, but more views and information will have been considered. The approach must be implemented incrementally, and collaboratively. It is an approach that is evolutionary, not revolutionary. There is no point when we have suddenly switched from a traditional approach to an ecosystem approach. In fact, I think we are applying an ecosystem approach today, more so than we were five years ago, but not as much so as we will be five years from now. There are many examples, dealing with bycatch, species interactions, habitat protection, and implication of regime shifts, as I discussed a few minutes ago. It is time to claim some victories, at least small victories, and build on them.

Let me close by thanking you for holding your Thirteen Annual Meeting here in the United States, in beautiful Honolulu. It gives US scientists a great opportunity to experience PICES. I also realize that such meetings are a lot of work for the local organizers and the Secretariat. I also want to thank them for their dedication and commitment to making this meeting a success.

PICES participants, please enjoy, learn and generate the new ideas and collaborations we need for the future. Thank you.

OP Endnote 3

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

Madame Chairman, distinguished guests and colleagues, on behalf of Canada and the Canadian delegation, I would like to thank the United States for inviting us here to Honolulu.

Last year was a milestone for PICES. We completed a Strategic Plan which is now posted on the PICES web site. The Plan includes a clear mission to provide scientific leadership and to advance scientific knowledge. The challenge for Committees here in Honolulu will be to begin to set this Plan in motion and to decide on actions that would chart the course for PICES over the next 3 – 5 years.

As a step in implementing the Strategic Plan, PICES agreed, for the first time in its history, to provide formal advice at the request of a Contracting Party, in this case, the United States. I think it is very appropriate for us to be meeting here in Honolulu to hear about the work of the Study Group and to present PICES' formal advice to the Government of the United States.

I, for one, am very impressed with the quality and relevance of the advice that the Study Group was able to provide. As mentioned by Dr. Sissenwine, we know that international collaboration is essential for addressing global problems like climate change and the sustainability of marine ecosystems. The work of the Study Group and the North Pacific Ecosystems Status Report are testaments to the willingness to collaborate within PICES. Together, these reports illustrate the strengths and opportunities of the vibrant PICES organization that we have created.

I anticipate that as we move forward, we will have an even greater need to provide impartial international advice on topics of concern to Pacific Rim nations. PICES has demonstrated its strength as an organization that can fulfill this role.

Let us look to the future and continue to build on our successes!

OP Endnote 4

Remarks at the Opening Session by Dr. Tokimasa Kobayashi (Japan)

Chairperson, distinguished delegates, guests and colleagues: First of all, on behalf of Japan and the Japanese delegation I would like to express sincere thanks to the Government of the United States of America, the Government of Hawaii State, the National Oceanic and Atmospheric Administration, and the local organizing committee for hosting this meeting and organizing all the events. We are sure that all your excellent efforts will make this meeting a great success. Furthermore I would like to appreciate the opportunity to visit wonderful and fantastic Hawaiian Islands here.

Since PICES was established in 1992, the Organization has been challenged with plenty of important issues on marine science. The activities of PICES have multiplied and extended in depth through the spirit of

international scientific cooperation on a mutually beneficial basis as outlined in the PICES Convention. Collaboration with relevant international scientific organizations has also growing every year. Of course, I would like to emphasize that the efforts of member countries have pushed forward PICES activities and made PICES a splendid and flexible Organization.

In recent years, in the southwestern area of Japan facing the East China Sea, specific changes have been observed in the fauna and flora of marine organism related to the rise of seawater temperature. Moreover, in the Sea of Japan, innumerable large jellyfish appeared and damaged coastal fisheries. It may indicate that the marine ecosystem around the East China Sea and the Sea of Japan has begun to shift to a new phase.

We are aware of the relationship between climate change and the sustainability of the marine ecosystem. Therefore elucidation of the marine ecosystem function is an important and substantial issue, and building up a new accurate trend-forecasting model on the relationship between ocean environmental change and the dynamic fisheries resources fluctuation is expected. I emphasize that it is necessary that PICES continues to lead the scientific investigation on this issue in the North Pacific.

By the way, reformation of national scientific organizations has been proceeding in Japan. National universities had been transformed into

outstanding executive agencies, independent of any direct connection with the government since last April. In October 2003, Japan Fisheries Research Agency had also combined two corporations, Japan Marine Resources Developing Center and Japan Sea Farming Association. Although our situation has changed, Japanese scientists would like to continue to encourage the mutually beneficial collaboration with PICES member countries.

Finally, to make sure the highly successful achievement of this Thirteenth Annual Meeting, all of the participants today would try to work together with the PICES spirit. Thank you.

OP Endnote 5

Remarks at the Opening Session by Mr. Wen-Xi Zhu (People's Republic of China)

Dr. Vera Alexander, Chairperson of PICES, distinguished guests, ladies and gentlemen, on behalf of the Chinese Government and the Delegation of China, I would like to thank the Government of the United States of America for inviting us here to Hawaii. The Delegation of China is very appreciative of our host's efforts to organize this meeting and expressions of their hospitality.

Ushering into 21st century, with rapid economic development, conflict among population, environment and resources is becoming more and more serious. In the context of sustainable development, it has become an important and pressing task for every country to better understand the oceans.

Adjacent to the Pacific Ocean, and with a dense population in coastal areas, China has inevitably come to depend more and more on the oceans. In response to the call of the UNCED and the WSSD, and to ensure the marine sustainable development, the Government of China adheres strictly to the principle of laying equal emphasis on protection and development. In recent years, several national plans and programs have been promulgated, such as the National Programming Compendium on Marine Economic

Development and the National Marine Functional Zoning Scheme, and a dozen of marine-related laws and regulations have been put into force or amended. Besides, our government has intensified its efforts in sea area use management, marine environment protection, disaster prevention and mitigation. However, we have fully realized that the efficiency of ocean management and the sustainability of ocean development are dependent on scientific understanding and assessment of the regional seas, even the global oceans. That is, marine science is the most important basis for management.

As an intergovernmental marine science organization, PICES concentrates its research efforts on the North Pacific. Through more than 10 years' effort, by displaying its important role in the promotion and coordination of marine research; advancing scientific knowledge about the global weather, climate change, oceans ecosystems and the impacts of human activities; and promoting the collection and rapid exchange of scientific information, PICES has already become a major forum for international cooperation in marine science around the world. As a country with important marine science capabilities, China attaches great importance to

marine scientific research. Therefore, China would like to strengthen its cooperation with each party within PICES' framework, and to play an active role in this connection.

Finally, I wish this meeting a great success and everybody a good stay in this beautiful city. Thank you.

OP Endnote 6

Remarks at the Opening Session by Dr. Chul Park (Republic of Korea)

Madam Chairperson, distinguished delegates, ladies and gentlemen, on behalf of the Government of the Republic of Korea and Korean delegation, I would like to appreciate Dr. Vera Alexander, Chairperson of PICES, Dr. Richard Marasco, Chairman of the Finance and Administration Committee, and Dr. Alexander Bychkov, Executive Secretary of PICES, for their enthusiastic effort to prepare this Thirteenth Annual Meeting.

Probably the oldest intergovernmental marine science organization is the International Council for the Exploration of the Sea, ICES, which was founded in 1902. Although its North Pacific analog, PICES, was established much later, it is catching up with ICES pretty fast. And this must be due to the excellent leadership shown by former Chairmen Dr. Warren Wooster, Dr. William Doubleday, and Dr. Hyung Tack Huh. On behalf of the Korean delegation, I would like to thank them for their devotion.

We gather here in the need for improved scientific understanding of the North Pacific Ocean and its processes, living resources, and oceanographic features. And this year's main theme is "Beyond the continental slope - complexity and variability in the open North Pacific Ocean". Obviously, questions related to this theme can be best answered through a spirit of international scientific cooperation.

One of the major topics we have discussed during the past couple of years, and will also discuss this year, is global warming and its

impact on fisheries. Previous discussions were primarily based on catch data, in that the amount of fisheries resources could be assessed. Though previous reports successfully showed the relationship between reduction in fish catches and climate changes, so-called regime shift, the time lag that might be accompanied in case of fishes with multi-year-classes was not fully examined yet. And the possibility was not tested yet, either, that fish species might change their habitats so that usual fishing sites were not appropriate for the amount of usual catches. This possible abnormal migration or the shift of habitats can better be studied by international cooperative research. In this sense this year's theme is timely and in very good harmony with the spirit of PICES.

Discussions on the recent increase in gelatinous zooplankton also seem to be very timely. Despite their importance to the ecosystem and their damage to fisheries, there are substantial gaps in our knowledge of these organisms. The ecology of gelatinous zooplankton will also be discussed this year.

Other topics of this Annual Meeting are all timely and essential for the better understanding of the ecosystem of the North Pacific. I believe this Thirteenth Annual Meeting will be very successful through the efforts of all the participants who will be working together. I hope you will all enjoy the meeting and the day and nights in this beautiful paradise of the North Pacific. Thank you for your attention.

OP Endnote 7

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

Distinguished Madam Chairperson, esteemed participating national representatives, ladies and gentlemen: First of all, let me thank you on behalf of the Russian delegation for this great opportunity to take part in this Annual Meeting and to visit Honolulu, which is one of the most beautiful cities in the world, located on the Hawaiian Islands.

I would like to emphasize the excellent work of the Local Organizing Committee and appreciate their tremendous efforts made to successfully host the Thirteenth Annual Meeting of PICES.

Over the past twelve years, the scope of PICES activities has multiplied. Currently, PICES as an international scientific organization is widely known in the world's scientific community and in the international fisheries community of the North Pacific.

Also I would like to mark the productive contacts between PICES and other scientific organizations involved in a complex study of hydrobionts stocks in the northern part of the Pacific Ocean. The forthcoming joint

symposium with the North Pacific Anadromous Fish Commission on "The State of Pacific salmon and their role as indicators of the health of North Pacific marine ecosystems" planned in 2005 confirms that.

It makes all of us proud, that by common efforts of the Contracting Parties, we have already completed the development of such important document for subsequent PICES work as the Strategic Plan.

Unfortunately, a potential country-participant of PICES – Mexico, has refused to join our Organization this year due to economical difficulties. We hope these difficulties are temporary and we will be very glad to see Mexico as an equal country-participant of PICES in the near future.

At the end of my speech I want to wish all participants of the Thirteenth Annual Meeting productive work this week. We have a lot of important tasks to accomplish and many important decisions to make. Good luck to the Meeting and thank you.

OP Endnote 8

Remarks at the Opening Session by Dr. Richard Marasco (U.S.A.)

Madam Chairperson, distinguished delegates, ladies and gentlemen: I would like to express a warmhearted welcome to all of you on behalf of the United States and the United States delegation. I would like to thank the Pacific States Marine Fishery Commission staff and the PICES Secretariat for their efforts in setting up this Annual Meeting.

The thematic focus of this Annual Meeting is on the area of the North Pacific far beyond the continental shelf. These areas are generally perceived as physically homogeneous and stable with low biological productivity. Despite the low productivity, they are viewed as supporting complex ecosystems with high biodiversity.

This focus provides the opportunity to compare and contrast these areas with neighboring regions of higher productivity.

Oceans transcend national boundaries and their study requires international cooperation and collaboration. The progress that PICES has made on the North Pacific Ecosystem Status Report is a testament to the willingness to collaborate within PICES. The Report provides an important summary of the status and trends of marine ecosystems and will promote movement toward a common understanding of changes that have occurred in these systems. Such knowledge is necessary if efforts to implement ecosystem-based management are going to be

successful. The North Pacific Ecosystem Status Report should therefore be viewed as the first step in the process of applying this increasingly important and popular paradigm. Steps that will follow include the development of joint research plans and analyses. These steps will be more difficult but they will pay high dividends. Some countries, such as the United States, have expressed interest in cooperating in joint studies of oceans to support sustainable use of marine resources. PICES has, and should, continue to play an active role in promoting these activities. Further, PICES scientists should continue to provide advice that will assist member nations

design management strategies that promote the sustainable use of their living marine resources.

Societies face many challenges in this 21st Century. One challenge is the implementation of an ecosystem approach to the management of living marine resources. PICES scientists should play an active role in addressing this challenge. The recent formation of the Ecosystem Based Study Group will promote a dialogue that should assist such efforts.

Again, I welcome you to Honolulu and hope that you find the scheduled sessions informative. Thank you.

OP Endnote 9

Welcome Address by Dr. Vera Alexander, Chairman of PICES

Welcome again to the opening session of the Thirteenth Annual Meeting of PICES, the North Pacific Marine Science Organization. Quite appropriately, we are meeting in the middle of the Pacific Ocean on the beautiful island of Oahu with two broad goals and activities for the week. First and foremost, we will discuss and synthesize scientific knowledge about our region, and the second goal is to accomplish the things needed, to effectively manage and advance the Organization itself, providing the support needed for the scientific work.

I am using this opportunity to present a brief discussion of the status of PICES today. There is no question about the scientific productivity of PICES – the output has been phenomenal, and the quality high. PICES' special issues of journals, part of the refereed literature, have been extremely highly used and cited. PICES is addressing scientific issues of great contemporary concern, and providing the best possible scientific analysis. Examples of areas in which PICES has contributed are climate change and ecosystems, including fisheries, scientific information needed for ecosystem-based management, carbon cycling, effective modeling of the complex ocean system, iron fertilization, marine birds and mammals, and so on.

The primary mission of PICES is to promote scientific knowledge of the North Pacific Ocean, and PICES is more than fulfilling this mission. There is absolutely no way that individual nations could produce such comprehensive analyses and publications or produce the venues for such extraordinary scientific interaction among young and older scientists from around the Pacific Rim. The concept of a PICES, roughly, but not entirely, parallel to ICES, was a good one; I believe that we can safely say this after more than a decade of experience. I am pleased to recognize the presence today of Dr. Warren Wooster, the visionary, but also the investor of hard labor and years of experience, who made this Organization a reality. Further, I might add that I am blessed, as PICES Chairman, with a functional and well-established Organization. Of course, we must continue to develop and refine, but the basics have been done. We have just completed a Strategic Plan, and will be moving towards a comprehensive action plan constructed from the plans of the Scientific Committees through the Science Board.

PICES, to an ever-increasing extent, is being recognized within the larger context of international marine organizations, and we are delighted with the great interest and

participation at this meeting by representatives from more than 22 organizations. Governing Council plans to spend a few minutes hearing from some of these, so that we can continue to develop relationships and cooperate effectively. In particular, we will be interested to learn of specific areas that we can pursue together.

This critical work of PICES that I have just described - the scientific mission - supported by the other Annual Meeting activity, the management of PICES business. We have a smoothly operating, but overworked, Secretariat; I want to acknowledge their hard and excellent work, their dedication, and their effectiveness. I also want to thank the national representatives who serve on the Governing Council and on the Finance and Administration Committee for their

hard work. Decisions are often not easy, and the thoughtful contributions of the contracting party delegates are critical to the Organization. Whereas the PICES Science Board and Scientific Committees and other bodies enjoy the responsibility for oversight and conduct of the scientific part of the work, the governing structure plays an essential role. Finally, many Contracting Parties have provided financial support beyond the required contributions, and this makes all the difference in PICES' ability to serve. It has allowed the expansion of activities and has contributed to the high scientific productivity.

So, on the balance, PICES is thriving. Now, we can look forward to this meeting. Thank you for coming - Aloha.

OP Endnote 10

PICES "Year-in-Review" 2004 by Dr. Ian Perry, Chairman of Science Board

The success of PICES, now and into the future, is being built upon three pillars: scientific excellence, scientific advice, and scientific capacity.

Scientific excellence includes publications, working group activities, workshops and symposia. PICES has been very productive scientifically this year, with five issues of primary scientific journals on PICES topics and one scientific report being published to date in 2004. Three other scientific reports are expected before the end of 2004. A measure of the scientific impact of these publications is provided by the *Elsevier* publications website which, as of September 2004, indicated that of the top 25 downloaded publications from journals in which PICES has special issues, papers published by PICES occupied positions numbered 2, 3, 5, 6, 12, 16, 18, 20 in *Progress in Oceanography* and 2, 9, 11, 13, 24 in *Marine Environmental Research*.

PICES-sponsored and co-ordinated research continues to be active on the water. The Continuous Plankton Recorder project conducts meridional transects in the NE Pacific 5-6 times

annually, and zonal transects across the North Pacific 3 times annually, using commercial ship-of-opportunity vessels. And just one week prior to the Annual Meeting, the PICES Advisory Panel on *Micronekton sampling inter-calibration experiment* hosted a field survey off Hawaii in which they conducted inter-comparisons of systems typically used to sample micronekton in the North Pacific.

Another indication of PICES' scientific excellence is the North Pacific Ecosystem Status Report, which is available in pre-publication form from the PICES web site, and is expected to be published shortly. This report provides an analysis of the thirteen PICES regions in the North Pacific and a synthesis which integrates the status of all these regions. In general, although there are local and regional stresses in the marine ecosystems of the North Pacific, there have also been successes where marine populations are doing well.

The extent of scientific meetings also indicates the vibrant scientific life of PICES. Over the past year, PICES has convened or co-sponsored 19 meetings and workshops, including

monitoring in the North Pacific, modelling lower trophic level production and linkages to fish, biogeochemical processes and data integration related to carbon cycling and iron enrichment experiments, and ecosystem indicators for fisheries management.

The Thirteenth Annual Meeting of PICES, which we open today, with the theme of “*Beyond the continental slope - complexity and variability in the open North Pacific Ocean*”, promises to be another successful event with 11 scientific sessions, 6 workshops, and several Working Group, Task Team and Advisory Panel meetings.

Scientific advice: PICES is not designed to provide short-term, tactical, management advice, in contrast to our sister organization ICES. However, PICES is moving to provide advice on broad issues concerning North Pacific marine systems, whether or not specifically requested by member nations. The North Pacific Ecosystem Status Report is one example of unsolicited advice. In October 2003, PICES received a formal request for advice from the United States concerning the characteristics and impacts of recent regime-like changes in the North Pacific. PICES responded by forming a 1-year Study Group (called FERRRS: *Fisheries and Ecosystem Responses to Recent Regime Shifts in the North Pacific*). The report of this Study Group will be presented to the United States at PICES XIII.

Scientific capacity: Scientific capacity within PICES includes the willingness and commitment of the scientists and others about the North Pacific (and elsewhere) to devote time and effort to the work of PICES. It also includes a strong PICES Secretariat which, with only 4 permanent staff, is doing an outstanding job of keeping these activities going.

To help a broad-based, scientific, organisation like PICES formulate a clear direction and maintain a sense of forward momentum, the Governing Council, Science Board, and scientists of PICES developed the PICES Strategic Plan. The PICES mission is “*To promote and coordinate marine scientific*

research in the North Pacific Ocean in order to advance scientific knowledge of the area concerned and of its living resources.” The Strategic Plan includes a strategy for PICES to achieve this mission, involving 5 themes each with specific goals:

- Theme A. Advancing scientific knowledge
- Theme B. Applying scientific knowledge
- Theme C. Fostering partnerships
- Theme D. Ensuring a modern organization supporting PICES activities
- Theme E. Distributing PICES scientific information.

The Strategic Plan was developed to guide the selection of future activities of PICES. The next steps are to develop an Action Plan, in which each PICES Committee considers where they want to go over the next 3-5 years, what topics they want to explore, and how these fit together with topics of other Committees.

PICES has also reorganized the Climate Change and Carrying Capacity (CCCC) Program. The Basin Scale (BASS) and Regional Experiment (REX) Task Teams are concluded at this Annual Meeting, and PICES thanks their Chairmen and members for their effort and dedication. They have been replaced with a new Task Team on *Climate Forcing and Marine Ecosystem Response* (CFAME), whose objective is to synthesize regional and basin-wide studies and provide a forum for the integration and conclusion of CCCC-related hypotheses and data. The MONITOR Task Team of the CCCC Program has been removed from the CCCC Program and re-formed as a Technical Committee directly under Science Board. This will provide an on-going focus on monitoring in the North Pacific, and in particular will consider the monitoring needs of the PICES Region, oversee updates to the North Pacific Ecosystem Status Report, and serve as the interface between PICES and observing systems such as GOOS.

In addition, PICES is discussing what scientific issues should be the basis for the next major integrating program of PICES, after the completion of the CCCC Program. Suggestions so far include additional questions arising from the CCCC Program, possible interactions with

CLIVAR on climate and North Pacific ecosystems, issues of marine biogeochemistry and food webs that would link with the new IGBP program on *Integrated Marine Biogeochemistry and Ecosystems Research* (IMBER), and ocean and ecosystem responses to high concentrations of carbon dioxide.

Finally, as this meeting is the end of my 3-year term as Chairman of PICES' Science Board, I welcome Dr. Kuh Kim (Korea) as the new Chairman of Science Board, and express my thanks to the Governing Council, the scientists, and in particular to the PICES Secretariat for their help and support during my term. Your support has been essential – Thank You!

OP Endnote 11

“Send out the turtle fleet!”

Abstract of the keynote lecture by Jeffrey J. Polovina (Pacific Islands Fisheries Science Center)

In order to describe the oceanic habitats and migratory pathways of large pelagic animals, biological oceanographers are sending out fleets of animals with electronic tags. Since 1997, I have worked with a number of colleagues deploying fleets of pelagic animals including sea turtles, tunas, moonfish and whale sharks. I will describe some of the insights we have gained from sending out fleets of loggerhead, olive ridley and leatherback sea turtles in the North Pacific. The turtles we tracked come from a variety of sources including turtles caught in long-line fisheries, turtles captured by research scientists, and turtles released from aquaria. Electronic tags are attached to the turtles to transmit frequent estimates of the turtles' positions via an Argos satellite. These data together with environmental data from satellite remote sensing are used to describe the oceanic habitat used by these turtles. The results indicate that loggerheads travel across the North Pacific, moving seasonally north and south primarily through the region 28°-40°N, and occupy sea surface temperatures (SST) of 15°-25°C. Their dive depth distribution indicated that they spend 40% of their time at the surface and 90% of their time at depths less than 40 m. Loggerheads are found in association with fronts, eddies and geotropic currents.

Specifically, the Transition Zone Chlorophyll Front (TZCF) and the meanders and eddies in and south of the Kuroshio Extension Current (KEC) appear to be important forage and migration habitats for loggerheads.

In contrast, olive ridleys were found primarily south of loggerhead habitat in the region 8°-31°N latitude, occupying warmer water of the subtropical gyre with SSTs of 23°-28°C. They have a deeper dive pattern than loggerheads, spending only 20% of their time at the surface and 60% shallower than 40 m. However, the three olive ridleys identified from genetics to be of western Pacific origin, spent some time associated with major ocean currents, specifically the southern edge of the KEC, the North Equatorial Current (NEC) and the Equatorial Counter Current (ECC). These habitats were not used by any olive ridleys of eastern Pacific origin, suggesting that olive ridleys from different populations may occupy different oceanic habitats. Finally leatherback turtles use a range of habitats including the California Current and the equatorial currents. Like the olive ridleys they forage subsurface with a high proportion of their time-at-depth in the 25-50 m depth range in both the eastern and equatorial Pacific.

REPORT OF GOVERNING COUNCIL



The Governing Council met from 8:30-12:30 on October 20, from 8:30-17:00 on October 22 and from 8:30-12:30 on October 23, under the chairmanship of Dr. Vera Alexander. Dr. Alexander Bychkov served as rapporteur. All Contracting Parties were represented at the three sessions (*GC Endnote 1*). The Chairman welcomed attendees, introduced the agenda and suggested the order in which to take up the various items. The agenda was adopted as presented (*GC Endnote 2*). This report summarizes the treatment of each agenda item during the course of the three sessions.

Report on Administration (Agenda Item 3)

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

Report of 2004 interim Science Board/ Governing Council meeting (Agenda Item 4)

The 2004 interim Science Board meeting, with the participation of Council members, was hosted by the Korean Ministry of Marine Affairs and Fisheries (MOMAF) and the Korean Ocean Research and Development Institute (KORDI) on May 6-8, 2004, in Jeju, Republic of Korea. Like the first interim meeting (April 7-9, 2003, Victoria, Canada), it proved to be valuable for assessing the progress and for planning future directions of the Organization. The report of this meeting is included elsewhere in this Annual Report. An article entitled "The future of PICES" that briefly summarizes the results from the meeting was prepared by the Science Board Chairman, Dr. Ian Perry, and published in PICES Press in July 2004 (Vol. 12, No. 2).

A ½-day Council meeting was convened in the afternoon of May 7, and the report of this meeting is appended as *GC Endnote 4*.

Membership and observers from other countries (Agenda Item 5)

The Secretariat did not receive proposals from any country to accede to the PICES Convention in 2004.

Earlier, Council expressed strong interest in encouraging Mexico to accede to the PICES Convention (an initial resolution was adopted at PICES VIII; Decision 99/A/), and spent significant efforts in doing so. Details can be found in the 1999-2003 PICES Annual Reports.

Mutual benefits of Mexico joining PICES were discussed at the meeting between PICES and Mexican representatives at the IOC Assembly in June 2003. It was then agreed that formal letters be sent by PICES, Canada, and the United States of America, to high-level Mexican government officials to start the procedures.

On July 24, 2003, the PICES Chairman wrote a letter to Ing. Marco Polo Bernal-Yarahuan (Subsecretario, Subsecretaria de Educación e Investigación Tecnológicas) encouraging Mexico to join the Organization. Supporting letters were also sent by Canada's delegate to PICES, Dr. Joan Kean-Howie, to Ing. Bernal-Yarahuan in late July, and by Ms. Margaret F. Hayes of the US Department of State to Mr. Gerardo Lozano (Director of Mexican Institute for International Cooperation, Secretariat of Foreign Relations) in mid-August. Subsequent to these letters, the PICES Secretariat sent a complete package of these documents with a copy of the PICES Handbook, which contains the PICES Convention and other official documents, to both Ing. Bernal-Yarahuan and Mr. Lozano.

A response from Ing. M.P. Bernal-Yarahuan (dated May 28, 2004) arrived on June 22, 2004. The letter states that the difficult economic situation of Mexico does not permit them to join

the Organization. The Canadian and the US governments have not received any response to their letters directly.

In spite of the negative outcome and the long delay in their reply, Dr. Alexander suggested, that the response from PICES should be encouraging and welcoming, and her view was supported by Council. Her letter to Ing. Bernal-Yarahuan was sent to Mexico by courier mail on July 29. No response has been received from Mexico as of October 5, 2004.

Council agreed that efforts in bringing Mexico to PICES should continue in the following directions:

- Request PICES national delegates to facilitate the process of having Mexico accede to the PICES convention through

Alaska Ocean Observing System (AOOS)
Census of Marine Life (CoML)
Climate Variability and Predictability Program (CLIVAR)
Global Ocean Ecosystem Dynamics (GLOBEC)
Global Ocean Observing System (GOOS)
Exxon Valdez Oil Spill Trustee Council (EVOS)
International Program for deployment of profiling floats (Argo)
International Council for the Exploration of the Sea (ICES)

Intergovernmental Oceanographic Commission (IOC)
Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)
International Whaling Commission (IWC)
North Pacific Anadromous Fish Commission (NPAFC)
North East Asian Regional GOOS (NEAR-GOOS)
North Pacific Research Board (NPRB)
Pacific Coast Observing System (PaCOS)

Scientific Committee on Oceanic Research (SCOR)
Surface Ocean Low Atmosphere Study (SOLAS)
IOC Sub-Commission for the Western Pacific (WESTPAC)

The Science Board Chairman and Executive Secretary reported on communication with the relevant organizations and programs since last year's meeting (see *GC Endnote 3* for details). Time was also reserved at the first session of Council (October 20, a.m.) for representatives of several organizations and programs (AOOS,

bilateral discussions between Mexico and their respective countries;

- Encourage the Directors of Mexican marine research institutes and leading scientists to send letters to high-level Mexican government officials expressing their interest for Mexico to join PICES;
- Explore the practical value of another visit of a PICES delegation to Mexico.

Relations with relevant organizations and programs (Agenda Item 6)

Letters of invitation to attend PICES XIII were sent to intergovernmental and non-governmental organizations and programs on the agreed *Standing List of International and Regional Organizations and Programs* (Decision 03/A/6), and the following sent observers:

Ms. Molly McCammon
Dr. George Boehlert
Dr. Kelvin Richards
Dr. Francisco E. Werner
Dr. Thomas C. Malone
Dr. Phillip Mundy
Dr. John Gould
Dr. David Griffith
Dr. Michael Sissenwine
Dr. Maria Hood
Dr. Julie Hall
Dr. Hidehiro Kato
Dr. Loh-Lee Low
Dr. Vyacheslav Lobanov
Dr. Clarence Pautzke
Dr. William W. Fox, Jr.
Dr. Usha Varanasi
Dr. John Hunter
Dr. Elizabeth Clarke
Dr. Julie Hall
Dr. Shigenobu Takeda
Dr. Miguel Fortes

EVOS, ICES, IMBER, IOC, NPRB, NPAFC, PaCOS, SCOR, SOLAS and WESTPAC/NEAR-GOOS) to express their views on potential areas of collaboration with PICES (some of these presentations are posted on the PICES website).

Dr. Alexander noted a steady progress in the integration and coordination of activities with other international scientific organizations and programs of regional and global scale, and with regional scientific and monitoring efforts in the North Pacific (these efforts might be national or involve several PICES member countries). She thanked all representatives for attending and presenting their ideas, and assured them that PICES will continue expanding its relationships with relevant organizations and programs, especially those aligned with the PICES ecosystem research focus.

The Science Board revises the *Standing List of International and Regional Organizations and Programs* annually (Decision 99/S/6). In addition, it selects a subset of organizations and programs that are considered to have the highest priority for PICES with respect to scientific cooperation and facilitation in the coming year. This list is used, in part, to assist the Executive Secretary and Science Board in decisions regarding travel to meetings of other international organizations. Council reviewed and approved the *Standing List* for 2004-2005 as recommended by Science Board (*SB Endnote 9*), and agreed with the identified priorities for interaction (Decision 04/S/6).

History of PICES: Science and politics (Agenda Item 7)

A study of the history of PICES, from the inception of planning in the 1970s through its first decade as an intergovernmental scientific organization, was funded by the National Science Foundation (through a grant to the University of Alaska Fairbanks) and carried out by Dr. Sara Tjossem during the last two years. She was working with founder and former PICES Chairman Dr. Warren S. Wooster, who was invited to report on the status of this project at the first session of Council on October 20.

Dr. Wooster indicated that the manuscript, "The Journey to PICES: Scientific Cooperation in the North Pacific", is essentially complete and has been delivered to the PICES Secretariat. He recommended that it be published jointly by PICES and a university press, for example, that

of the University of Alaska which made a major contribution to the development of PICES. Distribution of a joint publication would ensure bringing the story of PICES to a wide audience. Some funds to support publication are available from the National Science Foundation, but additional support will be needed from the publishers. Dr. Alexander agreed to approach the Alaska Sea Grant College Program (University of Alaska Fairbanks) to undertake the final editing and publication of the book. Dr. Richard Marasco offered to have the Publication Program of the Alaska Fisheries Science Center provide proofreading gratis. Council concluded that it would be desirable to publish the book prior to PICES XIV (October 2005).

Dr. Wooster also made the following statement. "*Review of the history reminds us that establishment of PICES was complicated and delayed by political questions, principally those connected with North Pacific fisheries. The motivation of the scientists promoting the organization was essentially to enhance our collective capability to find out how the ocean system works. Of course, achieving that understanding requires knowledge of human effects, but its application, for example in fishery management, is basically a political rather than a scientific question. The separation of science from its application, as is inherent in PICES structure and external interactions, is the key to ensuring the objective quality of scientific assessments.*

New political problems have now arisen in the naming of an important region of PICES activities, the sea lying between Japan, Korea, and Russia. Among other things, this region is a component of the North Pacific Ecosystem Status Report whose completion and publication is threatened by the controversy. The scientific questions are indifferent to its appellation which could as well be "Region X" or as I sometimes think of it, "the sea of despair." As one who has seen how fishery politics has complicated the early days of PICES, I express the hope that this political problem will be resolved outside the halls of PICES, by government officials who are in a better position than scientists to deal with such matters."

Report of the Study Group to respond to the US request for advice (Agenda Item 8)

In October 2003, PICES received a formal request for scientific advice from the United States concerning the characteristics and impacts of recent regime-like changes in the North Pacific (*SB Endnote 15* in the 2003 PICES Annual Report). Previous regime shifts have had serious implications for ecosystems, and consequently for fish populations and the fishing industry. As such, the National Marine Fisheries Service requested scientific advice from PICES that addresses the following questions:

1. Has the North Pacific shifted to a different state or regime since the late 1980s?
2. What is the nature of the new state?
3. What are the ecosystem responses?
4. How long can the shift be expected to last?
5. Is it possible to predict when the regime will shift back and what indicators should be used to determine when it happens?
6. What are the implications for the management of marine resources?

Council found the request as both timely and important, and established a 1-year Study Group on *Potential implications of recent regime shifts in the North Pacific for fisheries*, under the direction of Science Board, to deal with this project (Decision 03/A/5). The Study Group was comprised of 20 scientists representing all Contracting Parties, and was chaired by Dr. Jacquelynn King (Canada). Later, the Study Group was re-named *Fisheries and Ecosystem Responses to Recent Regime Shifts* (FERRRS). The National Marine Fisheries Service provided US \$45,000 to support PICES activities in this direction.

The Study Group met February 9-10, 2004, in Victoria, Canada, to organize activities and outline a report that would provide the background material necessary to prepare responses to the six questions posed in the request for advice. The background material was reviewed at a 3-day workshop held June 14-16, 2004, in Seattle, U.S.A. A major focus for the workshop was the description of coherent regional responses to the 1998 regime shift and development of advice on resource management

approaches. Answers to the six questions were formulated.

The report of the Study Group was submitted to Science Board on September 14, 2004, and then reviewed by selected PICES and external scientists. The revised (in response to reviewers' comments) report was approved by Science Board on September 29, 2004.

At the first Council meeting on October 20, Dr. King presented an overview of the FERRRS report. She indicated that the intent thereafter is

- to publish the full report in the PICES Scientific Report Series by the end of the year, and
- to prepare a simpler version of the Executive Summary with short answers to the questions posed by the United States in a glossy "brochure-type" format for a wider distribution.

At the recommendation of Science Board, Council supported these actions. It was also suggested that the findings of the Study Group be presented at the NOAA Lab Directors meeting to be held in Honolulu on October 21, 2004, and at the future meetings of the North Pacific Fishery Management Council and the Pacific Fishery Management Council.

Dr. Ian Perry, Science Board Chairman, pointed out that all the participants on the Study Group were superb, and the Chairman did an excellent job in keeping the process on track and on time. Council commended the FERRRS members for their work, and the Study Group was disbanded (Decision 04/S/4).

PICES Strategic Plan and development of an Action Plan (Agenda Item 9)

Following the recommendation of the PICES Review Committee, Council established a Study Group on *PICES Strategic Issues* to develop a Strategic Plan for the Organization (Decision 03/S/5(iv)). The final draft of the PICES Strategic Plan was reviewed and approved (with minor changes under *Goal 4*) at the 2004 interim Science Board/Governing Council meeting (Decision 04/A/6(i)).

The PICES Strategic Plan (*GC Endnote 5*) is now posted on the PICES website at http://www.pices.int/about/PICES_strategy.pdf. Council discussed other means for its wider distribution and agreed to publish the Strategic Plan as a brochure (Decision 04/A/6(ii)). Dr. George Boehlert (U.S.A.) and a representative of Science Board will work with the Secretariat to implement this task.

Council directed Science Board to indicate Strategic Plan relevance for all new proposals (Decision 04/A/6(iii)). All Scientific and Technical Committees and the CCCC Program were requested to develop their own Action Plans for current and future activities that fit within the Strategic Plan. An Action Plan for each Committee/Program should identify how to implement the ideas in the Strategic Plan on the short (annual) to medium (~5 years) time scales. Council instructed Science Board to prepare a template with guidance for developing Committee's Action Plans (Decision 04/A/6(iv)). Science Board will coordinate these "individual" Action Plans, and recommend to Council as to how to develop a PICES Action Plan. Detailed discussion on this issue is expected to take place during the 2005 interim Science Board/Governing Council meeting in spring 2005.

PICES capacity building opportunities (Agenda Item 10)

Science Board approved the final report of the Study Group on *PICES Capacity Building* in November 2003, and this document is now available on the PICES website at http://www.pices.int/about/capacity_strategy.pdf (see also *SB Endnote 14* in the 2003 PICES Annual Report).

Council supported the statement that PICES is already involved in various capacity building activities (*e.g.* travel support for young scientists to attend PICES Annual Meetings, Intern Program, *etc.*), and consented with F&A that the current budget limits any additional demands placed on the Organization. It was noted that several new PICES activities that incorporate

substantial capacity building elements have been planned or already begun. These include:

- A 4-day APN/PICES workshop on "Climate interactions and marine ecosystems" (October 2004),
- A 4-day APN/FRA/IAI/PICES workshop to build up a multi-species model using NEMURO.FISH (fall 2005),
- A 3-day CREAMS/PICES workshop on "East Asian Marginal Seas circulation: What we know and how well can we forecast?" (2006),
- A joint PICES/ICES Young Scientists Conference (2007).

Council supported all listed projects, but reiterated that Science Board needs to evaluate the priority of capacity building proposals, in relation to resources available.

At the 2004 interim Science Board/Governing Council meeting, all Scientific and Technical Committees and the CCCC Program were instructed to discuss capacity building opportunities at PICES XIII. Science Board was requested to present a summary of these discussions at the 2005 interim Science Board/Governing Council meeting in spring 2005.

PICES Intern Program (Agenda Item 11)

The PICES Intern Program was approved in 1999 (Decision 99/A/7). Since it was commenced in 2000, five scientists from three countries (2 from the People's Republic of China, 2 from the Republic of Korea and 1 from the Russian Federation) have worked as interns at the Secretariat. The description of the Program and the application and selection guidelines are posted on the PICES website (<http://www.pices.int/projects/intern.aspx>).

The status of the Intern Program is reviewed annually by both F&A and Council. Council confirmed again that the Organization and member countries are benefiting from the Program, and that it should be continued. It is also expected that national delegates will take additional measures to broadly advertise the

Intern Program within their countries to ensure the selection of high quality candidates.

2004-2005 PICES Internship

At PICES XII, Council approved extension of the deadline for applications for the 2004-2005 term of the Intern Program to December 31, 2003 (Decision 03/A/8(i)). Before the deadline, two Korean candidates, Mr. Gong-Gu Back (NORI/MOMAF) and Mr. Jin-Yong Lee (KORDI), were nominated and then accepted as interns, for shorter than usual and partially overlapping 6-month terms, starting June 1 and November 1, respectively. It was also agreed that these terms could be extended to a maximum of 8 months, depending on the intern's performance, the workload of the Secretariat and availability of funds. At the 2004 interim meeting (May 2004, Jeju, Republic of Korea), Council agreed that this practice of adopting two interns from the same country for two consecutive but shorter terms, should not be perceived as a permanent change in the PICES Intern Program's selection procedure and a precedent for multiple appointments from a single nation. But it will be a good trial of the Council's proposal of expanding the Intern Program to include a "scientific intern" and an "administrative intern" (see report of the 2003 interim Council meeting in the 2003 PICES Annual Report), and the recommendation by the F&A Committee that interested Contracting Parties give equal consideration to both scientific and administrative staff when making nominations.

2005-2006 PICES Internship

One nomination was received prior to the deadline for applications for the 2005-2006 term of the Intern Program. The Chairman of PICES, in consultation with the Executive Secretary and the Chairman of Science Board reviewed this application and approved Mr. Pavel Vorobyov (TINRO-Center, Russia) as the next PICES intern. His 8-month term is expected to start in July 2005. This term could be extended to a maximum of 12 months, depending on his performance, the workload of the Secretariat and availability of funds.

2006-2007 PICES Internship

According to the *Guidelines for application and selection procedure*, the nominations for the 2006-2007 term of the Intern Program are due at the first Governing Council meeting at PICES XIV in Vladivostok (October 4, 2005).

Financing for the Intern Program

The Intern Program has not been budgeted for, and over the years has been financed solely by voluntary contributions. The Department of Fisheries and Oceans (DFO, Canada) and the Alaska Fisheries Science Center (AFSC, U.S.A.) are the most generous partners for this activity. From 2000-2004, DFO had provided \$47,500 (including \$10,000 in 2004) and AFSC had provided \$74,916 (including \$23,550 in 2004) for the Intern Program. Council commended both partners for their continuing support of the Intern Program, and instructed the Executive Secretary to invite Contracting Parties to provide voluntary contributions supporting the Program in 2005 and beyond (Decision 04/A/10(i)).

Council confirmed that the stipend be kept at the current level of \$2,000 per month, and given the modest stipend, advised Contracting Parties to consider whether personal circumstances of intern warrant supplementation (Decision 04/A/10(ii)).

Schedule and financing of future Annual Meetings (Agenda Item 12)

At PICES XII (October 2003, Seoul, Republic of Korea), Council approved the proposal of the Russian Federation to hold the Fourteenth Annual Meeting from September 30-October 8, 2005, in Vladivostok, Russia (Decision 03/A/5(i)). The overall theme for PICES XIV is "*Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions*" (see *SB Endnote 11* for full description). At the recommendation of F&A, Council approved the request of the Russian delegation that \$40,000 be provided by PICES to partially cover Annual Meeting costs.

Council approved the proposal of Japan to host the Fifteenth Annual Meeting in 2006 (Decision 04/A/5), and requested that venue and dates be decided by the end of 2004, and information on the budgetary requirements be provided to the Secretariat by March 31, 2005. The overall theme for PICES XV is “*Boundary current ecosystems*” (see *SB Endnote 12* for full description).

In keeping with the six-year rotation cycle (Decision 94/A/6), Council invited Canada to explore the feasibility of hosting the Sixteenth Annual Meeting in October 2007, and inform the Secretariat on this matter by May 31, 2005 (Decision 04/A/5(ii)).

Council confirmed that the practice of charging a registration fee for future PICES Annual Meetings should continue, and adopted the registration fee structure and purposes of using the registration fee revenue as recommended by F&A (Decision 04/A/5(iii) and 04/A/5(iv)). It was also agreed that the present system of providing up to \$40,000 to assist the host country with expenses associated with Annual Meetings be kept. Council thanked the United States for covering the full cost of PICES XIII.

Council strongly supported the concept of inter-sessional Science Board meetings with the participation of Council members, and approved the holding of an interim Science Board/Governing Council meeting in spring 2005, provided that costs are carefully controlled (Decision 04/A/5(v)). The necessity of having an exclusive inter-sessional Council meeting, in conjunction with the Science Board meeting, will be decided at a later date by correspondence. Even though having inter-sessional meetings at the location of the Secretariat is the cheapest option for the Organization, the value of rotating the place for these meetings was re-iterated. The United States indicated an interest in hosting the 2005 interim Science Board/Governing Council meeting in Seattle, at the NOAA’ Sand Point facilities. The Executive Secretary was requested to communicate with the Alaska

Fisheries Science Center and the Northwest Fisheries Science Center regarding arrangements and financial requirements.

Participation and productivity of PICES committees and groups (Agenda Item 13)

At PICES XII, Council concluded that many problems with the participation in PICES activities outlined by Dr. Wooster in his paper on “PICES perspective” still exist (see p. 21-24 in the 1996 PICES Annual Report), and made several recommendations targeting at improving participation and productivity of PICES Standing Committees and temporary groups (Decision 03/S/7). The Executive Secretary reported on the implementation of these decisions.

In response to Council’s request to follow up on Decision 96/S/6 and the recommendation of the PICES Review Committee, and to consider the formation of national committees to enhance and coordinate involvement of their scientists in PICES activities (Decision 03/S/7(i)), a sub-Committee for PICES was established under the Korea Oceanographic Commission (KOC). The KOC-PICES Committee includes 14 members from MOMAF, NFRDI, KORDI, MRI and several universities, and is chaired by Dr. Hak-Gyoon Kim (NFRDI). Funds are committed by MOMAF to support activities of this Committee, starting FY 2005. Council was pleased to hear about this development and thanked Korean delegates for their efforts.

The Secretariat is regularly updating national membership lists on the PICES website (<http://www.pices.int/members/default.aspx>). In addition, prior to the Annual Meeting Contracting Parties are requested to confirm their most recent membership lists that will be subsequently included in the Annual Report (Decision 03/S/7(ii)). Council confirmed that this practice should continue as it will help maintain a historical record of PICES membership, and may help to improve participation in activities of the Organization (Decision 04/S/7(ii)).

Terms of reference for all Standing Committees and temporary groups and other relevant information, including the *Handbook for Chairmen and Convenors*, have been posted on the PICES website (http://www.pices.int/about/chairmens_handbook.aspx). National delegates are encouraged to use these materials when clarifying the responsibilities of members at the time of their appointment (Decision 03/S/7(iii)).

At the 2004 interim meeting, Science Board and Council discussed features that help make temporary groups (Working Groups, Study Groups, Task Teams and Advisory Panels) operate efficiently and complete their tasks in a timely manner. This discussion was initiated by concerns about a few temporary groups which have had problems, and is briefly summarized in the report of the 2004 Science Board/Governing Council interim meeting. Council agreed that important lessons can be learned from the performance and experience of past working groups, and instructed Science Board to perform a review of temporary groups established since the inception of the Organization, and present the results at the 2005 interim Science Board/Governing Council meeting (Decision 04/S/7(i)). The purpose of the review is not to evaluate the performance of any single group, but to get an idea of how PICES is doing in general and whether the current concept of temporary groups is working.

Report of Science Board (Agenda Item 14)

The Science Board met under the chairmanship of Dr. R. Ian Perry, who presented his report to the Governing Council, which Council approved. The complete report is included elsewhere in this Annual Report. Details are given in *Appendix A* (Decisions 04/S/1 – 04/S/7).

Report of F&A Committee (Agenda Item 15)

The Finance and Administration Committee (F&A) met under the chairmanship of Dr. Richard J. Marasco, who presented his report to the Governing Council, which Council approved. The complete report is included

elsewhere in this Annual Report. Details are given in *Appendix A* (Decisions 04/A/1 – 04/A/10).

15.1 Audited accounts for fiscal year 2003

At the recommendation of F&A, Council accepted the audited accounts of *FY* 2003 (Decision 04/A/1(i)).

15.2 Annual contributions

Council discussed the payment schedule of annual fees to the Organization (*F&A Endnote 4*), and following F&A, noted that there has been an overall improvement in the timeliness of payment for all countries but China (the late payment and partial payment in 2004 is uncharacteristic for the United States). Council directed the Executive Secretary to send a letter commending some Contracting Parties for improved performance in submitting annual contributions in 2002-2004, and describing the difficulties partial payment causes the Organization (Decision 04/A/2(i)).

Council re-iterated (Decision 04/A/2(ii)) that for planning of their funding requests, Contracting Parties should continue to use the guideline generally accepted at the Eighth Annual Meeting (Decision 99/A/2(ii)), which states that the annual contributions will increase at the rate of inflation (about 3%) in Canada.

15.3 Fund-raising activities

Grants and voluntary contributions received since PICES XII (October 2003) are reflected in *F&A Endnote 5*. Council noted that the level of external funding for various activities initiated by PICES has increased significantly over the last several years and thanked the Science Board Chairman and the Secretariat for their efforts.

Council re-iterated that fund-raising continues to be an important component of PICES activities and indicated that projects submitted for external funding have to be multi-disciplinary and of multi-national interest, and need to be consistent with the PICES Strategic Plan.

At the recommendations of F&A, Council: (i) requested national delegates, members of F&A Committee and Science Board to prepare information about funding opportunities in their countries by the 2005 interim Science Board/Governing Council meeting; and (ii) directed Science Board to develop a list of high-priority PICES activities that are strong candidates for external funding to be tabled at the 2005 interim Science Board/Governing Council meeting (Decision 04/A/4).

15.4 Budget

15.4a Estimated accounts for fiscal year 2004

The estimated accounts for *FY* 2004 were reviewed by F&A and approved by Council (Decision 04/A/3(i)).

15.4b Proposed budget for fiscal year 2005

Council approved the proposed *FY* 2005 budget of \$710,500 (*F&A Endnote 6*). The amount of \$95,500 will be transferred from the Working Capital Fund to the General Fund to reduce the total annual contribution to \$615,000, setting the 2005 fee at \$102,500 per Contracting Party (Decision 04/A/3(ii)).

15.4c Forecast budget for fiscal year 2006

The *FY* 2006 forecast budget of \$732,100 was examined by F&A and presented to Council for information only. It will be further discussed at PICES XIV. At the recommendation of Canada, Council instructed the Executive Secretary, for planning purposes, to hold 2006 expenses at the 2005 level, with the exception of personnel services (Decision 04/A/3(iv)).

15.4d Working Capital Fund

The balance in the Working Capital Fund is expected to be about \$295,600 at the end of 2004. Council approved a transfer of \$95,500 from the Working Capital Fund to the General Fund for 2005. Council also approved a transfer of \$15,700 from the Working Capital Fund to the Trust Fund to restore the Trust Fund to the level of \$110,000. After all inter-fund transfers

(Decision 04/A/3(iii)), the Working Capital Fund will total approximately \$179,400, including encumbered funds (\$18,690) held for various activities and the amount of \$59,200 contributed by the Alaska Fisheries Science Center for future high priority PICES projects.

15.4e Relocation and Home Leave Fund

The status of the Relocation and Home Leave Fund was reviewed. The Fund will be at its required level of \$110,000 by the end of the fiscal year. No relocation expenses are expected in *FY* 2005.

15.4f Trust Fund

In *FY* 2004, the Trust Fund was used to finance the Intern Program, and to bring young scientists from PICES member countries and scientists from countries with “economies in transition” to scientific meetings. These expenditures were only partly compensated for by interest earned by the Fund, the voluntary contributions from Fisheries and Oceans Canada and the Alaska Fisheries Science Center (U.S.A.) for the Intern Program, and by a travel grant from the Scientific Committee of Oceanic Research. Council approved a transfer of about \$15,700 from the Working Capital Fund to the Trust Fund to restore it to the level of \$110,000 by the end of the financial year.

Changes to PICES’ Rules of Procedure and Financial Regulations (Agenda Item 16)

Since PICES was established in 1992, the Organization has expanded from four to six Contracting Parties. New organizational elements such as Sections, Advisory Panels, Study Groups, *etc.* have been added, and the scope of PICES’ activities has broadened to include ecosystem status reports, an advisory role, and capacity building. Throughout this period of change, the administrative procedures of the Organization (Rules of Procedure and Financial Regulations) have been amended infrequently, to accommodate only the most major changes. In addition, it was indicated that in some cases (*e.g.*, voting eligibility and procedures), the Rules of Procedure lack clarity,

and in other cases (*e.g.* the conduct of elections), what has become the common practice of the Organization differs from what is described in its Rules of Procedure.

Council agreed that thorough review of the Rules of Procedure and Financial Regulations is warranted, and to perform such a review, decided to establish a Study Group on *Rules of Procedure and Financial Regulations* (SG-RPFR) with terms of reference as listed in Decision 04/A/7.

The Study Group should be chaired by the Chairman of F&A, with representation from each Contracting Party, plus a representative from Science Board. The Executive Secretary and Deputy Executive Secretary will serve as ex-officio members of the Study Group.

Election of Chairman and Vice-Chairman (Agenda Item 17)

According to the Rules of Procedure (Rule 7), *“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.”* Dr. Vera Alexander (U.S.A.) and Dr. Tokimasa Kobayashi (Japan) were elected the Chairman and Vice-Chairman, respectively, at PICES XI in 2002 (Qingdao, People’s Republic of China), with their terms ending at the conclusion of this year’s meeting.

Dr. Kobayashi, called for nominations for the Chairman of Council in accordance with the Rules of Procedure. Dr. Vera Alexander was nominated by the Russian Federation and seconded by Japan. She was unanimously elected as Chairman for a second 2-year term (Decision 04/A/8(i)). Dr. Hyung-Tack Huh (Republic of Korea) remains past-Chairman, and will be able to attend the meetings of Council in an ex-officio advisory capacity.

Dr. Alexander called for nominations for the Vice-Chairman of Council in accordance with the Rules of Procedure. Dr. Tokio Wada (Japan) was nominated by the United States and

seconded by the Russian Federation. He was unanimously declared as Vice-Chairman for a first 2-year term (Decision 04/A/8(ii)).

The Delegates congratulated Drs. Alexander and Wada on their election and expressed their gratitude to Dr. Kobayashi for his valuable contribution to Council affairs over the years. Drs. Alexander, Wada and Kobayashi thanked Council for their support.

Appointment of F&A Committee Chairman (Agenda Item 18)

Council accepted the recommendation of F&A and appointed Dr. Laura Richards (Canada) as Chairman of this Committee for a 2-year term (Decision 04/A/9). Dr. Richards thanked Council members for their support. Council also expressed its gratitude to Dr. Richard Marasco (U.S.A.) for his leadership of the Finance and Administration Committee since 1998.

North Pacific Ecosystem Status Report (Agenda Item 19)

At the 2004 interim meeting, Science Board reviewed the draft North Pacific Ecosystem Status Report (NPESR), which had been revised following discussions and comments at and after PICES XII, and approved the scientific content of the report. There was no disagreement with regard to the scientific issues and conclusions in the report. However, controversy emerged over the naming of the sea between the Japanese archipelago and the Northeast Asian mainland. This controversy has delayed the full publication of the report.

The naming issue was referred to Council and discussed at the exclusive Council meeting on May 7, 2004. No consensus was reached at this meeting, but Council adopted the US motion (see *GC Endnote 4* for details) and agreed to put an incomplete version of the report, without the chapter dealing with the sea in question, on the PICES website (available since July 5), with full publication according to PICES’ past usage of the “Japan/East Sea” designation within six months if there is no resolution of the controversy in the meantime.

In early September 2004, Japan has requested that an item on the North Pacific Ecosystem Status Report be included again in the agenda of the Council meeting at PICES XIII. At the meeting, Mr. Junzo Fujita tabled consecutively two motions:

1. The Governing Council recognizes that the name "Sea of Japan" is geographically and historically established and is currently used all over the world. The Governing Council therefore decides to use the name "Sea of Japan" in this report (North Pacific Ecosystem Status Report).
2. In light of the situation in which the naming issue between Japan and the Republic of Korea is pending, the Governing Council encourages the two parties to find an appropriate solution, while postponing the publication of this report (North Pacific Ecosystem Status Report) for another 6 months.

Neither motion 1 nor motion 2 was seconded, and thus they were not discussed by Council.

The Chairman indicated that no retrospective discussion of the matter should take place, since the vote at the 2004 interim Council meeting had already settled the issue. She re-iterated that this sort of political question must be resolved outside the forum of a purely scientific organization such as PICES, where timely scientific contributions can otherwise be seriously impeded. It was recommended that the statement "The NPESR was developed under the guidance of the PICES Science Board and its *North Pacific Ecosystem Status Report* Working Group, and that views expressed in the report are those of the participating scientists under their responsibility", be placed on the citation page in the report. As this condition applies to all PICES Scientific Reports, the Chairman suggested that similar statements be included in all future PICES publications.

It was indicated by several Council members that PICES is now on its way to move beyond its initial focus on advancing scientific knowledge, which centers on activities and products of interest primarily to scientists, to include activities focused on applying that scientific

knowledge to address societal needs through the provision of scientific advice, and a newly developed PICES Strategic Plan explicitly recognizes this important activity. In contrast to ICES, PICES is not designed to provide short-term, tactical, management advice. However, PICES is prepared to work towards providing advice on broad issues concerning North Pacific marine systems, whether specifically requested by member nations (like the FERRRS report prepared in response to the request from the U.S. government), or not. The North Pacific Ecosystem Status Report is one example of unsolicited advice.

Council concluded that the NPESR has been one of PICES most important contributions to North Pacific Ocean science, and should be continued. The project clearly demonstrated that recent conditions in the marine ecosystems of the North Pacific could successfully be integrated and synthesized. But it also identified many information gaps that need to be filled for the next report. Council supported the intent to update the report as regularly as funding will allow (hopefully every three years). The preparation of subsequent reports will be the responsibility of the newly established PICES MONITOR Technical Committee. Details concerning the schedule of the next version will be available after the MONITOR Workshop on "Filling the gaps in the PICES North Pacific Ecosystem Status Report", to be convened at PICES XIV, but the target date of publication is early spring of 2007.

Dr. Marasco stated that the development of the first NPESR attracted a lot of interest from organizations and funding agencies in the United States. For example, between 2001-2004, the Alaska Fisheries Science Center and the *Exxon Valdez* Oil Spill Trustee Council provided US \$36,710 and \$42,800, respectively, for this project. In addition, PICES was awarded a grant of US \$45,000 from the Alfred P. Sloan Foundation for a project complementary to the NPESR. He suggested that PICES submit a proposal to the North Pacific Research Board requesting their funding support for updates to the PICES North Pacific Ecosystem Status Report. He also requested other Contacting

Parties to consider providing voluntary contributions to support the project.

Other business (Agenda Item 20)

News Release

A necessity and mechanism of preparing News Releases for the Annual Meeting was discussed. Council agreed that it would be worthwhile to arrange for both a pre-conference and post-conference News Release. The pre-conference News Release should highlight the most newsworthy results of PICES activities, something that will actually get published under a PICES banner. The main message should be of local interest in particular, with broader

implications. To catch the media's attention, this News Release has to be done early, so that journalists can follow up with more specific items later in the meeting. The post-conference News Release should focus on what actually happened at the Annual Meeting (*e.g.*, it could be based on summaries by convenors and/or invited speakers). Both News Releases are recommended to be posted on the PICES website.

It was suggested that using a professional for preparing the News Releases is essential. Fisheries and Oceans Canada volunteered to assist the PICES Secretariat in drafting these documents.

GC Appendix A. Decisions

04/A/1: Auditor

Council accepted the audited accounts for 2003.

04/A/2: Annual contributions

- i. Council instructed the Executive Secretary to send a letter commending some Contracting Parties for improved performance in submitting annual contributions in 2004, and describing the difficulties 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 Eighth Annual Meeting (Decision 99/A/2(ii)), which states that the annual contributions will increase at the rate of inflation (about 3%) in Canada.

04/A/3: Budget

- i. Council accepted the estimated accounts for 2004.
- ii. Council approved the 2005 budget at the level of \$710,500. The amount of \$95,500 will be transferred from the Working Capital Fund to reduce the total required

contribution to \$615,000, setting the 2005 annual fee at \$102,500 per Contracting Party.

- iii. Council approved the following inter-fund transfers:
 - A transfer of \$95,500 from the Working Capital Fund to the General Fund for 2005;
 - A transfer of \$15,687 from the Working Capital Fund to the Trust Fund to restore the Trust Fund to the level of \$110,000.
- iv. Council instructed the Executive Secretary, for planning purposes, to hold 2006 expenses at the 2005 level, with the exception of personnel services.

04/A/4: Fund-raising

- i. Council requested national delegates, members of F&A and Science Board to prepare information about funding opportunities in their countries by the 2005 interim Science Board/Governing Council meeting.
- ii. Council directed Science Board to develop a list of high-priority PICES activities that are strong candidates for external funding to be tabled at the 2005 interim Science Board/Governing Council meeting.

04/A/5: Schedule and financing future Annual Meetings

- i. Council approved the proposal of Japan to host the Fifteenth Annual Meeting in 2006. Venue and dates will be decided by the end of 2004.
- ii. Council requested Canada to explore the possibility of holding the Sixteenth Annual Meeting in 2007, and inform the Secretariat on this matter by May 31, 2005.
- iii. Council accepted the same registration fee structure for 2005 as was agreed for 2004 at PICES XII:

Type	CDN \$
Registration fee	225
Early registration fee	150
Students registration fee	50
Spousal registration fee	50

- iv. Council approved that 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.
- v. Council approved the holding of an interim Science Board/Governing Council meeting in spring 2005, provided that costs are carefully controlled.

04/A/6: PICES Strategic and Action Plan

- i. Council approved the PICES Strategic Plan (at the 2004 interim Science Board/Governing Council meeting).
- ii. Council agreed to publish the Strategic Plan as a brochure. Dr. George Boehlert (U.S.A.) and a representative of Science Board will work with the Secretariat to implement this task.
- iii. Council instructed Science Board to prepare a template with guidance for developing Committee Action Plans.
- iv. Council directed Science Board to indicate Strategic Plan relevance for all new proposals.

04/A/7: Changes to Rules of Procedure and Financial Regulations

A Study Group to review PICES *Rules of Procedure and Financial Regulations* will be established under the direction of the Governing Council. The Study Group should be chaired by the Chairman of F&A, with representation from each Contracting Party, plus a representative from Science Board. The Executive Secretary and Deputy Executive Secretary will serve as ex-officio members of the Study Group. Its terms of reference are:

- To review the Rules of Procedure and Financial Regulations (hereafter RPF) to identify any inconsistencies between these documents and the PICES Convention, and to recommend, where appropriate, amendments to the RPF that might be required to alleviate any discrepancies found;
- To recommend such amendments as might be required to reduce ambiguity and/or inconsistency within the RPF;
- To assess the degree of compliance between the RPF and the current organization structure and its practices, and to recommend such amendments to the RPF or changes in current practices to resolve any major discrepancies;
- To report at the 2005 interim Science Board/Governing Council meeting.

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

- i. Council unanimously elected Dr. Vera Alexander (U.S.A.) as Chairman for a second 2-year term (2004-2006). Accordingly Dr. Hyung-Tack Huh (Republic of Korea) remains past-Chairman.
- ii. Council unanimously elected Dr. Tokio Wada (Japan) as Vice-Chairman for a 2-year term (2004-2006).

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

Council appointed Dr. Laura Richards (Canada) as Chairman of the Finance and Administration Committee for a 2-year term (2004-2006).

04/A/10: Intern Program

- i. Council instructed the Executive Secretary to invite Contracting Parties to provide voluntary contributions to support the Program in 2005 and beyond.
- ii. Council confirmed that the stipend be kept at the current level of \$2,000 per month, and given the modest stipend, advised Contracting Parties to consider whether personal circumstances of the intern warrant supplementation.

04/S/1: Inter-sessional meetings/workshops

The following inter-sessional meetings, Working Group and CCCC Program Workshops are to be convened/co-sponsored in 2005 and beyond (an Acronym List is at the end of the Annual Report):

- A 2-day CCCC/CFAME workshop to develop a CFAME work plan and hypothesis set for CCCC synthesis, late winter/early spring 2005, location on the west coast of North America to be decided;
- A 3-day interim Science Board/Governing Council meeting, spring 2005, location on the west coast of North America to be decided;
- A 2-day CREAMS/PICES workshop on “East Asian Seas Time Series”, spring 2005, Seoul, Korea;
- A symposium, co-sponsored with GLOBEC and several other organizations, on “Climate variability and sub-Arctic marine ecosystems”, May 16-20, 2005, Victoria, Canada (approved in 2003);
- A 2-day workshop to plan “An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean”, late spring 2005, Corvallis, U.S.A.;
- A 1-day ICES/PICES theme session on “Fisheries, ecology and life history of small pelagic fish” at the ICES Annual Science Conference, September 2005, Aberdeen, Scotland (approved in 2003);
- A 1-day ICES/PICES theme session on “Comparing and constructing the scientific strategies and output of regional ecosystem projects” at the ICES Annual Science

Conference, September 2005, Aberdeen, Scotland (approved in 2003);

- A 1-day MEQ/HAB workshop on “Review of selected harmful algae in the PICES region: I. *Pseudo-nitzschia* & *Alexandrium*”, in conjunction with PICES XIV (October 2005, Vladivostok, Russia);
- A 1-day MEQ workshop on “Introductions of marine species in the North Pacific”, in conjunction with PICES XIV (October 2005, Vladivostok, Russia);
- A ½-day IFEP/MODEL workshop on “Modelling and iron biogeochemistry: How far apart are we?”, in conjunction with PICES XIV (October 2005, Vladivostok, Russia);
- A 1-day MONITOR workshop on “Filling the gaps in the PICES Ecosystem Status Report”, in conjunction with PICES XIV (October 2005, Vladivostok, Russia);
- A 1-day CFAME workshop on “East-west comparison of community structure, productivity and biodiversity under climate change scenarios”, in conjunction with PICES XIV (October 2005, Vladivostok, Russia);
- A 2-day ORI/PICES workshop to synthesize results from the second *in situ* iron enrichment experiments in the western subarctic North Pacific (SEEDS-II), October 2005, Tokyo, Japan;
- A 4-day MODEL workshop to extend NEMURO.FISH to fish stocks in other geographic regions (Europe, Africa, Asia, South America), September or October 2005, location in Japan to be decided (pending funding from APN, FRA, IAI and IOC);
- A 3-day NPAFC/PICES symposium on “The status of Pacific salmon and their role in North Pacific marine ecosystems”, in conjunction with the NPAFC Annual Meeting, October 2005, location in Korea to be decided (approved in 2003);
- A CCCC/GLOBEC symposium on “Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis”, April 19-21, 2006, Honolulu, U.S.A. (approved in 2003);
- A symposium, co-sponsored with ICES, on “Marine bioinvasions”, late spring 2006,

location on the east coast of the United States to be decided (approved in 2003);

- A workshop/symposium celebrating the 50th anniversary of sampling along Line P, summer 2006, Victoria, Canada;
- A CREAMS/PICES workshop on “East Asian marginal seas circulation: What we know and how well can we forecast?”, summer 2006, near Vladivostok, Russia (approved in 2003; postponed to 2005);
- A 4th International Zooplankton Production Symposium, co-sponsored by GLOBEC and ICES, May 28 - June 1, 2007, Hiroshima, Japan (approved in 2003);
- A 3-day Young Scientists Conference, co-sponsored with ICES, dates in 2007 and location on the east coast of the United States to be decided.

04/S/2: Travel support

PICES will provide travel support for:

PICES XIV

- Invited speakers for Topic Sessions at the Annual Meeting with the normal allocation of approximately \$5,000 per Committee and CCC Program (additional requests are subject to fund availability);
- 3 invited speakers to the MEQ/HAB workshop on “Review of selected harmful algae in the PICES region”;
- 2-3 invited speakers to the MONITOR workshop on “Filling the gaps in the PICES Ecosystem Status Report”;
- 1-2 invited speakers to the IFEP/MODEL workshop on “Modelling and iron biogeochemistry: How far apart are we?”.

Inter-sessional meetings

- PICES representative to attend the NPAFC Twelfth Annual Meeting (November 2004, Sapporo, Japan);
- MONITOR Co-Chairman to represent PICES at the NEAR-GOOS Coordinating Committee meeting (November 2004, Sendai, Japan);
- TCODE member to participate in the Ocean Biodiversity Data Symposium (November 2004, Hamburg, Germany);
- 2 invited speakers to the 2005 CFAME

inter-sessional workshop (late winter/early spring 2005, west coast of North America);

- PICES representative to attend the meeting of the ICES/IMO/IOC Working Group on *Ballast waters and other ship vectors*, (March 14-18, 2005, Arendal, Norway);
- 2 scientists to attend the CREAMS/PICES workshop on “East Asian Seas Time Series” (spring 2005, Seoul, Korea);
- 2 invited speakers to the symposium on “Climate variability and sub-Arctic marine ecosystems” (May 16-20, 2005, Victoria, Canada);
- 4 scientists (2 from Asia and 2 from North America) to attend the workshop on “An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean” (late spring 2005, Corvallis, U.S.A.);
- Dr. Akihiko Yatsu (Japan) to travel to Canada (Pacific Biological Station in Nanaimo), to work with Dr. Richard J. Beamish to complete the WG 16 report;
- PICES representative to attend the meeting of the ICES/IOC Steering Group for GOOS (June 2004, Brest, France);
- PICES representative to participate in the 23rd Assembly of the Intergovernmental Oceanographic Commission (June 2005, Paris, France);
- Dr. Jacquelynne King (Canada) to attend the meeting of the Pacific Fishery Management Council (June 2005, San-Francisco, U.S.A.);
- MIE-AP members to participate in the next micronekton inter-calibration cruise in summer or early fall 2005;
- PICES representative to attend the 37th SCOR Executive Committee meeting (August 2005, Cairns, Australia);
- PICES convenors to the joint ICES/PICES theme sessions on “Fisheries, ecology and life history of small pelagic fish” and “Comparing and constructing the scientific strategies and output of regional ecosystem projects” at the 2005 ICES Annual Science Conference (September 2005, Aberdeen, Scotland);
- 2 scientists to participate in the MODEL workshop to extend NEMURO.FISH to fish stocks in other geographic regions (fall of 2005, Japan; contingent on funding from

GC-2004

- APN, FRA, IAI and IOC);
- 1 invited speaker to the SEEDS-II synthesis workshop (October 2005, Tokyo, Japan);
- PICES representative to attend the NPAFC Thirteenth Annual Meeting (October 2005, Korea);
- 2-4 scientists to participate in the NPAFC-PICES symposium on “State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems” (October 2005, Korea);
- POC member to attend the NEAR-GOOS Coordinating Committee meeting (fall 2005);
- 2 scientists to participate in two workshops of the “Federated metadata project”, to build a demonstration shared meta-data system between Korea and the United States.

Trust Fund

- Chinese HAB Section member to attend the MEQ/HAB workshop on “Review of selected harmful algae in the PICES region” at PICES XIV.

Science Board Chairman

- Science Board Chairman to attend the 2005 interim Science Board/Governing Council meeting (spring 2005, west coast of North America) and PICES XIV (October 2005, Vladivostok, Russia).

04/S/3: Publications

The following publications were approved:

PICES Scientific Report Series, 2005

- Final report of the Study Group on *Fisheries and ecosystem responses to recent regime shifts*;
- Final report of the Study Group on *Ecosystem-based management science and its application to the North Pacific*;
- Micronekton of the North Pacific (Final Report of WG 14 on *Effective sampling of micronekton*);
- Proceedings of the 2004 Workshop on “*In situ* iron enrichment experiments in the eastern and western subarctic Pacific”;
- Guide to best practices for oceanic CO₂ measurements and data reporting (WG 17);

- Final report of WG 16 on *Climate change, shifts in fish production, and fisheries management*.

PICES Scientific Report Series, 2006

- Findings of the Data-sharing project for federated meta-data on North Pacific ecosystems (TCODE).

PICES Special Publications, 2004-2005

- Marine ecosystems of the North Pacific (North Pacific Ecosystem Status Report);
- Report and web page development for the Census of Marine Life on “Marine life in the North Pacific Ocean: The known, unknown and unknowable”.

Special issues of primary journals, 2005-2007

- *ICES Journal of Marine Science* (2005) – selected papers from the 2004 symposium on “Quantitative ecosystem indicators for fisheries management”;
- *Deep-Sea Research II* (2005) – selected papers from the 2003 CCCC workshop on “Linkages between open and coastal systems”;
- *Ecological Modelling* (2006) – selected papers on NEMURO and NEMURO.FISH models;
- *Progress in Oceanography* (2006) – selected papers from the PICES XIII Topic Session on “Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?”;
- *Deep-Sea Research II* (2006) – selected papers from the PICES XIII Topic Session on “Hot spots and their use by migratory species and top predators in the North Pacific”;
- A leading international journal (2006 or 2007) – based on the 2003 and 2004 MBM-AP workshops on “Combining data sets on diet of marine birds and mammals”.

Other publications, 2005

- Advisory report on “Fisheries and ecosystem responses to recent regime shifts in the North Pacific” (glossy brochure);
- Book on history of PICES: Sara Tjossem “The journey to PICES: Scientific cooperation in the North Pacific”.

04/S/4: Future of current groups

- CCCC *Basin Scale Studies* (BASS) and *Regional Experiment* (REX) Task Teams and *Nemuro Experimental Planning Team* (NEXT) completed their tasks and will be concluded (approved at the 2004 interim Science Board/Governing Council meeting).
- Study Group on *PICES Strategic Issues* (under Governing Council) completed its terms of reference and will be dissolved.
- Study Group on *Fisheries and ecosystems responses to recent regime shifts* (under Science Board) completed its report and will be disbanded.
- Study Group on *Ecosystem-based management science and its application to the North Pacific* (under MEQ and FIS) submitted its report and will be concluded.
- WG 14 on *Effective sampling of micronekton* (under BIO) completed its report and will be dissolved.
- WG 16 on *Climate change, shifts in fish production and fisheries management* (under FIS) will continue its activities and produce a final report in 2005.
- Accomplishments of the Advisory Panel on *Marine birds and mammals* (under BIO) were reviewed and rated highly by the parent committee, and the Panel will continue for another 5-year term.
- Advisory Panel on *Continuous Plankton Recorder survey in the North Pacific* (CPR-AP) will be moved outside the CCCC Program and will work under the direction of the MONITOR Technical Committee.
- With the completion of BASS, the Advisory Panel on *Iron fertilization experiment in the subarctic Pacific Ocean* will report directly to the Executive Committee of the CCCC Program Implementation Panel.

04/S/5: New PICES groups

- The MONITOR Task Team will be moved outside the CCCC Program to become a Technical Committee directly under Science Board, with terms of reference as listed in *MONITOR Endnote 4* (approved at the 2004

interim Science Board/Governing Council meeting).

- A Task Team on *Climate Forcing and Marine Ecosystem Response* (CFAME) will be established under the CCCC Program, with terms of reference as presented in *CFAME Endnote 3* (approved at the 2004 interim Science Board/Governing Council meeting).
- A Working Group on *Ecosystem-based management science and its application to the North Pacific* will be formed under the direction of FIS and MEQ, with terms of reference as described in *SB Endnote 5* (terms of reference with additional information can be found in *SGEBM Endnote 4*).
- An Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* will be established under POC (co-sponsorship by BIO and MONITOR should be explored), with terms of reference as presented in *SB Endnote 6*.

04/S/6: Relations with other organizations and programs

Council approved the revised *Standing List of International Organizations and Programs*, and agreed with the identified priorities for interaction in 2004-2005.

04/S/7: Improvement of participation in PICES activities

- i. Council instructed Science Board to perform a review of temporary groups (Working Groups, Study Groups, Task Teams and Advisory Panels) established since the inception of the Organization and present the results at the 2005 interim Science Board/Governing Council meeting.
- ii. Council confirmed that national membership lists be prepared prior to each Annual Meeting and included as Appendices in the Annual Report. This will help maintain a historical record of PICES membership, and may help to improve participation in activities of the Organization.

GC Endnote 1

Participation List

Canada

Robin M. Brown (alternate delegate)
John A. Moores (advisor)
Laura Richards

Japan

Junzo Fujita (alternate delegate, October 22 and 23 only)
Tatsu Kishida (advisor)
Tokimasa Kobayashi
Tokio Wada (advisor)

People's Republic of China

Qian-Fei Liu (alternate delegate, October 22 and 23 only)
Wen-Xi Zhu (alternate delegate)

Republic of Korea

Young-Hoon Chung
Keun-Oh Kim (advisor)
Do-Hoon Lee (advisor)
Chul Park

Russia

Lev N. Bocharov
Sergey Maximov (alternate delegate, October 20 only)
Victor A. Nazarov (advisor)
Igor I. Shevchenko (advisor, October 20 and 23 only)
Pavel V. Vorobyov (advisor)

U.S.A.

George W. Boehlert
Richard J. Marasco
Elizabeth J. Tirpak (advisor)

Other

Vera Alexander (Chairman, PICES)
Alexander Bychkov (Executive Secretary)
Hyung-Tack Huh (Past-Chairman, PICES)
Skip McKinnell (Deputy Executive Secretary, October 20 and 23 only)
R. Ian Perry (Science Board Chairman, October 20 and 23 only)
Warren S. Wooster (First Chairman, PICES, October 20 only)

GC Endnote 2

Governing Council Meeting Agenda

1. Opening remarks
2. Adoption of agenda and meeting procedures
3. Preliminary report on administration
4. Report of 2004 Science Board/Governing Council interim meeting
5. Membership and observers from other countries
6. Relations with relevant international and regional organizations
7. History of PICES: Science and politics
8. Report of Study Group to respond to the US request for advice
9. PICES Strategic Plan and discussion on development of an Action Plan
10. PICES capacity building opportunities
11. PICES Intern Program
12. Schedule and financing of future Annual Meetings
13. Improvement of participation and productivity of PICES committees and groups
14. Report and recommendations of Science Board
15. Report and recommendations of F&A Committee
16. Changes to PICES' Rules of Procedure and Financial Regulations
17. Election of Chairman and Vice-Chairman
18. Appointment of F&A Chairman
19. North Pacific Ecosystem Status Report
20. Other business

GC Endnote 3

Report on Administration for 2004

I. Annual contributions

According to Financial Regulation 5(ii), all national contributions to PICES are payable by

Japan-----	December 26, 2003
Canada-----	January 5, 2004
Russian Federation-----	March 2, 2004
Republic of Korea-----	March 24, 2004
People's Republic of China-----	August 10, 2004
U.S.A.-----	February 9, 2004 (50%) and September 8, 2004 (50%)

the first day of the financial year (January 1) to which they relate. Dues for 2004 were paid as follows:

II. External and additional funding

Serious efforts were made this year to get additional and external funding for various activities initiated by PICES. The following reflects special contributions and grants received since PICES XII (October 2003):

scientific advice on the implications of the 1998/99 regime shift for fisheries.

High priority PICES projects

- In December 2003, the Ministry of Maritime Affairs and Fisheries (MOMAF) of the Republic of Korea contributed \$18,778 to support high priority PICES projects.
- In July 2004 and September 2004, the Alaska Fisheries Science Center (AFSC/NMFS, U.S.A.) contributed \$9,200 (US \$7,000) and \$50,000 (US \$38,200), respectively, to finance high priority PICES projects. [Between 2001-2003, AFSC had provided US \$36,710 for the North Pacific Ecosystem Status Report.]
- In September 2004, the Exxon Valdez Oil Spill Trustee Council (EVOS, U.S.A.) contributed \$11,600 (US \$8,800) to the production of the North Pacific Ecosystem Status Report. [Between 2002-2003, EVOS had provided US \$34,000 for the North Pacific Ecosystem Status Report.]

Ecosystem modeling

- In April 2004, the Asia Pacific Network (APN) approved a proposal by the PICES MODEL Task Team entitled "Climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food-webs and implications for marine fish production in the North Pacific Ocean and marginal seas". The amount of the award is US \$45,000, and this will fund a workshop with approximately 25 participants to be held October 10-13, 2004, in Honolulu, immediately prior to PICES XIII. Funds will be managed by the MODEL Task Team Co-Chairman, Dr. Francisco E. Werner (Univ. North Carolina).

Implications of the 1998/99 regime shift

- In April 2004, the National Marine Fisheries Service (NMFS/NOAA, U.S.A.) provided \$60,410 (US \$45,000) to support PICES activities to address a formal request made by the Government of United States for

Guide to best practices for oceanic CO₂ measurements and data reporting

- In September 2004, the International Ocean Carbon Coordinated Program (IOCCP), via the Intergovernmental Oceanographic Commission (IOC), provided \$2,650 (US \$2,000) for the publication of the "Guide to best practices for oceanic CO₂ measurements and data reporting" being prepared by PICES WG 17 on *Biogeochemical data integration and synthesis*. [In 2003, IOCCP/IOC contributed \$7,932 (US \$6,000) for the same publication.]

Inter-calibration of micronekton sampling

- The PICES Advisory Panel on *Micronekton inter-calibration experiment* (MIE-AP) succeeded in securing 8 days-at-sea aboard the NOAA ship *Oscar Elton Sette* (October 6-13, 2004), for an international collaborative field program to evaluate the efficiency of sampling gears and procedures employed by different agencies to sample micronekton.
- A proposal entitled “Inter-calibration of sampling gear and techniques for assessing prey abundance (micronekton) in the North Pacific and the Eastern Bering Sea” seeking funds for logistical support to conduct the cruise has been submitted to the North Pacific Research Board (NPRB, U.S.A.). Although the proposal was favorably reviewed (all three reviewers rated it “Excellent/Should be Funded”), there was only a limited amount of funding available this year, and the proposal was rejected.

Intern Program

- In March 2004, Fisheries & Oceans Canada (DFO) contributed \$10,000 to finance the PICES Intern Program. [Between 2000-2003, DFO had provided \$37,500 for the Intern Program.]
- In July 2004, AFSC/NMFS (U.S.A.) contributed \$23,550 (US \$17,900) to finance the PICES Intern Program. [Between 2000-2003, AFSC had provided \$51,360 for the Intern Program.]

PICES Annual Meetings

- In December 2003, MOMAF (Korea) contributed \$18,778 to the Trust Fund to involve more young scientists in PICES activities, including Annual Meetings.
- In July 2004, AFSC/NMFS (U.S.A.) contributed \$7,900 (US \$6,000) to support the travel of speakers at the BIO Topic Session on “Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?” at PICES XIII.
- In September 2004, IOCCP/IOC allocated \$10,500 (US \$8,000) to support the travel of speakers at the joint PICES/IOCCP Topic Session on “The impact of climate change

on the carbon cycle in the North Pacific” at PICES XIII.

- In July 2004, the Scientific Committee on Oceanic Research (SCOR) provided a travel grant of \$5,250 (US \$4,000) for scientists from countries with “economies in transition” to attend the MEQ Workshop on “Developing a North Pacific HAB data resource” at PICES XIII.

Inter-sessional meetings

- In May 2004, MOMAF (Korea) provided special funds to offset PICES expenses for the 2004 inter-sessional Science Board/Governing Council meeting (May 6-8, 2004, Jeju, Korea).
- In July 2004, AFSC/NMFS (U.S.A.) provided \$13,150 (US \$10,000) for the international symposium on “Climate variability and sub-Arctic marine ecosystems” (May 16-20, 2005, Victoria, Canada).
- In August 2004, EVOS (U.S.A.) approved funding for PICES in an amount of US \$15,000 in support of two workshops during the time period October 1, 2004 – September 30, 2005. The workshops that would be most appropriate for this funding source will be identified at PICES XIII.

PICES Publications

- The National Science Foundation approved funding in an amount of US \$15,000 for the publication of a book “The journey to PICES: Scientific cooperation in the North Pacific”.

Several on-going projects are utilizing funding provided in 2003:

CPR Program

- The sample collection and analysis for the east-west transect of the PICES Continuous Plankton Recorder (CPR) survey of the North Pacific and southern Bering Sea is supported by a grant from NPRB (US \$185,000 total, from July 2003 to June 2005), and for the north-south transect by a grant from EVOS (US \$120,000 per year, from 2004 to 2006).

Ecosystem modeling

- A MODEL workshop to document and distribute the NEMURO/NEMURO.FISH model code, and to edit manuscripts for *Ecological Modeling* (August 2004, Seattle, U.S.A.) was partially covered by a grant from the Fisheries Research Agency of Japan (from April 2003 to March 2006) to support international collaboration on the development of model on coupled response of lower and higher trophic level ecosystems for climate variability in the North Pacific.

III. Inter-sessional meetings

Since PICES XII (October 2003), the following inter-sessional meetings were convened/co-sponsored, for which financial, travel and logistical arrangements were made:

- A 3-day PICES/CoML workshop on “Marine life in the North Pacific: The known, unknown and unknowable”, November 17-19, 2003, Victoria, Canada;
- A 3-day workshop on “Development of pilot coastal monitoring program(s) in the NE Pacific” (co-sponsored by PaCOS, EVOS and AOOS), November 20-22, 2003, Victoria, Canada;
- A 5-day MODEL workshop on “Summary and synthesis of contributions from NEMURO and NEMURO.FISH” (funded by the Fisheries Research Agency of Japan), December 4-6, 2003, Yokohama, Japan;
- A 4-day IOCCP/NIES/PICES workshop on “Ocean surface p(CO₂), data integration and database development”, January 14-17, 2004, Tsukuba, Japan (44 scientists from 12 countries);
- A 2-day meeting of the PICES Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* (FERRRS), February 9-10, 2004, Victoria, Canada;
- A 3-day PICES-IFEP workshop on “*In situ* iron enrichment experiments in the eastern and western subarctic Pacific”, February 11-13, 2004, Victoria, Canada (25 scientists from 3 countries);
- A 1½-day Canada-SOLAS/PICES-IFEP Session on “Response of the upper ocean to mesoscale iron enrichment” at the TOS/ASLO 2004 Ocean Research

Conference, February 17-18, Honolulu, U.S.A.;

- A 4-day symposium on “Quantitative ecosystem indicators for fisheries management” (co-sponsored by IOC, SCOR, PICES, ICES, GLOBEC, etc.), March 31-April 3, 2004, Paris, France (250 scientists from 42 countries);
- A 3-day interim Science Board/Governing Council meeting, May 6-8, 2004, Jeju, Republic of Korea;
- A 3-day NOAA/GCP/PICES workshop on “Understanding North Pacific carbon-cycle change: Data synthesis and modeling”, June 2-4, 2004, Seattle, U.S.A. (60 scientists from 5 countries);
- A 3-day meeting of the PICES Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts*, June 14-16, 2004, Seattle, U.S.A.;
- A 4-day MODEL workshop on “The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific” to document and distribute the NEMURO model code, and to edit *Ecological Modeling* manuscripts (co-sponsored by the Fisheries Research Agency of Japan), August 20-23, 2004, Seattle, U.S.A.

The following workshops were held in conjunction with PICES XIII:

- A 4-day APN/PICES Workshop on “Climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food webs and implications for marine fish production in the North Pacific Ocean and marginal seas” and young-investigator training, October 10-13, 2004;
- A 1-day MIE-AP workshop/meeting on “Micronekton sampling gear inter-calibration experiment”, October 14, 2004;
- A 1-day MBM-AP workshop/meeting on “Combining data sets on diets of marine birds and mammals - Phase II”, October 14, 2004;
- A 1-day CCCC/REX workshop on “Seasonal cycles of plankton production in continental shelf waters around the North Pacific Rim”, October 14, 2004;

GC-2004

- A 1-day MEQ workshop on “Developing a North Pacific HAB data resource II”, October 15, 2004;
- A 2-day CCCC workshop on “Linking open ocean and coastal ecosystems II”, October 15-16, 2004,
- A 2-day PICES-CLIVAR workshop on “Scale interactions of climate and marine ecosystems”, October 23-24, 2004.

Preparation and arrangements are in progress for:

- A 5-day GLOBEC symposium on “Climate variability and sub-Arctic marine ecosystem”, May 16-20, 2005, Victoria, Canada (PICES is represented in the Scientific Steering Committee and the Local Organizing Committee; PICES Secretariat is responsible for local arrangements of the meeting);
- A 3-day NPAFC/PICES symposium on “The status of Pacific salmon and their role in North Pacific marine ecosystems”, fall 2005, Republic of Korea;
- A 3-day PICES/GLOBEC symposium on “Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis”, April 19-21, 2006, Honolulu, U.S.A.

IV. Publications

Publications produced after PICES XII or still in progress include:

Special issues of primary journals, 2004

- *Marine Environmental Research* (Vol. 57, Nos. 1-2, Feb.-Mar. 2004) - papers resulting from the 1999 MEQ Practical Workshop (Guest editor: R. Addison); the issue includes 9 papers from all PICES member countries;
- *Journal of Oceanography* (Vol. 60, No. 1, Feb. 2004) - invited papers on *Synthesis of JGOFS North Pacific Process Study* (jointly with JGOFS) (Guest editors: Toshiro Saino, Alexander Bychkov, Chen-Tung A. Chen and Paul J. Harrison); the issue includes 13 papers by authors from Canada, Germany, Japan, Russia, and U.S.A.;

- *Progress in Oceanography* (Vol. 61, No. 2-4, May-June, 2004) - selected papers from the PICES/CREAMS workshop on “Recent progress in studies of physical processes and impact to the Japan/East Sea ecosystem” (Guest editors: Stewart M. McKinnell, Alexander Bychkov, Kyung-Ryul Kim and Makoto Terazaki); the issue includes 9 papers by authors from Japan, Korea, Russia and U.S.A.;
- *ICES Journal of Marine Research* (Vol. 61, No. 1, June 2004) - selected papers from the 3rd Zooplankton Production Symposium (Guest editors: Luis Valdez, Roger Harris, Tsutomu Ikeda, Stewart M. McKinnell and William Peterson); the issue includes 27 papers by authors from 14 countries;
- *Journal of Marine Systems* (Vol. 50, Nos. 1-2, September 2004) - selected papers from the 2002 BIO/POC/FIS Topic Session on “The importance of biophysical coupling in concentrating marine organisms around shallow topographies” (Guest editors: Richard D. Brodeur and John Dower); the issue includes 5 papers by authors from Israel, Japan, Mexico and U.S.A.

Peer-review process is initiated for three special issues (publication is expected in early 2005):

- *Deep-Sea Research II* – selected papers from the 2003 PICES workshop on “Linkages between open and coastal systems” (Guest editors: Stewart M. McKinnell and Gordon A. McFarlane);
- *Ecological Modelling* – selected papers on NEMURO and NEMURO.FISH models (Guest editors: Shin-ichi Ito, Michio Kishi, Bernard Megrey and Francisco Werner);
- *ICES Journal of Marine Research* – selected papers from the 2004 symposium on “Quantitative ecosystem indicators for fisheries management” (Guest Editor: Neils Daan).

PICES Scientific Report Series

- PICES Scientific Report No. 26 (September 2004): Proceedings of the Third PICES workshop on the Okhotsk Sea and adjacent areas;
- PICES Scientific Report No. 27 (publication is expected in December 2004): PICES-

GLOBEC International Program on Climate Change and Carrying Capacity Program - Report of the 2003 MODEL Task Team second workshop to develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes;

- PICES Scientific Report No. 28 (publication is expected in December 2004): Report of the Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts*;
- PICES Scientific Report No. 29 (publication is expected in December 2004): Report of the 2000 Planning Workshop on Designing the iron fertilization experiment in the subarctic Pacific and the 2004 Workshop on *In situ* iron enrichment experiments in the eastern and western subarctic Pacific.

Special publications

- North Pacific Ecosystem Status Report (pre-publication available on the PICES website);
- Executive summary of the Report of the Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* (publication is expected in December 2004);
- Report on “Marine life in the North Pacific Ocean: The known, unknown and unknowable” (publication of the baseline report and detailed web version is expected in December 2004).

PICES Press - Newsletters

- Two regular issues: Vol. 12, No. 1 (January 2004) and Vol. 12, No. 2 (July 2004).

Other publications

- Final announcement and poster for PICES XIII (February 2004);
- PICES 2003 Annual Report (March 2004);
- A Book of Abstracts for the Symposium on “Quantitative ecosystem indicators for fisheries management” (April 2004);
- A Book of Abstracts for PICES XIII (September 2004).

V. Travel and representation at other organization meetings

- Full travel support was provided to all members (except NOAA employees) of the

FERRRS Study Group to attend the 1st (February 2004, Victoria, Canada) and 2nd (June 2004, Seattle, U.S.A.) meetings of the group;

- Dr. Alexander Bychkov (Executive Secretary) and Ms. Christina Chiu (Deputy Executive Secretary on Administration) travelled in February 2004, to Honolulu, U.S.A., to discuss preparations for PICES XIII with the Hawaii Convention Center, hotels and the Local Organizing Committee; and attended the International Fisheries Commission Pension Society Meeting in April, in Washington DC, U.S.A.;
- Drs. Ian Perry (Science Board Chairman) and Jeffrey Polovina (invited speaker) and members of the Secretariat travelled in March 2004, to Paris, France, for the Symposium on “Quantitative ecosystem indicators for fisheries management”;
- Partial travel support from the Trust Fund was provided to 2 scientists from the People’s Republic of China, and 1 scientist from the Republic of Korea, to attend the Symposium on “Quantitative ecosystem indicators for fisheries management” in March 2004, in Paris, France;
- Drs. Vera Alexander (PICES Chairman) and Ian Perry (Science Board Chairman) and members of the Secretariat travelled in May 2004, to Jeju, Republic of Korea, for the 2nd interim Science Board / Governing Council Meeting; and in October 2004 to Honolulu, U.S.A., for PICES XIII;
- Full travel support was provided to 1 scientist from the Republic of Korea and 1 scientist from Russia to participate in the NOAA/GCP/PICES workshop on “Understanding North Pacific carbon-cycle change: Data synthesis and modeling” in June 2004, in Seattle, U.S.A.;
- Partial travel support was provided to Dr. Francisco Werner (MODEL Task Team Co-Chairman) to attend the MODEL workshop on “The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific” in August 2004, in Seattle, U.S.A.;
- Full travel support was provided to 2 Canadian scientists to attend the APN/PICES Workshop on “Climate

- interactions and marine ecosystems: Effects of climate on the structure and function of marine food webs and implications for marine fish production in the North Pacific Ocean and marginal seas” held in conjunction with PICES XIII;
- Full travel support was provided for 1 invited speaker to the REX Workshop on “Seasonal cycles of plankton production in continental shelf waters around the North Pacific Rim”, 1 invited speaker to the MBM-AP Workshop on “Combining data sets on diets of marine birds and mammals - Phase II”, 2 invited speakers to the CCCC Workshop on “Linking open ocean and coastal ecosystems II”, and 9 invited speakers to the PICES/CLIVAR Workshop on “Scale interactions of climate and marine ecosystems” (funding for 5 speakers was allocated by the US CLIVAR, and 2 speakers by WCRP) at PICES XIII;
 - Full or partial travel support was provided to 21 invited speakers to scientific sessions at PICES XIII;
 - Full travel support from the Trust Fund (funding is allocated by SCOR) was provided to 1 Russian and 1 Chinese scientist to attend the MEQ workshop on “Developing a North Pacific HAB data resource II” at PICES XIII;
 - Partial travel support from the Trust Fund was provided to 1 Canadian, 8 Chinese, 3 Japanese, 6 Korean, 1 Mexican, 12 Russian and 8 US scientists to attend PICES XIII. The majority of these scientists are younger than 35 years of age;
 - Full travel support was provided to the recipient of the 2004 Wooster Award, Dr. Paul LeBlond and partial travel support was provided to the PICES past-Chairman, Dr. Hyung-Tack Huh, to attend PICES XIII.
 - Dr. Elizabeth Logerwell (US member of FIS) represented PICES at the 11th NPAFC Annual Meeting, held in October 2003, in Honolulu, U.S.A.;
 - Dr. Sei-ichi Saitoh (Co-Chairman, MONITOR Task Team) represented PICES at the POGO Annual Meeting held in November 2003, in Tokyo, Japan. It is expected that he will represent PICES at the 12th NPAFC Annual Meeting to be convened in October 2004, in Sapporo, Japan; and at the 9th NEAR-GOOS Coordinating Committee meeting to be held in November 2004, in Sendai, Japan;
 - Dr. Skip McKinnell (Deputy Executive Secretary) represented PICES at the Canada Global Change Planning Meeting and Canada CLIVAR Network Meeting held in February 2004, in Victoria, Canada; at the PaCOS Board Meeting convened in May 2004, in La Jolla, U.S.A.; and at the NOAA Climate regimes and ecosystems Planning Meeting (by invitation from NOAA) held in September 2004, in Seattle, U.S.A.;
 - Drs. Yasuwo Fukuyo and Mark Wells (Harmful Algal Blooms Section) represented PICES at the meetings of the ICES/IOC/IMO Working Group on *Ballast and Other Ship Vectors* and the ICES Working Group on *Introductions and Transfers of Marine Organisms* held consecutively in March 2004, in Cesenatico, Italy;
 - Dr. Phillip Mundy (Co-Chairman, MONITOR Task Team) represented PICES at the meeting of the ICES-GOOS Steering Group held in April 2004, in Tenerife, Spain;
 - Dr. Georgiy Moiseenko (Russian member of TCODE) represented PICES at the meeting of the ICES-IOC Study Group on *Development of marine data exchange systems using XML* held in May 2004, in Oostende, Belgium;
 - Dr. Suam Kim (Co-Chairman, CCCC Program) represented PICES at the 7th North Pacific Rim Fisheries Conference held in May 2004, in Busan, Republic of Korea;
 - Dr. Ian Perry represented PICES at the 2004 ICES Annual Science Conference held in September 2004, in Vigo, Spain;
 - Dr. Alexander Bychkov represented PICES at the NOAA/GCP/PICES workshop on “Understanding North Pacific carbon-cycle change: Data synthesis and modeling” convened in June 2004, in Seattle, U.S.A.; and the 27th SCOR General Meeting held in September 2004, in Venice, Italy.

VI. Relations with international scientific organizations and programs

The following reflects expanding relationships with international scientific organizations and programs, and with regional monitoring efforts in the North Pacific that are aligned with the PICES ecosystem research:

International Program for Deployment of profiling floats (Argo)

- PICES co-sponsored the First Argo Science Symposium held in November 2003, in Tokyo, Japan.
- A 1-day joint PICES/Argo Topic Session on “Application of Global Observing Systems to physics, fisheries, and ecosystems” was held on October 19, 2004, at PICES XIII.

International Research Programme on Climate Variability and Predictability (CLIVAR)

- A 2-day PICES-CLIVAR workshop on “Scale interactions of climate and marine ecosystems” was held October 23-24, 2004, in conjunction with PICES XIII.

Census of Marine Life program (CoML)

- In 2002, PICES was awarded a grant of US \$45,000 from the Alfred P. Sloan Foundation to produce a report for the Census of Marine Life entitled *Marine life in the North Pacific Ocean: The known, unknown and unknowable*. The project will be completed this year by publication of a baseline report in December 2004; a detailed web version of the report will be posted on the PICES website at the same time.

Global Ocean Ecosystem Dynamics (GLOBEC)

- The PICES 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.
- PICES co-sponsored the GLOBEC/SPACC Workshop (December 8-10, 2003, Tokyo, Japan) to compare long-term data on small pelagics from the Kuroshio/Oyashio system with those of other ecosystems in the Pacific

and Atlantic Oceans to better understand mechanisms which govern regime shifts.

- Members of the GLOBEC Focus 3 Working Group on *Linking biophysical and upper trophic level models* and the PICES MODEL Task Team were the key players in the SCOR/IOC Study Group on *Extending ecosystem models to the basin scale*. Two workshops convened by this Study Group in May and October 2003 (Cambridge, UK) resulted in the publication of a multi-authored background paper “Challenges in modeling ocean basin ecosystems” in *Science* in 2004.
- Several scientific sessions directly related to GLOBEC activities were convened at PICES XIII (e.g., **S2: Mechanisms that regulate North Pacific ecosystems: Bottom-up, top-down, or something else?** and **S9: The impacts of large-scale climate change on North Pacific marine ecosystems**).
- The GLOBEC Focus 1 Working Group on *Retrospective analysis* met in conjunction with PICES XIII and contributed joint and individual papers to the CCCC Topic Session on “The impacts of large-scale climate change on North Pacific marine ecosystems”. This provided an opportunity for PICES CCCC scientists to interact more closely with GLOBEC synthesis efforts.
- PICES will act as a co-sponsor and a local organizer of the GLOBEC Symposium on “Climate variability and sub-arctic marine ecosystems” to be held May 16-20, 2005, in Victoria, Canada. The symposium’s scientific objective is to present current knowledge of the effects of seasonal to multi-decadal climate variability on the structure and function of sub-arctic marine ecosystems.
- GLOBEC will co-sponsor the PICES/CCCC Symposium on “Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis” to be held April 19-21, 2006, in Honolulu, U.S.A. The primary scientific objective of this symposium is to present a synthesis of the effects of seasonal to multi-decadal variability on the structure and function of the North Pacific that goes beyond the analysis and understanding

developed from studies of a single trophic level, process or region—a True Synthesis.

- PICES and GLOBEC agreed to work together to organize the 4th International Zooplankton Production Symposium to be held in spring 2007, in Hiroshima, Japan (local sponsors and organizers are the Plankton Society of Japan and the Japanese Society of Fisheries Oceanography).

Global Ocean Observing System (GOOS)

- PICES carries on a few projects of direct relevance to GOOS: the North Pacific Ecosystem Status Report, North Pacific Continuous Plankton Recorder Program, inter-laboratory method comparisons of measurement technique for carbonate parameters in seawater and micronekton sampling gears, etc.
- PICES and GOOS started a dialogue in order to define the direction that PICES should take in integrating its regional interests with GOOS.
- PICES is actively communicating with regional monitoring efforts in the eastern North Pacific to develop options for international coordination of observing resources of the California Current, Gulf of Alaska and the Bering Sea.
- PICES is working with NEAR-GOOS (North-East Asian Regional GOOS) and participating in NEAR-GOOS meetings, with the idea of broadening the program to an ecosystem-based effort.

International Council for the Exploration of the Sea (ICES)

- PICES, ICES and GLOBEC worked together to organize the 3rd Zooplankton Production Symposium on “The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Ocean” held May 20-23, 2003, in Gijón, Spain. The project was completed this year by the publication of a special issue (Guest editors: Luis Valdez, Roger Harris, Tsutomu Ikeda, Skip McKinnell, and William Peterson) in the *ICES Journal of Marine Science*, Vol. 61, No. 4, p. 441-737.
- ICES accepted PICES’ invitation to co-sponsor a Topic Session on “Introduction of

marine species” at PICES XIII by identifying and covering travel expenses of an invited speaker and convenor, Dr. Stephan Gollasch (Chairman of the ICES Working Group on *Introductions and Transfers of Marine Organisms*).

- PICES accepted ICES’ invitation to co-sponsor two Topic Sessions on “Fisheries, ecology and life history of small pelagic fish” and on “Comparing and constructing the scientific strategies and output of regional ecosystem projects” at the 2005 ICES Annual Science Conference (Aberdeen, Scotland), by identifying and supporting travel expenses of PICES convenors for these sessions. Dr. Douglas E. Hay (Canada) will serve as a PICES convenor for the first session. A PICES convenor for the second session will be identified later.
- A joint ICES/PICES Symposium on “Marine bioinvasions” is planned for spring 2006, on the east coast of the United States. Dr. Yasuwo Fukuyo (Japan) will serve as a PICES co-convenor and a member of the Scientific Program Committee for the Symposium.
- At PICES XII, Dr. David Griffith, General Secretary of ICES, extended an invitation to PICES to jointly organize a (P)ICES Young Scientist Conference on Marine Sciences that would bring together “early career” scientists from around the globe. A draft proposal of the conference tabled by the PICES Secretariat was enthusiastically endorsed by the PICES Science Board and Council at their interim meeting in May 2004, and by the ICES Consultative Committee and ICES Bureau at their meetings in June 2004.
- To discuss/initiate possible co-operation in specific areas, PICES representatives attended annual meetings of the following ICES Groups:
 - Drs. Yasuwo Fukuyo and Mark Wells (PICES Section on Harmful Algal Blooms) attended meetings of the ICES/IOC/IMO Working Group on *Ballast and Other Ship Vectors* and the ICES Working Group on *Introductions and Transfers of Marine Organisms*

held consecutively March 22-24 and March 25-26, 2004, in Cesenatico, Italy.

- Dr. Phillip Mundy (Co-Chairman, PICES MONITOR Task Team) attended the meeting of the ICES-GOOS Steering Group held April 20-21, 2004, in Tenerife, Spain.
- Dr. Georgiy Moiseenko (PICES Technical Committee on Data Exchange) participated in the meeting of the ICES-IOC Study Group on Development of marine data exchange systems using XML held May 6-7, 2004, in Oostende, Belgium.

Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)

- PICES is interested in the development of a new project on ocean biogeochemistry and ecosystem research, and invited a representative of IMBER to give a programmatic talk at PICES XIII and to discuss how PICES can assist in the implementation of this project in the North Pacific. Dr. Julie Hall attended PICES XIII on behalf of IMBER.

Intergovernmental Oceanographic Commission (IOC)

- In 2002, IOC and PICES agreed to cooperate on four fronts: (i) monitoring (PICES - GOOS cooperation, see under GOOS); (ii) ecosystem indicators (PICES - SCOR/IOC WG 119, see under SCOR); (iii) CO₂ data integration and synthesis (see under IOCCP); and (iv) harmful algal blooms (see below).
- At last year's joint PICES/IOC Workshop on "Harmful algal blooms – Harmonization of data", representatives from PICES member countries accepted an offer from IOC/ICES to utilize their successful harmful algal event meta-database (HAE-DAT) format on a trial basis. A follow-up PICES/IOC workshop on "Developing a North Pacific HAB data resource - II" was held at PICES XIII to provide an interim "report card" on the use of this database.

International Ocean Carbon Coordinated Project (IOCCP)

- IOCCP is working to develop a central information source of on-going and planned ocean carbon observations, and to establish 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 is acting as a regional coordinator for these activities (see the article by Dr. Maria Hood in PICES Press, July 2004, Vol. 12, No. 2).
- To foster international cooperation towards integration and synthesis, IOCCP and PICES continue to collaborate on developing the global database for CO₂ and CO₂-related data. An initial North Pacific data inventory (PICNIC - PICES CO₂ Related Data Inventory in North Pacific) has been prepared following recommendations from two PICES CO₂ Data Integration Workshops and is now available on-line at <http://picnic.pices.jp> (426 cruises by six PICES member countries). The PICES WG 17 on *Biogeochemical data integration and synthesis* will carry this task to ensure continuous updates and geographical expansion of the database.
- A joint IOCCP/PICES/NIES Workshop on "Ocean surface pCO₂ data integration and database development" was held January 13-17, 2004, in Tsukuba, Japan. This workshop, which brought together 44 participants from 12 countries, focused on (i) the results of the inter-comparison experiment for ocean underway and moored pCO₂ systems, (ii) standardization of data and metadata formats, and (iii) data integration and networking.
- IOCCP, via the Intergovernmental Oceanographic Commission, provided US \$6,000 in 2003 and US \$2,000 in 2004 to PICES for the publication of the "Guide to best practices for oceanic CO₂ measurements and data reporting" being prepared by PICES WG 17. Publication is expected in the PICES Scientific Report Series by the end of 2004.

- A joint PICES/IOCCP Topic Session on “The impacts of climate change on the carbon cycle in the North Pacific” was convened October 20-21, 2004, at PICES XIII. IOCCP/IOC allocated US \$8,000 to support the travel of speakers to this session.

Joint Global Ocean Flux Study (JGOFS)

- Selected papers from the PICES/JGOFS Topic Session on “Plankton size classes, functional groups and ecosystem dynamics: Causes and consequences” at PICES X were published as a special issue of *Progress in Oceanography* (Guest editors: A. Peña and A. Bychkov) published in October 2003 (Vol. 57, Nos. 3-4). The issue includes 11 papers by authors from Canada, Chile, Japan, Korea and U.S.A.
- A collection of invited papers on JGOFS North Pacific Synthesis was published as a special issue of *Journal of Oceanography* (Guest Editors: T. Saino, A. Bychkov, C.T.A. Chen and P. Harrison) in February 2004 (Vol. 60, Nos. 1-2). The issue includes 13 papers by authors from Canada, Germany, Japan, Russia and U.S.A.
- A JGOFS North Pacific Process Studies DVD, prepared jointly by JGOFS North Pacific Task Team and PICES WG 13/WG 17 was released by the Japan Oceanographic Data Center (JODC) in fall 2004.

North Pacific Anadromous Fish Commission (NPAFC)

- NPAFC accepted PICES’ invitation for the Chairman of NPAFC’s Committee on Scientific Research and Statistics (CSRS) to present annual updates on the status of Pacific salmon in the North Pacific to the MONITOR Technical Committee. Every third year, the CSRS Chairman will make a more complete presentation on the status of Pacific salmon in the North Pacific as input to update the North Pacific Ecosystem Status Report. A representative of PICES will present the North Pacific Ecosystem Status Report to NPAFC Annual Meetings.
- A 3-day NPAFC/PICES symposium on “The status of Pacific salmon and their role in North Pacific marine ecosystems” will be held in fall 2005, in the Republic of Korea.

PICES’ convenor for the symposium is Dr. V. Radchenko, and PICES members of the Scientific Steering Committee are Drs. Y. Ishida, S. Kim, I. Perry and J. Stein. Symposium outline will be discussed during PICES XIII and the 2004 Annual Meeting of NPAFC.

Scientific Committee on Oceanic Research (SCOR)

Relationships with GLOBEC, JGOFS, SOLAS, IMBER and IOCCP are reflected separately. Other collaborations between PICES and scientific projects and groups established/co-sponsored by SCOR are listed below:

- The overlapping scientific interests of PICES and SCOR-IOC WG 119 resulted in PICES’ involvement in planning and organizing the International Symposium on “Quantitative ecosystem indicators for fisheries management” held March 31-April 3, 2003, in Paris, France. PICES was represented on the Scientific Steering Committee and supplied logistical support to get the Symposium organized by handling on-line registrations and submission of abstracts, producing the book of abstracts, staffing the Symposium Office during the event, as well as supporting the participation of some scientists from PICES member countries. The Symposium attracted 250 participants from 43 countries, and the program included 40 presentations and close to 150 posters. The Symposium papers will be published as a special issue of the ICES *Journal of Marine Science* in early 2005.
- PICES is developing a North Pacific Ecosystem Status Report, and this effort opens new opportunity for cooperation with the SCOR-IOC WG 119 that could assist in identifying what should be addressed in the report, using relevance to management decisions as selection criteria.
- A workshop on “Climate variability, zooplankton abundance and distribution – comparative opportunities from the world’s oceans” hosted at the 3rd PICES/ICES/GLOBEC Zooplankton Production Symposium (May 2003, Gijón, Spain) led to a proposal submitted to SCOR for a Working Group on *Global*

comparisons of zooplankton time series. At the 2004 interim meeting, PICES Science Board supported this proposal and agreed to provide funding for one additional member from the North Pacific to participate in this Working Group, should it be accepted by SCOR.

- All PICES member countries and Mexico have significant HAB problems, and similar levels of scientific uncertainty in regards to HABs that are severely limiting the ability to forecast and mitigate HAB events. To achieve and maintain the appropriate level of coordination and collaboration among its member countries, PICES decided to establish a longer-lifespan Section on *Harmful algal blooms and their impacts* (instead of a short-lived Working Group). This will provide additional opportunity for participation in the international collaborations that are currently underway, including GEOHAB.
- SCOR provided a travel grant of US \$5,000 to support participation of Russian and Chinese scientists in the workshop on “Developing a North Pacific HAB data resource” to be convened at PICES XIII.

Surface Ocean-Lower Atmosphere Study (SOLAS)

- Iron enhancement experiments are an important part in the agenda of both SOLAS and PICES. In the summer of 2001, an iron enrichment experiment (Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study – SEEDS-I) was performed in the western subarctic Pacific, and in the summer of 2002, another iron enrichment experiment (Subarctic Ecosystem Response to Iron Enrichment Study - SERIES) was carried out in the eastern subarctic Pacific. These international collaborative projects were developed under the umbrella of PICES, through its Advisory Panel on *Iron Fertilization Experiment in the Subarctic Pacific Ocean*. Both experiments were successful and generated important new findings were published recently in *Science* (SEEDS-I: Tsuda *et al.* 2003, 300: 958-961) and *Nature* (SERIES: Boyd *et al.* 2004, 428: 549-553). More detailed results from these

experiments will be published as special issues of primary journals in 2004/05. The latest joint Japan/U.S.A./Canada experiment in the western subarctic Pacific (SEEDS-II) was completed in August 2004.

- A 1½-day session on “Response of the upper ocean to meso-scale iron enrichment” was organized jointly by Canadian-SOLAS and PICES at the TOS/ASLO 2004 Ocean Research Conference (February 17-18, 2004, in Honolulu, U.S.A.). A brief report on the session was published in PICES Press (Vol. 12, No. 2).
- A 3-day workshop on “*In situ* iron enrichment experiments in the eastern and western subarctic Pacific” organized by the PICES IFEP was held February 10-12, 2004, in Victoria, Canada. Specific objectives of the workshop were (i) to synthesize results from two recent *in situ* iron enrichment experiments in the subarctic Pacific (SEEDS-2001 and SERIES-2002); (ii) to determine similarity and differences in biogeochemical and ecosystem responses to iron addition between eastern and western subarctic Pacific; and (iii) to identify specific scientific questions for the longer-term experiment in the western subarctic Pacific (SEEDS-2004). The workshop was attended by 25 scientists from Canada, Japan and U.S.A. A brief report of the workshop was published in PICES Press (Vol. 12, No. 2), and proceedings will be published in the PICES Scientific Report Series.

Exxon Valdez Oil Spill Trustee Council (EVOS)

- The sample collection and analysis for the north-south transect of the PICES Continuous Plankton Recorder (CPR) survey of the North Pacific is supported by a grant from EVOS (US \$120,000 per year, from 2004 to 2006).
- In September 2004, EVOS contributed \$11,600 for the production of the North Pacific Ecosystem Status Report. [Between 2002-2003, EVOS provided \$34,000 for the North Pacific Ecosystem Status Report.]
- In August 2004, EVOS approved funding in an amount of US \$15,000 in support of two

PICES workshops during the time period October 1, 2004 – September 30, 2005. The workshops that would be most appropriate for this funding source will be identified at PICES XIII. The deliverables will be PICES publications on the workshops.

North Pacific Research Board (NPRB)

- The sample collection and analysis for the east-west transect of the PICES Continuous Plankton Recorder (CPR) survey of the North Pacific and southern Bering Sea is supported by a grant from NPRB (US \$185,000, from July 2003 to June 2005).
- NPRB agreed to provide US \$25,000 for the symposium on “Climate variability and sub-arctic marine ecosystems” to be held May 16-20, 2005, in Victoria, Canada. PICES will act as a co-sponsor and a local organizer for this symposium.

Pacific Coastal Observing System (PaCOS)

- An international alliance for monitoring the California Current’s natural resources and ecosystems is needed to coordinate existing observing activities in the EEZs of the three countries (Canada, U.S.A. and Mexico) and international waters, integrate new initiatives as they arise, and provide early warning of ocean ecosystem change for all dependent coastal communities. PaCOS encouraged PICES to develop options for such an alliance that could be considered by the governments and organizations involved. The options developed at the workshop on “Development of pilot coastal monitoring program(s) in the NE Pacific” (November 2003, Victoria, Canada) were endorsed at the 2004 interim PICES Science Board/Governing Council meeting, and presented at the PaCOS Board meeting in May 2004. This proposal will be considered by the Board at its next meeting.

VII. PICES Intern Program

See GC Agenda item 11 for details.

VIII. PICES database and website

In today’s era of communication, the first contact between the public and an organization

is most often through its website, which therefore provides the first impressions of this organization. At the 2003 interim Science Board/Governing Council meeting (April 2003, Victoria, Canada), it was agreed that the PICES website was in need of a complete overhaul, and the Secretariat was requested to develop a plan to improve the website. The most important changes implemented in 2003-2004 include:

- The *look* and *functionality* of the website were considerably improved. Overall, about 40 new pages (*e.g.* Site map, Publications, PICES Intern Program) were added. Existing pages were re-organized and/or connected to the database to become user-friendly (*e.g.* News, Member Search). Pages with PICES publications and meetings are now updated on a regular basis. The drop-down and left-hand menus, and the local search engine were added to improve the navigation through the website.
- Both PICES’ database and website were re-organized and re-designed to make use of various advantages of a *dynamic* website (*e.g.* allow users to register for meetings and update information on-line, withdraw the most updated information, *etc.*).
- The website now provides more useful information for PICES members. 28 new pages were created for PICES standing and temporary groups. Among other information, these pages carry (i) *Terms of Reference* for the group (useful for new members); (ii) *List of members* with detailed contact information; and (iii) *Mailing List* – a tool to improve members’ communication. Some pages (*e.g.* FERRRS, WG-14) have their “Private Login areas” accessible only to members of the specific group. From these pages users can download protected files, such as draft reports, for editing purpose.
- The new, password protected, Login system was created. This protected system significantly improved database security and allowed users to directly “communicate” (update/withdraw information) with the database on-line. This direct “communication” allowed the new feature – “personal meeting summary” that brings

useful information to meeting registrants about their registration, abstract submission, registration fee payment processing, financial support status, *etc.* This system saves time for both users and the Secretariat: there is no need to exchange e-mails to confirm registration, payments, *etc.*, as these e-mails are generated automatically; and there is no need to manually update database tables as most of these updates are done by users on-line.

The new database and website have been successfully tested during the registration for the Symposium on “Quantitative ecosystem indicators for fisheries management” (April 2004, Paris, France), and PICES XIII (October 2004, Honolulu, U.S.A.). At the 2004 interim meeting, Science Board concluded that the

PICES website is now an attractive and effective product, and congratulated the PICES Secretariat for their work. In July 2004, the Secretariat received a formal letter from Dr. Ian Perry, PICES Science Board Chairman, who highly valued the new PICES website.

At the 2004 interim meeting, Science Board also agreed that the major outstanding issue now is to populate the website with information, in particular about each Committee and Program. Quality control of information posted to the PICES website will be maintained by a small “web” Publications Committee, which will periodically review information and recommend common formats. Dr. Harold P. Batchelder volunteered to chair this Committee, with additional members being nominated by each Committee and the CCCC Program.

GC Endnote 4

Report of 2004 interim Governing Council meeting

The 2004 interim Governing Council meeting was held from 14:00-18:00 on May 7, 2004, immediately after the 2004 interim Science Board/Governing Council meeting at the Hyatt Regency Hotel, Jeju, Republic of Korea. All Contracting Parties were represented at the meeting. The Chairman, Dr. Vera Alexander, also invited Dr. Ian Perry, Science Board Chairman, to attend. The participants are identified in *GC-IM Endnote 1*, and the agenda is appended as *GC-IM Endnote 2*.

PICES Strategic Plan and the next steps (Agenda Item 1)

At the 2003 interim meeting, Council established a Study Group on *PICES Strategic Issues* to develop a Strategic Plan for the Organization (Decision 03/S/5(iv)). The Study Group worked primarily by correspondence and met only once, at PICES XII (October 2003, Seoul, Korea). The Study Group is chaired by Dr. Alexander, who presented her report to Council. The draft PICES Strategic Plan was reviewed and approved in principle. The only change suggested during this discussion was to include “sustainable development” somewhere

in the draft. It was agreed that the Chairman will make the requested modification, and then the final version of the Strategic Plan will be posted on the PICES website.

All Standing Committees and the CCCC Program are requested to review the Strategic Plan prior to PICES XIII and to discuss development of their own Action Plans for current and future activities that fit within the Strategic Plan. These Action Plans should undergo an initial review at PICES XIII.

A potential role for PICES in coordinating international coastal and ocean observing systems (Agenda Item 2)

Currently, strong national and international attention is being paid to establishing effective observing systems for long-term information gathering and to serve research and operational requirements. The Pacific Coastal Observing System (PaCOS) is a new U.S. NOAA/NMFS initiative concerned with offshore and integrated coast-wide observations in the California Current System (CCS). An international alliance for monitoring the California Current’s

natural resources and ecosystems is needed to coordinate existing observing activities in the EEZs of the three countries bordering the CCS (Canada, U.S.A. and Mexico) and international waters, integrate new initiatives as they arise, and to provide early warning of ocean ecosystem change for all dependent coastal communities. PaCOS formally invited PICES to develop options for such an alliance that could be considered by the governments and organizations involved, and present them to the PaCOS Governing Board at their meeting on May 17-18, 2004.

Council reviewed the recommendations of the PICES/PaCOS/EVOS workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" (November 20-21, 2003, in Victoria, Canada; the report of this workshop was published in PICES Press Vol. 12, No. 1), and endorsed an initiative to explore the formation of a relationship with PaCOS to coordinate the international elements of this program, as long as there was no impact on national annual contributions to PICES. PICES involvement could range from facilitating international collaboration among Canada, Mexico and the United States, to providing services such as data provision and analyses, to a "PaCOS desk" at the PICES Secretariat, which would have an important role in updating the CCS chapter of the next North Pacific Ecosystem Status Report. Any involvement of PICES that requires funds must be accompanied by incremental contributions from PaCOS to implement these activities. It was also suggested that PICES should consider ways to facilitate similar interactions in the western Pacific (that do not overlap with existing projects such as NEAR-GOOS).

Approval of the recommendations from the 2004 interim Science Board meeting (Agenda Item 3)

The Chairman noted that the 2004 interim Science Board meeting proved to be extremely valuable for assessing the progress of the PICES Committees, Scientific Program and temporary groups, and for planning future directions for the Organization. All member countries profited

from the experience of having Governing Council meet with Science Board. Council complimented the Science Board Chairman, Dr. Ian Perry, on his excellent work in preparing for and convening the meeting.

Council approved the proposed structural changes to the CCCC Program:

- Concluding the *Basin Scale Studies* (BASS) and *Regional Experiment* (REX) Task Teams and the *Nemuro Experimental Planning Team* (NEXT);
- Establishing a new Task Team on *Climate Forcing and Marine Ecosystem Response* (CFAME) with terms of reference as presented in *SB-IM Endnote 3*;
- Moving the MONITOR Task Team outside the CCCC Program to become a Technical Committee directly under Science Board with terms of reference as presented in *SB-IM Endnote 4*.

Council also recommended that Contracting Parties:

- Review their membership on MEQ to determine if current national members are still appropriate, and appoint new members if necessary;
- Review their membership on TCODE for ability to represent national data holdings, and appoint new members if necessary.

Financial and administrative matters (Agenda Item 4)

Auditor's report for FY 2003

The Auditor's (*Flader & Hale*) Report for FY 2003 was distributed at the meeting. In the auditor's opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2003. It was agreed that audited accounts for FY 2003 should be reviewed by F&A and presented to Council for approval at PICES XII.

Annual and voluntary contributions

Council reviewed the payment schedule of annual contributions in 2000-2004, and noted further improvements in the timeliness of

payments for all countries but China (it was indicated that the separate partial payments in 2004 is uncharacteristic for the United States). Four of the six Contracting Parties paid their full fees, and the United States paid half the fee by the end of March 2004. The People's Republic of China stated that they will attempt to pay the 2004 annual dues and the outstanding balance from 2003 within the third fiscal quarter.

The Executive Secretary reported on the following voluntary contributions and grants received since PICES XII:

- The Ministry of Maritime Affairs and Fisheries of the Republic of Korea contributed \$18,778 to the Trust Fund to involve more young scientists in PICES activities, and \$18,778 to the Working Capital Fund to support high priority PICES projects. (December 22, 2003).
- In addition to the annual fee, Fisheries & Oceans Canada contributed \$10,000 to the Trust Fund to finance the 2003-2004 PICES Intern Program. (March 29, 2004).
- The National Marine Fisheries Service (NOAA, U.S.A.) provided \$45,000 US to support activities of the PICES Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* which was formed to address a formal request made by the United States Government for scientific advice on the implications of the 1998/99 regime shift for fisheries. (April 19, 2004).
- The Scientific Committee on Oceanic Research (SCOR) provided a grant of \$4,000 US to support travel of scientists from countries with "economies in transition" to PICES XIII (March 18, 2004).
- The Asia Pacific Network (APN) approved a proposal by the PICES MODEL Task Team entitled "Climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food-webs and implications for marine fish production in the North Pacific Ocean and marginal seas" (the amount of the final award will be known by the end of April). This will fund a workshop with approximately 25 participants in October 2004, in Honolulu, immediately prior to PICES XIII. (April 7, 2004).

Council thanked the Republic of Korea, Canada and the United States for their voluntary contributions.

PICES Intern Program

Council reviewed the status of the Intern Program and re-iterated that this is one of the best working PICES programs that is beneficial for the Organization as well as for member countries.

At PICES XII, Council approved extension of the deadline for applications for the 2004-2005 term of the Intern Program to December 31, 2003 (Decision 03/A/8(i)). Before the deadline, two Korean candidates, Mr. Gong-Gu Back (NORI/MOMAF) and Mr. Jin-Yong Lee (KORDI), were nominated and then accepted as interns, for shorter and partially overlapping 6-month terms, starting June 1 and November 1, respectively. It was also agreed that these terms could be extended to a maximum of 8 months, depending on the intern's performance, the workload of the Secretariat and availability of funds. Council agreed that this practice of adopting two interns from the same country for two consecutive but shorter terms, should not be perceived as a permanent change in the PICES Intern Program's selection procedure and a precedent for multiple appointments from a single nation, but rather a good trial of the Council's proposal of expanding the Intern Program to include a "scientific intern" and an "administrative intern".

The Intern Program has not been budgeted for, and over the years has been financed solely by voluntary contributions. According to the instructions from Council (Decision 03/A/8(ii)), the Executive Secretary sent letters inviting voluntary contributions from member countries to support the Intern Program in 2004 and beyond. He reported that in response to this request:

- Canada contributed \$10,000 to the Trust Fund to finance the 2003-2004 Intern Program; and
- The Republic of Korea suggested that a part of their contribution to the Trust Fund

(\$18,778) can be used to finance the 2004-2005 Intern Program.

Dr. Marasco indicated that the Alaska Fisheries Science Center would contribute at least US \$10,000 to the Intern Program in 2004. Dr. Kobayashi mentioned that the Fisheries Research Agency of Japan is trying to establish a new system that will allow funding to the Intern Program in the future.

Schedule and financing of future Annual Meetings

Dr. Marasco reported on the status of arrangements for PICES XIII (October 15-23, 2004, Honolulu, U.S.A.), and the Russian delegation provided brief information on preparations and the budgetary requirements for PICES XIV (September 30-October 5, 2005, in Vladivostok, Russia).

At PICES XII, Council requested Japan to explore the possibility of hosting the Fifteenth Annual Meeting in 2006, and inform the Secretariat on this matter by May 31, 2004 (Decision 03/A/5(ii)). At the interim meeting, the Japanese delegation confirmed their intention to host PICES XV.

At PICES XII, and again at the 2004 interim Council meeting, Canada indicated an interest to host the Annual Meeting in 2008, so as to link it to the celebration of the centennial anniversary of the Pacific Biological Station (Nanaimo, B.C.). This would mean an alteration to the existing rotation cycle. No action was taken, and it was agreed that this issue will be revisited at PICES XIII.

Administrative matters

At PICES XII, four specific administrative issues were raised and discussed. Canada was requested (1) to explore the feasibility of an amendment to the Headquarters Agreement that will allow the extension of the tax levy practice to all staff of the Secretariat; and (2) to clarify and inform the Secretariat of the process required to request a change in the terms of "Acceptance" status. The United States was

asked (1) to resolve the problem with restrictions when issuing the official G4 visa for PICES' Russian staff; and (2) to explore the possibility of tax exemption for PICES.

The Canadian and US delegations and the Executive Secretary provided an update on the status of these requests. It was recommended that F&A should re-visit these issues at PICES XIII.

Other business (Agenda Item 5)

North Pacific Ecosystem Status Report

At the 2004 interim meeting, Science Board reviewed the draft North Pacific Ecosystem Status Report (NPESR), which had been revised following discussions and comments at and after PICES XII, and approved the scientific content of the report. However, the controversy emerged over the naming of the sea between the Japanese archipelago and the Northeast Asian mainland. This controversy would affect the full publication of the report and the timely delivery of this scientific product valuable to all Contracting Parties. Thus, the issue of the naming of the sea was referred to Council.

The Chairman reminded Council that concerning the body of water bounded by Japan on the east and Russia and the Korean Peninsula on the west, PICES has, since 1995, used the terminology "Japan/East Sea". This practice arose because of cooperative investigations of Japan and Korea at that time, and until recently has not been challenged. Accordingly that name was used in the current preparation of the NPESR. In 2002, representatives of the Government of Japan asked that the sole term "The Sea of Japan or Japan Sea" be used for that sea (see *GC Endnote 9* in the 2002 PICES Annual Report).

Japanese and Korean representatives repeated well-known views of their governments on this issue. Japan's position is that the only "Sea of Japan or Japan Sea" should be used in the international arena, as this name is historically and geographically established, and Korea's position is that the names "East Sea" and "Japan

Sea (Sea of Japan)” should be used simultaneously, until a final resolution is agreed upon between the relevant countries (see *GC Endnote 5* in the 2003 PICES Annual Report).

After a lengthy discussion, all Contracting Parties agreed that PICES, as a scientific organization, is not the appropriate venue for political discussions, but no consensus was reached on how to proceed with the publication of the NPESR.

Dr. Marasco indicated that the NPESR is an excellent example of how an international scientific organization can generate a product of value to many countries, and that Council should not allow postponing the publication of this report any further. On behalf of the United States he tabled the following motion:

1. With the exception of the chapter currently identified as “Region 3”, all remaining chapters will be published on the web, after checking other chapters to ensure references to the sea in question have been removed.
2. The chapter on “Region 3” will be held off the web for a period of up to 6 months. If the naming issue is resolved within 6 months, the agreed name would be included and hard copy produced. If the issue is not resolved, use of past naming practices of PICES will be employed and the document published on the web and in hard copy.

This motion was seconded by the Republic of Korea and came to a vote. The outcome of the vote was four votes in favour, one against and one abstention. The PICES Convention requires a three-quarters majority in favour for a motion to pass. The Japanese delegate claimed that all six Contracting Parties have to be counted as voting, and thus the motion failed. The Korean delegate claimed that only five Contracting Parties have to be counted as voting (excluding the abstention), and thus the motion passed. The Chairman stated that neither the PICES Convention nor its Rules of Procedure contains a provision on how to deal with an abstention. Accordingly, she will seek legal advice from international lawyers and inform Council on the decision of the vote at the earliest possible date. A letter from Dr. Alexander (*GC-IM Endnote 3*) was circulated on May 28, 2004. The conclusion was that the US motion is adopted by a concurring vote of more than the three-quarters majority required to pass a motion, as a party that abstains is count as not voting.

At the conclusion of this item, the Chairman emphasized again that this sort of political question must be resolved outside the forum of a purely scientific organization such as PICES, where timely scientific contributions can otherwise be seriously impeded. Council should take all possible measures that would allow important efforts such as the NPESR to proceed unimpaired.

GC-IM Endnote 1

Participation List

Canada

Joan Kean-Howie

Japan

Tokimasa Kobayashi
Tsuyoshi Yamamoto
Satoru Yasuda (advisor)

People's Republic of China

Zhi-Xin Chen (alternate delegate)
Qian-Fei Liu (alternate delegate)
Jin-Ping Zhao (advisor)

Republic of Korea

Jong-Hyun Choe (alternate delegate)
Young-Hoon Chung
Keun-Oh Kim (advisor)

Kuh Kim (advisor)

Russian Federation

Lev N. Bocharov
Igor I. Shevchenko (alternate delegate)
Pavel V. Vorobyov (advisor)

U.S.A.

George W. Boehlert
Richard J. Marasco

Others

Vera Alexander (Chairman, PICES)
Hyung-Tack Huh (Past-Chairman, PICES)
Alexander Bychkov (Executive Secretary)
Skip McKinnell (Deputy Executive Secretary)
R. Ian Perry (Chairman, Science Board)

GC-IM Endnote 2

Governing Council 2004 Interim Meeting Agenda

1. PICES Strategic Plan and the next steps (Report of Study Group on *PICES Strategic Issues*)
2. A potential role for PICES in coordinating international coastal and ocean observing systems
3. Approval of the recommendations from the 2004 interim Science Board meeting
4. Financial and administrative matters
 - 4.1 Auditor's report for FY 2003
 - 4.2 Annual and voluntary contributions
 - 4.3 PICES Intern Program
 - 4.4 Schedule and financing of future Annual Meetings
 - 4.5 Administrative matters
5. Other business

GC-IM Endnote 3

**Decision on the vote on the US motion
(Letter of May 28, 2004, from Dr. Vera Alexander to Governing Council)**

I promised to present my decision vis-à-vis the vote on the U.S. motion (see full text below) that was taken at the meeting of the North Pacific Marine Science Organization Governing Council (PICES) held in Jeju, Korea, on May 7, 2004.

First of all, I must express my deep regret that our Governing Council was obliged to consider an issue that is not scientific, that is of direct concern to only two of the Contracting Parties,

and that has not been yet resolved in other, more appropriate, international venues. Nevertheless, two years of solid work on the North Pacific Ecosystem Status Report are in jeopardy, and in this regard, also the ability of the Organization to deliver scientific input to the Contracting Parties on a timely basis. This has serious implications, since PICES is purely a scientific organization, even though it is intergovernmental in nature, and it must provide timely information to be effective.

The use of the joint name (Japan/East Sea) has been the custom in PICES since 1995, when the Working Group on “Circulation and ventilation in the Japan/East Sea” was established. It was not until 2002, that the issue was raised by representatives of the Government of Japan, asking that the sole term used for the sea between Japan and Korea must be “the Sea of Japan or Japan Sea”. There is absolutely no way for PICES to rule effectively on the principles of such a matter. Nevertheless, the matter did come to a vote at our May meeting, specifically with regard to the name used in the North Pacific Ecosystem Status Report. The U.S. motion had two parts. First, to place an incomplete version of the report on the web, with the chapter dealing with the sea in question deleted, and second, if there is no resolution re the name of the sea within six months, to publish the report using PICES past practice (Japan/East Sea) to identify the sea that lies between Japan and Korea.

The outcome of the vote was four votes in favor, one against and one abstention. Official delegates from all six Contracting Parties were

present. The PICES Convention requires a three-quarters majority in favor for a motion to pass. If all six Contracting Parties are counted as voting, as the Japanese delegate claimed, the motion fails. If only five are counted as voting, excluding the abstention, as the Korean delegate claimed, then the motion passes with four in favor and one against. Neither the PICES Convention nor its Rules of Procedure contains a provision on how to deal with an abstention. Accordingly, the Executive Secretary and I have consulted extensively with experts, and sought legal advice. The conclusion is that the three-quarters majority required to pass a motion, as specified in the PICES Convention, is based on those who vote. A party that abstains is not voting. Therefore, the motion was adopted.

I point out that this decision by Council concerns only this particular report. Even if no resolution of the name is achieved in other venues within the six-month period, and PICES reverts to its previous practice, this does not necessarily have permanent implications for future uses. It does, however, point out the need for this matter to be settled as soon as possible.

GC Endnote 5

PICES Strategic Plan

The Nations surrounding the North Pacific Ocean depend on these waters for food, economic benefit and recreation, primarily through the abundant living marine resources. The ocean also provides transportation, while the coastal areas afford desirable locations for human habitation. Human health, pollution, aquaculture, overfishing and the effects of geo-tectonic processes are becoming major issues. The importance of the oceans in climate, and the effects of variability in climate on weather and on living marine resources are now recognized. Yet integration of scientific knowledge on the North Pacific Ocean, along with its marginal seas, has not occurred as a coherent effort in the past. The North Pacific Marine Science Organization (PICES) has undertaken this task, by bringing together scientific expertise from the Contracting Parties to synthesize and disseminate knowledge and design appropriate multi-national research programs in response to identified needs. PICES is working to advance knowledge and develop an integrated understanding about how the Pacific Ocean works, so that we can make predictions and improve human conditions among the Contracting Parties.

The PICES Mission

To promote and coordinate marine scientific research in the North Pacific Ocean in order to advance scientific knowledge of the area concerned and of its living resources

The goal is to advance scientific knowledge and capacity available to the Contracting Parties, including information on human activities affecting, and affected by marine ecosystems, and to provide a mechanism for collaboration among scientists in addressing timely and critical scientific questions.

The PICES Mission calls for:

- Providing leadership on scientific issues and identifying research priorities and problems pertaining to the North Pacific Ocean, as well as appropriate methods for their solution;
- Promoting the collection and exchange of data related to marine scientific research in the North Pacific Ocean;
- Recommending coordinated research programs and related activities pertaining to the North Pacific Ocean to be undertaken through the national efforts of the participating partners;
- Establishing effective arrangements for scientific consultation and exchange;
- Coordinating and enhancing physical, chemical, biological, and interdisciplinary research;
- Developing and implementing large-scale research;
- Synthesizing scientific information regarding the regions, and making the results widely available;
- Responding to requests from the Contracting Parties to provide advice on scientific issues relating to the North Pacific Ocean;
- Building capacity within the scientific communities of the Contracting Parties;
- Fostering partnerships with other organizations that share a common interest;
- Informing interested parties and the public about marine ecosystem issues.

The PICES Strategy

The PICES mission is built upon five central themes: (A) Advancing scientific knowledge; (B) Applying scientific knowledge; (C) Fostering partnerships; (D) Ensuring a modern organization in support of PICES activities; and (E) Distributing PICES scientific knowledge. Specific goals are identified within each of these themes. The actions and activities required to meet each of these goals will change over time, and will be described and updated regularly in a separate PICES Action Plan.

Theme A. *Advancing scientific knowledge*

Goals 1 and 2 address our need to understand the Pacific Ocean system, a need that can only be addressed by multi-national scientific cooperation. Effective resource management by each member country requires comprehensive scientific understanding, including, for example, the role of the ocean in climate. Furthermore, human populations residing in coastal regions are growing, and the sustainable use of marine resources is a priority. The potential for disrupting the marine ecosystems is increasing, but mitigation and effective use is possible with sufficient information on the impacts of human activities.

Goal 1. *Understand the physical, chemical, and biological functioning of marine ecosystems*

The PICES scientific program is dedicated to understanding and quantifying the physical, chemical and biological processes of the North Pacific Ocean, including the oceanographic and ecological responses to climate variability. Understanding biological diversity, life histories and trophic relationships depend on the development of modern technologies for sampling the marine environment.

Goal 2. *Understand and quantify the impacts of human activities and climate on marine ecosystems*

PICES recognizes that humans are part of the ecosystem of the North Pacific Ocean. They are affected by climate scale variability, and in turn conduct activities that impact marine ecosystems. This goal

addresses the ecosystem effects of fishing, mariculture, contamination and eutrophication on the marine ecosystem, and also includes physical habitat changes and accidental introduction of non-native species.

Goal 3. *Provide advice on methods and tools to guide scientific activities*

The quality of our science benefits from comparable methods and techniques. PICES provides workshops on, and opportunities for, inter-calibration of methodology and sampling equipment, as well as collaborative opportunities to develop new, creative methodologies.

Theme B. *Applying scientific knowledge*

Scientific knowledge can be applied to address societal needs. This activity follows logically from the previous theme, in that it demonstrates how scientific understanding can assist with societal problems related to the North Pacific Ocean.

Goal 4. *Provide scientific advice towards wise use of the North Pacific Ocean*

PICES provides periodic reports dealing with critical issues, including a comprehensive assessment of the Status of the North Pacific Ecosystem. Information needed in support of sound utilization and sustainable development of the marine environment is a PICES priority.

Theme C. *Fostering partnerships*

Collaboration and communication lies at the heart of creating scientific knowledge and using it effectively. PICES creates a forum that enhances international collaboration in the North Pacific region, as well as with similar organizations throughout the world.

Goal 5. *Promote collaboration with organizations, scientific programs, and stakeholders that are relevant to the PICES goals*

PICES develops close relationships with scientific organizations and commissions that have shared goals, and also exchanges observers and carries out joint activities. Close collaboration with regional and international programs is critical to PICES success. PICES activities provide an opportunity for capacity building through internships and expediting the involvement of young scientists in PICES activities.

Goal 6. *Promote collaboration among scientists within PICES*

PICES must continue to widen the appeal of the PICES Annual Meeting, broaden the scope and readership of publications, and continually develop new partnerships to address emerging issues. PICES must be open to non-governmental scientists, and must ensure the participation of under-represented groups.

Theme D. *Ensuring a modern organization in support of PICES activities*

The activities in support of the primary mission of PICES require effective support and implementation, as well as broad participation from the scientific communities of the Contracting Parties.

Goal 7. *Provide an effective infrastructure to support PICES programs*

An effective Secretariat that supports the mission and goals of the organization is essential to its success.

Theme E. *Distributing PICES scientific information*

PICES has an important role in making information resulting from the Organization's activities available.

Goal 8. Make the scientific products of PICES accessible

PICES needs to communicate the results of its scientific activities broadly, through high quality publications, the PICES website, and production and dissemination of educational materials. PICES will maximize the use of electronic media as a vehicle, to allow updates as new information is produced.

REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE



The Finance and Administration Committee (F&A) met from 08:30-17:00 hours on October 16 and from 08:30-17:00 on October 19, under the chairmanship of Dr. Richard J. Marasco. Dr. Stewart M. McKinnell acted as rapporteur.

Welcome and opening remarks (Agenda Item 1)

The Chairman called the meeting to order, welcomed participants and requested an introduction of members for each delegation. All Contracting Parties were present at the meeting, but the People's Republic of China was represented only at the second session (*F&A Endnote 1*).

Adoption of agenda (Agenda Item 2)

The Committee reviewed and adopted the agenda as presented (*F&A Endnote 2*). To ensure participation of all Contracting Parties in the discussion, Dr. Laura Richards suggested moving budgetary items until later in the meeting, and her proposal was accepted.

Audited accounts for FY 2003 (Agenda Item 3)

At the first inter-sessional Governing Council meeting (April 9, 2003, Victoria, Canada), *Flader & Hale* was selected as the external auditor for FY 2003-2005.

The Auditor's Report for FY 2003 (*F&A Endnote 3*) was circulated by e-mail to all Contracting Parties in April 2004, and distributed again at the second inter-sessional Governing Council meeting on May 7, 2004 (Jeju, Republic of Korea). In the auditor's opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2003. The Committee reviewed the Auditor's Report and recommended it for approval by Council.

Annual contributions (Agenda Item 4)

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 2004 annual fee payment dates, and provided information on the payment schedule of national contributions for the last five years (*F&A Endnote 4*). The Committee noted that even though only two contributions (from Japan and Canada) arrived close to the due date, there has been an overall improvement in the timeliness of payment for all countries but China (the late payment in 2004 is uncharacteristic for the United States). It was also re-iterated that the operation of the Secretariat is structured around the receipt of full annual fee payments at the beginning of the PICES fiscal year, and that late and partial payments could adversely affect its operations. The Committee recommended that Council instruct the Executive Secretary to send a letter to each Contracting Party commending them for improved performance in submitting annual contributions in 2004, and describing the difficulties partial payment causes the Organization. It was also recommended that for planning purposes, Contracting Parties should continue to use the guideline generally accepted at the Eighth 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 member countries in preparing timely funding requests to cover annual contributions, and the Executive Secretary in developing future budgets.

The Executive Secretary reviewed the history of annual contributions and pointed out that the total budget is growing faster than these contributions. In the eight years from 1996 (when the number of Contracting Parties increased to six) to 2004, annual contributions have increased less than 18%. At the same time, the annual budget has increased by almost 39%.

F&A-2004

Every year since 1999, a significant amount was transferred from the Working Capital Fund to the General Fund to offset this deficit. The practice of transferring such surpluses from the Working Capital Fund is a viable approach to balance accounts, but only if the required transfer is lower than the miscellaneous income.

The Executive Secretary requested a discussion on the need for increased annual contributions, as their current level (about \$100,000) is not adequate for the level of scientific activities sponsored and/or conducted by PICES. To support the work of the Organization at the level that Contracting Parties desire, annual contributions of \$150,000-160,000 would be an appropriate target. The Chairman suggested deferring this discussion until the next Annual Meeting.

Fund-raising activities (Agenda Item 5)

The Executive Secretary reported on fund-raising efforts in 2004. Extra-budgetary contributions and grants received since PICES XII (October 2003) are reflected in F&A *Endnote 5*. It was noted that the level of external funding for various activities initiated by PICES has increased significantly over the last several years, but (i) it remains heavily dependent on U.S. funding sources (*e.g.*, \$57,756 in 2002, \$91,336 in 2003, and \$175,810 in 2004), and (ii) these funding offers have specific product and service requirements, and place additional demand on the Secretariat, the size and structure of which have remained unchanged for the last 10 years.

Mr. Robin Brown reminded the Committee that Japan's contribution to support activities of WG 13 and WG 17 has been high but is not reflected in the tabled summary document as funds were spent directly, without transferring to PICES accounts.

Discussion then focused on potential sources of additional funding for on-going or proposed projects. Committee members suggested that PICES should explore the possibility of working more closely with the North Pacific Research Board (on topics such as the development of the

North Pacific Ecosystem Status Report, and the utility of ecological indicators to evaluate ecosystem change), the Asia-Pacific Network for Global Change Research (ecosystem modeling and effect of climate change on ecosystems), and the Brain Korea 21 Program (capacity building). Dr. Marasco pointed out that projects submitted for external funding have to be multi-disciplinary and of multi-national interest. Dr. Richards reminded Committee members that these projects also need to be consistent with the PICES Strategic Plan.

It was re-iterated that 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, and therefore, fund-raising continues to be an important component of PICES activities. The discussion led to two recommendations to Council:

- To instruct the Science Board to prepare a list of high priority PICES activities that are strong candidates for external funding to be tabled at the 2005 inter-sessional Science Board/ Governing Council meeting (or at PICES XIV if no inter-sessional meeting occurs);
- To request National Delegates, members of F&A and Science Board to prepare information about funding opportunities in their countries by the 2005 inter-sessional Science Board/Governing Council meeting (or at PICES XIV if no inter-sessional meeting occurs).

Ms. Elizabeth Tirpak suggested that identified funding opportunities have to be reflected on the PICES website. The Committee supported this proposal and agreed to nominate a person with responsibility for this action.

Budget (Agenda Item 6)

Estimated accounts for FY 2004 (Agenda Item 6a)

The Committee reviewed the estimated accounts for FY 2004 and recommended their acceptance by Council.

Interest and other income (Agenda Item 6b)

In *FY* 2004, the total income (excluding annual fees from Contracting parties) is estimated at approximately \$300,000, but only about 25-30% of this amount is from permanent “guaranteed” sources such as bank interest, tax rebates, income tax levies from foreign staff, and registration fees for Annual Meetings. The remainder includes the postage reimbursement from Fisheries and Oceans Canada and voluntary contributions and grants as listed in *F&A Endnote 5*.

Relocation and Home Leave Fund (Agenda Item 6c)

The status of the Relocation and Home Leave Fund was reviewed. It was noted that home leave expenses for the Executive Secretary and his family (\$7,367) will be offset by interest earned by the Fund and, in part, by the foreign staff tax levies. The Fund will be at its required level of \$110,000 by the end of the fiscal year. No relocation expenses are expected in *FY* 2005.

Trust Fund (Agenda Item 6d)

Approximately \$74,250 from the Trust Fund will be used by the end of *FY* 2004, to finance the PICES Intern Program, and to support participation of young scientists and scientists from countries with “economies in transition” in meetings organized and co-sponsored by PICES. These expenditures are compensated for partly by interest earned by the Fund, the voluntary contributions from Fisheries and Oceans Canada and the Alaska Fisheries Science Center (U.S.A.) for the Intern Program (totalled \$33,550), and by a travel grant from SCOR (\$5,250). The Committee recommended a transfer of about \$15,700 from the Working Capital Fund to the Trust Fund to recover the 2004 expenses, and to restore it to the level of \$110,000 by the end of the financial year.

Working Capital Fund (Agenda Item 6e)

The balance in the Working Capital Fund is expected to be about \$295,600 at the end of *FY* 2004. The Committee recommended a transfer

of \$95,500 from the Working Capital Fund to the General Fund for 2005. The Committee also recommended a transfer of \$15,700 to the Trust Fund as mentioned above. After these transfers, the Working Capital Fund will total approximately \$179,400. This amount includes \$59,200 provided by the Alaska Fisheries Science Center for future high priority PICES projects, and encumbered funds (\$18,690) held for activities of the Study Group on *Fisheries and ecosystem responses to recent regime shifts* and the symposium on “Climate variability and sub-Arctic marine ecosystems” (May 16-20, 2005, Victoria, Canada).

At the recommendation of Canada, a new format was adopted for the table summarizing income and expenses from the Working Capital Fund. This table now clearly shows all encumbered funds and makes it easier to understand the level of surpluses available for transferring to other funds, if necessary.

Budget for *FY* 2005 (Agenda Item 6f)

The Committee reviewed the proposed *FY* 2005 budget of \$710,500 (*F&A Endnote 6*) and recommended its approval by Council. The Executive Secretary reported that the July 2003 value of the Canadian Consumer Price Index (CPI) provided by the Bank of Canada is 2.3%. The government of the Province of British Columbia, home of the PICES Secretariat, stated that in the city of Victoria, the annual (from July 2003 to July 2004) CPI was 2.7%. The United States suggested that setting the increase in annual contributions to 2.5% would be consistent with the guideline generally accepted at the PICES Eighth Annual Meeting (Decision 99/A/2(ii)). This proposal was supported, and the Committee recommended a transfer of \$95,500 from the Working Capital Fund to reduce the total annual contribution to \$615,000, setting the 2005 fees at \$102,500 per Contracting Party.

China informed the Committee that their internal procedure requires justification of the increase in annual contributions, and requested an inflation rate certificate indicating the percentage used for calculations, and why it was chosen.

Forecast budget for FY 2006 (Agenda Item 6g)

The Executive Secretary presented the *FY 2006* forecast budget of \$732,100, and noted that this budget is prepared based on insufficiently founded information that was available as of September 15, 2004, and is 3.04% higher than in *FY 2005*. It was indicated that if the inflation rate in Canada remains the same as in 2004 (2.5%), then under the adopted guidelines, the 2006 annual fee should be set at a level of \$105,100 per Contracting Party. Then total annual contribution will be \$630,600, and a transfer of \$101,500 from the Working Capital Fund would be required to balance the budget. A transfer of this magnitude will only be possible if additional funds can be raised.

The Committee examined the *FY 2006* forecast budget and submitted it to Council for information only. Canada suggested that for planning purposes, the Executive Secretary should be requested to hold 2006 expenses at the 2005 level, with the exception of personnel services.

PICES Intern Program (Agenda Item 7)

The Committee reviewed the current status of the Intern Program. At PICES XII, it was recommended that all Contracting Parties should advertise the Program broadly to ensure the selection of high quality candidates. Dr. Igor Shevchenko reported that the description of the Program was translated into Russian and posted on the TINRO website; it was suggested that PICES and Russian versions should be linked to each other and the websites of other Russian institutes. Dr. Chul Park indicated that the Korean Oceanographic Commission will notify ocean-related organizations about the Program. Dr. Tokimasa Kobayashi mentioned that the Intern Program was advertised in Japan but there were no applications.

The Executive Secretary reminded the Committee that the Intern Program remains unbudgeted for, and over the years has been financed solely by voluntary contributions. He

reviewed the history of voluntary contributions for the Program and noted that in 2004, the Alaska Fisheries Science Center (U.S.A.) and Fisheries and Oceans Canada provided \$23,550 and \$10,000, respectively, to finance the Program. The Committee recommended that Council thank both partners for their continuing support of the Intern Program, and instruct the Executive Secretary to invite Contracting Parties to provide voluntary contributions supporting the Program in 2005 and beyond.

The Committee reviewed the level of stipends for the interns and discussed whether this stipend is sufficient to cover the cost of living in Canada. It was recommended that the stipend be kept at the current level of \$2,000 per month, and given the modest amount, that Contracting Parties consider whether personal circumstances warrant supplementation.

PICES capacity building (Agenda Item 8)

The report of the Study Group on *PICES Capacity Building* was approved in November 2003, and is now available on the PICES website (http://www.pices.int/about/capacity_strategy.pdf). The Committee re-iterated that PICES is already involved in various capacity building activities (*e.g.*, travel support for young scientists to attend meetings organized or co-sponsored by PICES, Intern Program, *etc.*) and that the current budget limits any additional demands placed on the Organization. It was unanimously agreed that Council and Science Board need to evaluate the priority of capacity building proposals, in relation to resources available. Then, the Committee reviewed:

- potential monetary sources for capacity building, such as (i) special allocations from member countries, government agencies and private foundations; and (ii) partnering with some other organizations and programs to jointly support capacity building activities or jointly apply for funding for educational/training/outreach projects);
- some new PICES' activities that incorporate substantial capacity building elements that have been planned or already begun.

The main discussion focused on a proposal for a Young Scientists Conference to be held jointly with ICES in 2007. At PICES XII, Dr. David Griffith, General Secretary of ICES, extended an invitation to PICES to jointly organize a conference that would bring together “early career” scientists from around the globe. A draft proposal for the conference was endorsed at the interim Science Board/Governing Council meeting in May 2004, and by the ICES Consultative Committee and ICES Bureau at their meetings in June 2004. Science Board also recommended that a Study Group be formed to facilitate PICES’ action on this topic.

Dr. Ian Perry, Science Board Chairman, reviewed the outcome of his meeting with the ICES Consultative Committee at the ICES Annual Science Conference in September 2004, during which this topic was discussed. At this meeting, ICES:

- identified several “senior” scientists who might be willing to serve on the Organizing Committee to help guide the young scientists (PICES is expected to do the same);
- suggested the following possible locations for the conference on the eastern seaboard of the United States: Portsmouth, New Hampshire or the Chesapeake Bay area;
- recommended that at least 10% of the participating young scientists be from developing countries;
- agreed that ICES and PICES should coordinate their funding requests to various agencies/foundations, spearheaded by the convenors.

The Committee supported, in principle, the holding of the Young Scientists Conference, but indicated that funding required is sizable (US \$150,000 per organization) and fund-raising for this event needs further study. Dr. Marasco noted that considering existing resistance to support international organizations, ICES and PICES need to be realistic about their ambitions and, if the goal of raising \$150,000 cannot be achieved, to scale the conference down. It was also suggested that Contracting Parties have two options for supporting the conference: (i) to provide money to PICES; or (ii) to support

participation of their scientists in the conference directly.

Schedule and financing of future Annual Meetings (Agenda Item 9)

Schedule of future Annual Meetings

At PICES XII (October 2003, Seoul, Republic of Korea), Council approved the proposal of the Russian Federation to hold the Fourteenth Annual Meeting from September 30-October 8, 2005, in Vladivostok, Russia (Decision 03/A/5(i)). The overall theme for PICES XIV is “Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions”. The Russian delegation and the Secretariat provided some brief information on the status of preparations and the budgetary requirements for the meeting.

At PICES XII, Council requested Japan to explore the possibility of hosting the Fifteenth Annual Meeting in 2006, and inform the Secretariat on this matter by May 31, 2004 (Decision 03/A/5(ii)). Dr. Tokimasa Kobayashi indicated that Japan will be able to confirm their intention to host PICES XV at the Council meeting later during the Annual Meeting.

The Committee recommended that in keeping with the 6-year rotation cycle, Canada be invited to explore the feasibility of hosting the Sixteenth Annual Meeting in 2007. Dr. Richards noted that Canada anticipates hosting PICES XVI, and a formal notification will be provided by May 31, 2005.

Financing of future Annual Meetings

The Committee reviewed Canada’s proposal of 2002 (re-iterated at PICES XII in 2003) to discontinue the practice of transferring funds from PICES to member countries to partially cover Annual Meeting costs, and the recent experience of the Organization. After a lengthy discussion it was agreed to keep the present system of providing up to \$40,000 to assist the host country with expenses. Additional costs for the Secretariat associated with the Annual

F&A-2004

Meeting can be taken from the registration fee revenue.

At PICES X (October 2001, Victoria, Canada), Council approved the charging of a registration fee for future Annual Meetings of the Organization (Decision 01/A/4(iv)). The Committee recommended the following registration fee structure for 2005:

Type	CDN \$
Registration fee	225
Early registration fee	150
Students	50

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 Committee supported the proposal by Canada that the allocation among these three purposes should be flexible and decided by the Executive Secretary for the first year. He will report on the success of this approach at the next Annual Meeting.

Inter-sessional meeting of Science Board and Governing Council

The 2003 and 2004 inter-sessional Science Board meetings with the participation of Governing Council were held in Victoria (Canada) and Jeju (Korea), respectively. These joint meetings of the two senior bodies of PICES were successful and met their objectives of engaging both groups in detailed discussions on issues of broad and long-term importance to the Organization, that are not possible during the busy Annual Meetings. The Committee supports the concept of inter-sessional Science Board/Governing Council meetings, as required, provided that costs are carefully controlled.

Changes to PICES Rules of Procedure and Financial Regulations (Agenda Item 10)

Since PICES was established in 1992, the Organization has expanded from four to six Contracting Parties. New organizational elements such as Sections, Advisory Panels, Study Groups, *etc.*, have been added, and the

scope of PICES activities has broadened to include ecosystem status reports, an advisory role, and capacity building. Throughout this period of change, the administrative procedures of the Organization (Rules of Procedure and Financial Regulation) have been amended infrequently, to accommodate only the most major changes. The Committee agreed that a thorough review of the Rules of Procedure and Financial Regulations is warranted, and recommended the establishment of a Study Group (under the direction of Council) on *Rules of Procedure and Financial Regulations* with the following terms of reference:

- To review the Rules of Procedure and Financial Regulations (hereafter RPF) to identify any inconsistencies between these documents and the PICES Convention, and to recommend, where appropriate, amendments to the RPF that might be required to alleviate any discrepancies found;
- To recommend such amendments as might be required to reduce ambiguity and/or inconsistency within the RPF;
- To assess the degree of compliance between the RPF and the current organization structure and its practices, and to recommend such amendments to the RPF or changes in current practices to resolve any major discrepancies;
- To report to Council at its next meeting (at the 2005 interim meeting or at PICES XIV).

The Study Group should be chaired by the F&A Chairman, with representation from each Contracting Party and from the Science Board. The Executive Secretary and Deputy Executive Secretary should serve as *ex-officio* members of the Study Group.

Administrative matters from PICES XII (Agenda Item 11)

At PICES XII (October 2003, Seoul, Korea), four specific administrative issues were raised and discussed. The United States was requested (i) to explore the possibility of tax exempt status for PICES; and (ii) to resolve the problem with restrictions when issuing the official G4 visa for PICES' Russian staff. Canada was requested

(i) to clarify and inform the Secretariat of the process required to request a change in the terms of “Canadian acceptance” for foreign personnel at the Secretariat; and (ii) to explore the feasibility of an amendment to the Headquarters Agreement that will allow the extension of the tax levy practice to all staff (foreign and local) of the Secretariat.

The Committee reviewed the status of these requests:

- The U.S. Department of State Legal Office has confirmed that PICES is not entitled to sales tax exemption under the International Organizations Immunities Act (22 USC 288k; defines immunities - U.S. sales tax is not one of the listed immunities).
- Partial progress has been achieved on visa problems. The U.S. Consulate in Vancouver agreed to issue a G4 visa for the current Executive Secretary and members of his family by mail. The Office of Foreign Mission of the Department of State decided to add the pre-flight inspection facilities in Vancouver and Toronto, Canada, as authorized ports of exit/entry for Dr. Bychkov and his wife for a 1-year period, but they were granted only a 1-time exception (for PICES XIII) for Honolulu as an authorized port of entry/exit. The U.S. delegation will seek a waiver of port restrictions for Dr. Bychkov and his wife that will remain valid for the duration of his appointment as Executive Secretary.
- In response to a written request sent to the Canadian Department of Foreign Affairs and International Trade (DFAIT) regarding the terms of “Canadian acceptance” for foreign personnel at the Secretariat, Mr. Stephane Henry, DFAIT Head of Documentation & Liaison, decided that “upon the next request of an extension for the Executive Secretary (February 2005), DFAIT could give him and his wife a 3-year extension.
- No practical information has been received from the Canadian delegation on the extension of the tax levy practice to all staff of the Secretariat. On September 16, 2004, the Executive Secretary was re-assured that Fisheries and Oceans Canada “will be trying

to determine the process by which the federal portion of the income tax could, if possible, be recouped by PICES.” It was also suggested that for the provincial portion of taxes, the Organization should deal directly with the government of British Columbia.

The Committee re-iterated that tax levies are an important source of alternative “revenue” for PICES, but this practice currently extends only to the foreign personnel. Several international organizations (*e.g.*, ICES with headquarters in Denmark and NAFO with headquarters in Canada) have had such a practice for all staff members. Adoption of such a practice by PICES would greatly increase PICES’ revenue (with the current level of salaries, to about \$70,000 per year). Canada was requested to continue their efforts of exploring a possibility of making an appropriate amendment to the Headquarters Agreement.

Space, facilities and services for the PICES Secretariat (Agenda Item 12)

Space and general administrative services are traditionally provided to the Secretariat by the Government of Canada through the Department of Fisheries and Oceans (DFO). The original agreement commenced on April 1, 1992, and continues indefinitely with a review every three years. According to the current agreement (signed in 2001, and amended on April 1, 2002), PICES is to pay an annual sum of \$28,000 (in quarterly payments of \$7,000), which includes \$23,500 for postage, \$2,500 for telephone and fax lines and \$2,000 for janitorial/ maintenance services. The Committee noted that the agreement between PICES and DFO is to be renewed in 2005.

Appointment of Finance and Administration Committee Chairman (Agenda Item 13)

According to the PICES Rules of Procedure (Rule 15), “*The Chairman of the Finance and Administration Committee shall be appointed by the Council from amongst the Committee’s members for a term of two years and shall be eligible for re-appointment only once for a*

F&A-2004

successive term.” Dr. Marasco (U.S.A.) was appointed as the F&A Chairman at PICES VII in 1998 (Fairbanks, U.S.A.), and re-appointed at PICES IX in 2000 (Hakodate, Japan). At the recommendation of the Committee, Council extended his term for one year in 2002 (PICES XI, Decision 02/A/7), and again in 2003 (PICES XII, Decision 03/A/7).

The Committee expressed its gratitude to Dr. Marasco for his leadership over the years, and recommended that Council appoint Dr. Laura Richards (Canada) as the Chairman of the Finance and Administration Committee for a period of 2 years (October 2004-October 2006).

Other business (Agenda Item 14)

Term extension for Committee Chairmen

As stated in *Rules of Procedure*, Chairmen of the permanent Scientific Committees shall be elected for a term of three years and shall not be eligible for re-election for the immediate succeeding term (Rule 16(i)), and Chairmen of Technical Committees shall be appointed for a term of three years and shall not be eligible for re-appointment for the immediate succeeding

term (Rule 16(ii)). In 2002, the Review Committee suggested that PICES should be more flexible and have an option to extend terms for Committee Chairmen, if worthwhile. At PICES XI, Council endorsed the report of the Review Committee and its recommendations (Decision 02/A/9), but no changes were made in the *Rules of Procedure*. In the meantime, in practice, recommendations by the Review Committee were already implemented: MEQ unanimously approved the extension of Dr. John Stein’s term as MEQ Chairman for one year in 2003 and again in 2004, and TCODE unanimously approved the extension of Dr. Igor Shevchenko’s term as TCODE Chairman for one year in 2004.

The Committee supported these decisions and recommended that appropriate changes be made in the *Rules of Procedure* and the *Chairman’s Handbook*.

Adoption of F&A report and recommendations to Council (Agenda Item 15)

The Committee approved the F&A Report and its recommendations to Council.

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

Robin M. Brown (alternate)
 John A. Moores (advisor)
 Laura Richards

Japan

Tatsu Kishida (advisor)
 Tokimasa Kobayashi
 Tokio Wada (advisor)

People's Republic of China

Qian-Fei Liu (alternate, only on Oct. 19)

Republic of Korea

Chul Park

Russia

Sergey Maximov (advisor)
 Victor Nazarov (advisor)
 Igor Shevchenko
 Pavel Vorobyov (advisor)

U.S.A.

Elizabeth J. Tirpak

Other

Vera Alexander (Chairman, PICES)
 Alexander Bychkov (Executive Secretary)
 Richard J. Marasco (F&A Chairman)
 Stewart M. McKinnell (Deputy Executive Secretary)
 R. Ian Perry (Science Board Chairman)

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 fiscal year 2003
4. Annual contributions
5. Fund-raising activities
6. Budget
 - a. Estimated accounts for fiscal year 2004
 - b. Interest and other income
 - c. Relocation and Home Leave Fund
 - d. Trust Fund
 - e. Working Capital Fund
 - f. Proposed budget for fiscal year 2005
 - g. Forecast budget for fiscal year 2006
7. PICES Intern Program
8. PICES capacity building opportunities
9. Schedule and financing of future Annual Meetings
10. Changes to PICES Rules of Procedure and Financial Regulations
11. Administrative matters from PICES XII
12. Space, facilities and services for the PICES Secretariat
13. Appointment of F&A Committee Chairman
14. Other business
15. Adoption of F&A report and recommendations to Governing Council

F&A Endnote 3

Auditor's report (2003) to the Organization

To the Council of the
North Pacific Marine Science Organization

We have audited the statement of financial position of North Pacific Marine Science Organization as at December 31, 2003 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 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, 2003 and the results of its operations and changes in fund balances for the year then ended in accordance with Canadian generally accepted accounting principles.

Flader & Hale
Chartered Accountants
9768 Third Street
Sidney, B.C.,
Canada. V8L 3A4
Phone: 1-250-656-3991
Fax: 1-250-656-6486
E-mail: mail@fladerandhale.ca

Sidney, B.C.
March 20, 2004

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF FINANCIAL POSITION
AS AT DECEMBER 31, 2003**

ASSETS	2003	2002
CURRENT ASSETS		
Cash and short term deposits	\$ 554,475	\$ 637,748
Accounts receivable	4,630	21,387
Prepaid expenses	5,814	5,253
	\$ 564,919	\$ 664,388
LIABILITIES		
CURRENT LIABILITIES		
Accounts payable	\$ 36,667	\$ 9,624
Funds held for contracting parties (Note 3)	100,000	194,000
	136,667	203,624
FUND BALANCES		
WORKING CAPITAL FUND	189,474	223,264
TRUST FUND	128,778	127,500
HOME LEAVE RELOCATION FUND	110,000	110,000
	428,252	460,764
	\$ 564,919	\$ 664,388

**STATEMENT OF OPERATIONS AND CHANGES IN FUND BALANCES
FOR THE YEAR ENDED DECEMBER 31, 2003**

	General Fund	Working Capital Fund	Trust Fund	Home Leave Relocation Fund	2003 Total	2002 Total
FUND BALANCES , beginning of year	-	\$ 223,266	\$ 127,500	\$ 110,000	\$ 460,766	\$ 395,808
SOURCES OF FUNDS						
Contributions from Contracting Parties	560,800	4,000			564,800	560,000
Budgeted transfer to General Fund	110,500	(110,500)				
Additional transfer to General Fund (Note 4)	21,200	(21,200)				
Voluntary contributions and grants (Note 5)	-	105,478	60,326		165,804	150,510
Interest and other income (Note 6)	-	58,794	420	7,538	66,572	103,191
FUND BALANCES , before expenditures	692,500	259,838	188,246	117,538	1,258,122	1,209,509
EXPENDITURES						
Personnel services	330,000	10,909			340,909	321,113
Annual Meeting	49,884	4,124			49,884	49,990
Workshops	60,613	4,016			64,629	68,050
Travel	83,691	3,609	42,967		130,267	114,024
Printing	74,025				74,025	68,901
Communication	30,980				30,980	30,753
Equipment	8,787	1,122			9,909	8,213
Supplies	7,584				7,584	7,447
Contractual services	26,389				26,389	14,719
Miscellaneous	3,256				3,256	3,563
Intern program			26,799		26,799	26,968
Ecosystem Status Report		28,702			28,702	10,581
PICES X Anniversary						31,144
Relocation				7,538	7,538	4,830
Unrealized losses on foreign exchange (Note 7)	27,534				27,534	(6,722)
	702,563	50,003	69,766	7,538	829,870	748,745
NET FUNDS AVAILABLE	(10,063)	209,835	118,480	110,000	428,252	460,764
TRANSFER TO WORKING CAPITAL FUND (Note 8)	10,063	(10,063)	-	-	-	-
INTERFUND TRANSFERS (Note 4)	-	(10,298)	10,298	-	-	-
FUND BALANCES , end of year (Note 9)	-	\$ 189,474	\$ 128,778	\$ 110,000	\$ 428,252	\$ 460,764

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2003**

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 Home Leave Relocation Fund was established in 1996 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. This fund is set at \$110,000.

(b) Capital Assets

Capital assets acquired by the Organization are expensed in the year of acquisition.

(c) Income Tax

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

(d) 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.

3. FUNDS HELD FOR CONTRACTING PARTIES

The funds held for contracting parties are advance contributions from Japan (\$100,000).

4. INTERFUND TRANSFERS

The Governing Council approved the transfer of \$21,200 from the Working Capital Fund to the General Fund to compensate for China's insufficient payment.

Additionally, the Governing Council approved the transfer of \$10,298 from the Working Capital Fund to bring the Trust Fund balance to \$110,000. After this decision was made, Korea made a voluntary contribution to the Trust Fund which brought the fund balance to \$128,778.

5. VOLUNTARY CONTRIBUTIONS AND GRANTS

Contributions/grants	Working Capital Fund, \$	Trust Fund, \$
MOMAF contribution for high priority projects	18,778	
EVOS contribution for NPESR	33,047	
AFSC contribution for NPESR	17,200	
SWFSC contribution for Pacific Coastal Obser. System	23,889	
IOC contribution for CO ₂ Guide	7,932	
GLOBEC contribution to PICES Press	4,632	
Contributions to Intern Program:		
DFO Canada		10,000
Alaska Fisheries Science Center		17,200
MOMAF contribution for young scientists		18,778
SCOR travel grant for Zooplankton Symposium		7,738
SCOR grant for PICES XII		6,610
	105,478	60,326

6. INTEREST AND OTHER INCOME

	Working Capital Fund, \$	Trust Fund, \$	Home Leave and Relocation Fund, \$
Interest income	3,246	420	2,456
Income tax levies	21,917		5,082
GST, PST & WCB rebates	802		
Registration Fees	32,829		
	58,794	420	7,538

7. FOREIGN EXCHANGE LOSS

At year-end all funds held in foreign currency (US \$108,727) are converted to Canadian dollars using the December 31st exchange rate. An unrealized 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 (2003 =1.2965, 2002 =1.5776), and not by the actual purchase or sale of any foreign currencies.

8. TRANSFER TO/FROM WORKING CAPITAL FUND

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

9. WORKING CAPITAL FUND SURPLUS

Pursuant to decision 03/A/3(ii) of the Governing Council, \$79,000 of the funds held in the Working Capital Fund will be transferred to the General Fund to reduce 2004 contributions.

10. COMMITMENTS

General administrative and communications services are provided to the Secretariat of the Organization by the Government of Canada through the Department of Fisheries and Oceans. The agreement was amended April 1, 2002 and continues until March 31, 2004. The fixed cost for services is \$28,000 per year which are paid quarterly as invoiced.

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 national contributions, 2000-2004¹

	Canada	China	Japan	Korea	Russia	U.S.A.
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

¹ late payments are indicated in bold

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

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

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

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

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

F&A Endnote 5

External funding and special contributions received since PICES XII (October 2003)

High priority PICES projects (including North Pacific Ecosystem Status Report)

- In December 2003, the Ministry of Maritime Affairs and Fisheries (MOMAF) of the Republic of Korea contributed \$18,778 to support high priority PICES projects.
- In July 2004 and September 2004, the Alaska Fisheries Science Center (AFSC/NMFS, U.S.A.) contributed \$9,200 (US \$7,000) and \$50,000 (US \$38,200), respectively, to finance high priority PICES projects. [Between 2001-2003, AFSC had provided US \$36,710 for the North Pacific Ecosystem Status Report.]
- In September 2004, the Exxon Valdez Oil Spill Trustee Council (EVOS, U.S.A.) contributed \$11,600 (US \$8,800) to the production of the North Pacific Ecosystem Status Report. [Between 2002-2003, EVOS had provided US \$34,000 for the North Pacific Ecosystem Status Report.]

Implications of the 1998/99 regime shift

- In April 2004, the National Marine Fisheries Service (NMFS/NOAA, U.S.A.) provided \$60,410 (US \$45,000) to support PICES activities to address a formal request made by the United States Government for scientific advice on the implications of the 1998/99 regime shift for fisheries.

Ecosystem modeling

- In April 2004, the Asia Pacific Network (APN) approved a proposal by the PICES MODEL Task Team (PIs: Drs. Francisco E. Werner and Bernard A. Megrey) entitled “Climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food-webs and implications for marine fish production in the North Pacific Ocean and marginal seas”. The amount of the award is US \$45,000, and this will fund a workshop (with approximately 25 participants) and young investigator training to be held October 10-13, 2004, in Honolulu, immediately prior to PICES XIII. Funds will be managed by the MODEL Task Team Co-Chairman, Dr. Werner (Univ. North Carolina).

Guide to best practices for oceanic CO₂ measurements and data reporting

- In September 2004, the International Ocean Carbon Coordinated Program (IOCCP), via the Intergovernmental Oceanographic Commission (IOC), provided \$2,650 (US \$2,000) for the publication of the “Guide to best practices for oceanic CO₂ measurements and data reporting” being prepared by PICES WG 17 on *Biogeochemical data integration and synthesis*. [In 2003, IOCCP/IOC contributed \$7,932 (US \$6,000) for the same publication.]

Inter-calibration of micronekton sampling

- The PICES Advisory Panel on *Micronekton inter-calibration experiment* (MIE-AP) succeeded in securing 8 days at sea aboard the NOAA ship *Oscar Elton Sette* (October 6-13, 2004), for an international collaborative field program to evaluate the efficiency of sampling gears and procedures employed by different agencies to sample micronekton.
- A proposal entitled “Inter-calibration of sampling gear and techniques for assessing prey abundance (micronekton) in the North Pacific and the Eastern Bering Sea” seeking funds for logistical support to conduct the cruise has been submitted to the North Pacific Research Board (NPRB, U.S.A.). Although the proposal was favorably reviewed (all three reviewers rated it “Excellent/Should be Funded”), there was only a limited amount of funding available this year, and the proposal was rejected.

Intern Program

- In March 2004, Fisheries & Oceans Canada (DFO) contributed \$10,000 to finance the PICES Intern Program. [From 2000-2003, DFO had provided \$37,500 for the Intern Program.]

- In July 2004, AFSC/NMFS contributed \$23,550 (US \$17,900) to finance the PICES Intern Program. [From 2000-2003, AFSC had provided \$51,360 for the Intern Program.]

PICES Annual Meetings

- In December 2003, MOMAF contributed \$18,778 to the Trust Fund to involve more young scientists in PICES activities, including Annual Meetings.
- In May 2004, MOMAF provided special funds to offset PICES expenses for the 2004 inter-sessional Science Board/ Governing Council meeting (May 6-8, 2004, Jeju, Korea).
- In July 2004, AFSC/NMFS contributed \$7,900 (US \$6,000) to support travel of speakers at the BIO Topic Session on “Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?” at PICES XIII.
- In September 2004, IOCCP/IOC allocated \$10,500 (US \$8,000) to support travel of speakers at the joint PICES/IOCCP Topic Session on “The impact of climate change on the carbon cycle in the North Pacific” at PICES XIII.
- In July 2004, the Scientific Committee on Oceanic Research (SCOR) provided a travel grant of \$5,250 (US \$4,000) for scientists from countries with “economies in transition” to attend the MEQ Workshop on “Developing a North Pacific HAB data resource” at PICES XIII.

PICES Publications

- The National Science Foundation approved funding in an amount of US \$15,000 for the publication of a book “The journey to PICES: Scientific cooperation in the North Pacific”.

ESSAS Symposium

- In July 2004, AFSC/NMFS provided \$13,150 (US \$10,000) for the international symposium on “Climate variability and sub-Arctic marine ecosystems” (May 16-20, 2005, Victoria, Canada).

F&A Endnote 6

Budget for fiscal year 2005

Category	Allotment
Personnel Services	376,500
Annual Meeting	40,000
Special Meetings	68,000
Travel	81,000
Printing	76,000
Communication	32,000
Equipment	8,000
Supplies	7,500
Contractual Services	18,000
Miscellaneous	3,500
Total	710,500
Source	Contribution
Contributions from six Contracting Parties	615,000
Transfer from Working Capital Fund	95,500
Total	710,500
2005 Annual Fee for each Party	102,500

REPORT OF 2004 INTER-SESSIONAL SCIENCE BOARD MEETING



The second inter-sessional Science Board meeting, with the participation of Governing Council, was held at the Hyatt Regency Hotel, Jeju, Korea, from May 6-8, 2004. The Science Board Chairman, Dr. Ian Perry, welcomed participants and thanked them for attending the meeting. He also thanked the Korean Ministry of Marine Affairs and Fisheries (MOMAF) and the Korean Ocean Research and Development Institute (KORDI) for their logistical and financial support of the meeting. Dr. Perry noted that this was the second time that members of Science Board and Governing Council have had the opportunity to meet together to discuss larger issues for PICES, in particular relating to future directions of the Organization. The participants are identified in *SB-IM Endnote 1*, and the agenda is provided in *SB-IM Endnote 2*.

Updates from the Committees and Programs (Agenda Item 2)

BIO Committee

The BIO Chairman, Dr. Vladimir I. Radchenko, presented his Committee's interim report (the full BIO report is included elsewhere in this Annual Report). The main items were related to nominations for the next BIO Chairman, preparations for BIO sessions at PICES XIII, problems with the participation and progress of Working Group 14 on *Effective sampling of micronekton*, updates on plans for the 2004 field study by the Advisory Panel on *Micronekton sampling inter-calibration experiment* (MIE-AP), and membership concerns with the Advisory Panel on *Marine birds and mammals* (MBM-AP; active members of this Advisory Panel are predominantly from Japan and the United States).

The issue of participation in, and effectiveness of, Working Groups was deferred to later during the meeting under the agenda item "Other business". Regarding participation in the

MBM-AP, it was recommended that BIO consider reviewing the status of this Advisory Panel and/or be more active in referring questions to the Panel for them to address. If such issues were sufficiently general, they may attract more participation. Potential interest was expressed in collaborating with the NPAFC BASIS program in the Bering Sea. In regards to additional funding to support the activities of the MIE-AP, it was suggested that the Census of Marine Life might be interested in the issue of sampling micronekton. A coordinated "Year of the Euphausiid" program to study their vital rates throughout the different environments of the North Pacific was recommended as a topic of potential interest to BIO.

ACTION:

Dr. Radchenko:

- 2.BIO.1 Identify nominations for next BIO Committee Chairman;**
- 2.BIO.2 Conclude WG 14 and review report;**
- 2.BIO.3 Discuss reporting of MIE-AP field activities at PICES XIII and next steps for the Advisory Panel;**
- 2.BIO.4 Discuss status and future of MBM-AP with its Co-Chairmen, and if there is interest to continue, develop new topics and a plan of action (in particular which might attract more participation).**

FIS Committee

The FIS Chairman, Dr. Yukimasa Ishida, presented his Committee's interim report (the full FIS report is included elsewhere in this Annual Report). The main points were related to preparations for FIS-sponsored sessions at PICES XIII, and updates on the activities of Working Group 16 on *Climate change, shifts in fish production, and fisheries management* and the joint MEQ/FIS Study Group on *Ecosystem-based management science and its application to the North Pacific* (EBM-SG).

Science Board requested that WG 16 present a draft report to FIS at PICES XIII and the final report prior to the third inter-sessional Science Board meeting (expected in spring 2005). Science Board also needs to know if publication is planned as a PICES Scientific Report or in some other format (such as a book). Regarding the EBM-SG, the Chairmen of FIS and MEQ were requested to co-ordinate a joint presentation of this Study Group at PICES XIII.

ACTION:

Dr. Ishida:

2.FIS.1 Encourage the Co-Chairmen of WG 16 to submit a draft report to FIS at PICES XIII, and a final report to FIS in spring 2005 so that it can be approved at the third inter-sessional Science Board meeting;

Dr. Ishida/Dr. Stein:

2.FIS/MEQ.1 Co-ordinate presentation of EBM-SG at PICES XIII.

MEQ Committee

The MEQ Chairman, Dr. John E. Stein, presented his Committee's interim report (the full MEQ report is included elsewhere in this Annual Report). The main points were related to nominations for the next MEQ Chairman, preparations for MEQ sessions at PICES XIII, and updates on the new *Harmful Algal Bloom* Section (HAB-S) and WG 18 on *Mariculture in the 21st century – The intersection between ecology, socio-economics and production*.

Science Board noted that Dr. Stein's term as MEQ Chairman has already been extended once, and that a new Chairman needs to be nominated. Membership in MEQ appears to be in flux, with few appointed members actually able to participate consistently. Appointing members to MEQ who are interested in the topics and able to participate consistently may require Governing Council attention.

Science Board encouraged TCODE to discuss data issues with HAB-S. Science Board also encouraged MEQ to closely support the start-up of WG 18 (co-sponsored with FIS), and further noted the need for a Chinese Co-Chairman of

this Working Group. The Chinese national delegate offered to help in this effort.

ACTION:

Dr. Stein:

2.MEQ.1 Continue seeking nominations for MEQ Chairman;

2.MEQ.2 Provide frequent support to WG 18 as it starts its program;

Governing Council:

2.MEQ.3 Review membership on MEQ to determine if current national members are still appropriate, and appoint new members if necessary;

2.MEQ.4 Chinese national delegate will seek a Chinese Co-Chairman for WG 18.

POC Committee

The POC Chairman, Dr. Kuh Kim, presented his Committee's interim report (the full POC report is included elsewhere in this Annual Report). The main points were related to preparations for PICES XIII, nominations for the next POC Chairman, and an update on the progress of WG 17 on *Biogeochemical data integration and synthesis*. No report was received from the *North Pacific Data Buoy Advisory Panel* (NPDB-AP). The POC Chairman also presented a brief report on a proposal for a CREAMS III (*Circulation Research in the East Asian Marginal Seas*) program which would add biological measurements to a previously physical oceanographic program.

Science Board suggested that POC discuss the CREAMS III proposal and, if desired, recommend to Science Board how PICES should proceed (*e.g.*, by forming an Advisory Panel to take an active facilitating role).

ACTION:

Dr. K. Kim:

2.POC.1 Identify nominations for the next POC Chairman;

2.POC.2 Discuss CREAMS III proposal and recommend to Science Board how PICES should proceed.

TCODE

The TCODE Chairman, Dr. Igor Shevchenko, presented his Committee's interim report (the full report is included elsewhere in this Annual Report). The main points were related to nominating the next TCODE Chairman and updates on the progress of the *North Pacific Ecosystem Meta-database* (NPEMD).

Science Board recommended that TCODE discuss with HAB-S opportunities for including data on harmful algal blooms. Science Board also recommended that TCODE consider discussions with the Ocean Biogeochemical Information System (OBIS) regarding data for the North Pacific. With respect to the Ecosystem Meta-database, Science Board noted the problems that TCODE members have in representing other data agencies than their own, whereas in fact they should be able to represent data issues in their whole country. Science Board requested that members of Governing Council review the national membership of TCODE to ensure it remains appropriate. Science Board also asked China to re-confirm their members to TCODE.

ACTION:

Dr. Shevchenko:

- 2.TCODE.1** Seek nominations for next TCODE Chairman or consider willingness to extend his term);
- 2.TCODE.2** Contact HAB-S Co-Chairmen regarding collaborations;
- 2.TCODE.3** Contact OBIS regarding possible interactions;

Governing Council:

- 2.TCODE.4** Review national membership on TCODE for ability to represent national data holdings;
- 2.TCODE.5** Chinese national delegate to check and re-confirm Chinese members to TCODE.

CCCC Program

The CCCC Co-Chairman, Dr. Harold P. Batchelder, presented the interim report on behalf of the CCCC Program (the full CCCC report is included elsewhere in this Annual

Report). The main points were related to preparations for CCCC-sponsored sessions at PICES XIII, the final report of the *Nemuro Experiment Planning Team* (NEXT), plans for synthesis of the CCCC Program and its major symposium in April 2006, re-organization of the administrative structure of the CCCC Program, and possible participation by PICES with emerging ocean monitoring programs in the NE Pacific.

Science Board agreed that NEXT had completed its tasks and thanked its Chairman, Dr. Batchelder, for a job well done. It was also noted that the successful MODEL Task Team proposal funded by the Asia-Pacific Network (APN) has significant contributions to building modeling expertise among PICES nations. Science Board approved the CCCC plans for synthesis and the proposal for the symposium in 2006. Science Board also approved the proposed structural changes to the CCCC Program: (1) concluding the BASS and REX Task Teams, (2) adopting a new Task Team on *Climate Forcing and Marine Ecosystem Response* (CFAME) with terms of reference as presented in *SB-IM Endnote 3*, and (3) moving the MONITOR Task Team outside the CCCC Program to become a Technical Committee directly under Science Board with terms of reference as presented in *SB-IM Endnote 4*. Science Board asked the CCCC Co-Chairmen to thank the Co-Chairmen of BASS and REX for their service to the CCCC Program, and to nominate new Co-Chairmen and propose new members for CFAME, so that its first meeting can be held at PICES XIII. Science Board noted that as a Technical Committee, MONITOR will need a Chairman plus confirmation of its membership by Governing Council. The new Chairman will be expected to participate in all Science Board meetings.

Science Board had a brief discussion of what PICES' role should be in coordinating ocean observing systems in the NE Pacific. It was noted that discussions with the Pacific Coastal Observing System (PaCOS) are ongoing with options ranging from providing contacts to providing services such as data provision and analyses. Science Board agreed to let

MONITOR and the PICES Secretariat continue discussions with PaCOS, and to consider ways that PICES might also facilitate such interactions in the western Pacific (that do not overlap with existing projects such as NEAR-GOOS).

ACTION:

Dr. Batchelder/Dr. S.Kim:

- 2.CCCC.1 Thank Co-Chairmen and members of BASS and REX Task Teams for their service, and these Task Teams to be completed;**
- 2.CCCC.2 Form CFAME Task Team by proposing Co-Chairmen and members to Science Board (who will refer these to Governing Council) prior to PICES XIII so that CFAME can hold its first meeting at PICES XIII;**

Dr. Perry:

- 2.CCCC.3 Contact the present Co-Chairmen of MONITOR to discuss chairmanship duties, and contact national delegates regarding re-confirming members of MONITOR in its new role as a Technical Committee under Science Board. MONITOR will be expected to meet and participate in PICES XIII as a Technical Committee.**

Science Board

Dr. Perry, presented the interim report of the Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* (FERRRS) and the update on the Census of Marine Life project on *Marine life in the North Pacific: The known, unknown, and unknowable*.

Updates on interactions with other programs and organizations (Agenda Item 3)

NPAFC

PICES will invite the Chairman of the NPAFC's Committee on Scientific Research and Statistics (CSRS) to present annual updates on the status of Pacific salmon in the North Pacific to the MONITOR Technical Committee. Every third year, PICES will invite the Chairman of the

CSRS Committee to make a more complete presentation on the status of Pacific salmon in the North Pacific as input to update the North Pacific Ecosystem Status Report.

PICES agreed to co-sponsor with NPAFC a symposium on Pacific salmon as indicators of North Pacific marine ecosystems, and suggested changes to the draft symposium proposal as outlined in *SB-IM Endnote 5*. PICES volunteers for the Scientific Steering Committee of this symposium are Drs. Radchenko, S. Kim, Stein, with one more member needed from the FIS Committee.

ACTION:

Dr. Perry:

- 3.NPAFC.1 Invite Chairman of NPAFC-CSRS Committee to present annual updates on the state of North Pacific salmon to the MONITOR Committee at each PICES Annual Meeting; more detailed updates to be invited every three years as input to the Ecosystem Status Report;**
- 3.NPAFC.2 Finalize symposium outline with NPAFC, and implement the Scientific Steering Committee for this Symposium;**

Dr. Ishida:

- 3.NPAFC.3 Nominate a FIS member to be part of the joint symposium Scientific Steering Committee.**

SCOR

Science Board supported a joint PICES/ICES/GLOBEC proposal submitted to SCOR for a Working Group on *Global comparisons of zooplankton time series*, and agreed to provide funding for one additional member (from PICES) to participate in this Working Group should it be accepted by SCOR.

Discussion of Capacity Building Study Group report (Agenda Item 4)

Science Board discussed the report of the Study Group on *PICES Capacity Building*, which was approved in November 2003. Science Board noted that training and capacity building

activities are now part of the terms of reference of the new MONITOR Technical Committee. It was recommended that Scientific Committees discuss capacity building opportunities at PICES XIII.

A draft proposal was tabled for a Young Scientists Conference to be held in 2007, jointly with ICES (*SB-IM Endnote 6*). Science Board enthusiastically endorsed this proposal, requested comments from ICES, and recommended that a Study Group be formed to facilitate PICES action on this topic.

Science Board also noted that two specific activities have begun already that incorporate substantial capacity building elements: the MODEL APN funded workshop and young-investigator training in October 2004, and a proposed CREAMS/PICES training workshop in the summer of 2005. These might serve as initial models for future PICES capacity building efforts.

ACTION:

Dr. Perry:

4.1 Contact ICES for comments on the draft Young Scientists Conference proposal and if favourable, form a PICES Study Group to implement;

Committee and Scientific Program Chairmen:

4.2 Discuss capacity building opportunities, and report to Science Board meeting at PICES XIII.

PICES Strategic Plan (Agenda Item 5)

Science Board and Governing Council approved the draft PICES Strategic Plan that had been revised following discussion and comments at PICES XII (this plan is published in full elsewhere in this Annual Report). Scientific Committees and Programs are requested to review this plan and to discuss development of their own Action Plans that fit within the Strategic Plan. These Action Plans will undergo an initial review at PICES XIII.

ACTION:

Committee and Scientific Program Chairmen:

5.1 Circulate the PICES Strategic Plan to their members, discuss the activities of their Committee in relation to the Strategic Plan, and develop a first draft of an Action Plan for current and future activities based on this Strategic Plan.

PICES communications (Agenda Item 7)

Science Board congratulated and thanked the PICES Secretariat for their hard work at re-designing the PICES website, which is now an attractive and effective product. The major outstanding issue is to populate the website with information, in particular about each Committee and Program. Quality control of information posted to the PICES website will be maintained by a small "Web Publications Committee", which will periodically review information and recommend common formats. Dr. Batchelder volunteered to chair this Committee, with additional members being the members of Science Board.

Science Board also discussed the utility of the session summaries that are published from each Annual Meeting in the PICES Annual Report. It was agreed to continue these summaries and to consider posting them on the PICES website following each Annual Meeting.

ACTION:

Committee and Scientific Program Chairmen:

7.1 Prior to PICES XIII, Committees are asked to propose information that should go on their PICES website. These proposals should be discussed at PICES XIII Committee meetings. Possible formats and sample information will then be discussed at the PICES XIII Science Board meeting;

7.2 Summaries of scientific sessions at Annual Meetings will continue. Committee Chairmen remain responsible for ensuring that session convenors provide these summaries. Science Board Chairman will provide sample session summary.

Awards (Agenda Item 8)

Science Board recommended continuing the procedure of forming an *ad hoc* committee to determine the Best Poster at the Annual Meetings. The Secretariat will be asked to provide a list of posters presented by young scientists, and to identify eligible posters with some special marking on the poster itself.

ACTION:

Secretariat:

8.1 Provide Committee and Scientific Program Chairmen with a list of posters eligible for the Best Poster Award as soon as possible at Annual Meetings, and put a special mark on the eligible posters to make them clearly identifiable.

Process to develop the major integrating program for PICES (Agenda Item 9)

Science Board continued its ongoing discussions about the potential topics and process to develop the second major PICES integrating program, to follow the completion of the current CCC Program. Committees are asked to discuss over the summer possible topics for such a major program, how such a program should be developed, and if possible, to consider what worked and what did not work in developing and conducting the CCC Program. Comments from the Committees will be discussed by Science Board at PICES XIII (or possibly the next inter-sessional meeting), potentially leading to formation of a Study Group to provide recommendations.

ACTION:

Dr. Perry:

9.1 Provide written instructions to Committee Chairmen regarding (1) possible topics, (2) process for developing the next major PICES integrating program, and (3) lessons-learned from developing the CCC Program;

Committee and Scientific Program Chairmen:

9.2 Encourage Committee discussions during the summer on topics and

approaches for the next major PICES integrating program, in preparation for discussions at Committee meetings at PICES XIII.

Other business (Agenda Item 11)

Effective Working Groups

Science Board discussed features that help make Working Groups operate efficiently and complete their tasks in a timely manner. This discussion was initiated by concerns about a few Working Groups which have had problems. Key features include:

- clear (and realistic) terms of reference, in particular with objectives and deliverables;
- capable and committed Chairmen;
- committed, available, and interested members;
- adequate resources (time and funding);
- active communication with (and guidance from) the parent committee;
- frequent reporting deadlines.

Having clear terms of reference, and committed and interested members, means that the topic proposed for a Working Group must be of high interest to PICES. Having capable Chairmen who understand the objectives is obviously important, but it is equally important to have members willing to work on the topic. It was suggested that when a Working Group is proposed, a list of potential members be provided which would go to Governing Council to assist them in selecting members. Frequent interaction and guidance by the parent committee is also important to the success of Working Groups, in particular if the Chairmen or members are not familiar with PICES.

Committee Vice-Chairman positions

Science Board discussed the idea of having Vice-Chairman positions for each of the Committees on Science Board (the CCC Program already has two Co-Chairmen). As with the new position of Vice-Chairman of Science Board, Vice-Chairman of Committee would help the Chairman with the duties of planning and running the committee business on an on-going basis throughout the year. The Vice-Chairman would not be expected

necessarily to participate in the meetings of Science Board, but could potentially be eligible for election to Committee Chairman once the Chairman's term has been completed. All Committees were requested to discuss this idea and report to Science Board at its meeting in October 2004.

ACTION:

Committee and Scientific Program Chairmen:

11.1 Discuss the possibility of having a Vice-Chairman position for their Committee to assist the Chairman with the on-going business of the Committee, with a

report on viewpoints to be presented at Science Board in October 2004.

North Pacific Ecosystem Status Report

The draft North Pacific Ecosystem Status Report (NPESR), which had been revised following discussions and comments at and after the PICES XII, was reviewed. Science Board approved the scientific content of the report, but did not reach consensus on the name for the sea between the Japanese archipelago and the NE Asian mainland. This matter was referred to Governing Council.

SB-IM Endnote 1

Participation List

Science Board members

Harold P. Batchelder (Co-Chairman, CCCC-IP)
Yukimasa Ishida (Chairman, FIS)
Kuh Kim (Chairman, POC)
Suam Kim (Co-Chairman, CCCC-IP)
R. Ian Perry (Chairman, Science Board)
Vladimir I. Radchenko (Chairman, BIO)
Igor I. Shevchenko (Chairman, TCODE)
John E. Stein (Chairman, MEQ)
Jin Ping Zhao (China, Science Board member)

Governing Council members and advisors

Vera Alexander (Chairman, PICES) (6-7th only)
Lev N. Bocharov (Russia, national delegate)
George Boehlert (U.S.A., national delegate)
Zhi-Xin Chen (China, alternate delegate)
Jong-Hyun Choe (Korea, advisor)
Young-Hoon Chung (Korea, national delegate)
Joan Kean-Howie (Canada, national delegate)
Hyung-Tack Huh (Past-Chairman, PICES)

Keun-Oh Kim (Korea, national delegate)
Tokimasa Kobayashi (Japan, national delegate)
Qian-Fei Liu (China, advisor)
Richard J. Marasco (U.S.A., national delegate)
Pavel Vorobyov (Russia, advisor)
Tsuyoshi Yamamoto (Japan, national delegate)
Satoru Yasuda (Japan, advisor)

PICES Secretariat

Alexander Bychkov (Executive Secretary)
Stewart (Skip) M. McKinnell (Deputy Executive Secretary)

Observers

Woo-Jeung Choi (Korea, NFRDI, observer)
Hee-Dong Jeong (Korea, NFRDI, observer)
Young-Shil Kang (Korea, NFRDI, observer)
Hak-Gyoon Kim (Korea, NFRDI, observer)
Won-Seo Park (Korea, NFRDI, observer)
Sinjae Yoo (Korea, KORDI, observer)

SB-IM Endnote 2

Science Board/Governing Council Inter-sessional Meeting Agenda

Thursday, May 6

1. Welcome, introductions, logistical details, purpose of meeting
2. Updates from Scientific Committees and Programs

- 2.1. BIO (Radchenko)
- 2.2. FIS (Ishida)
- 2.3. MEQ (Stein)
- 2.4. POC (K. Kim)
- 2.5. TCODE (Shevchenko)

- 2.6. CCCC (Batchelder/S. Kim)
- 2.7. Science Board (Perry)

Friday, May 7

- 3. Updates on interactions with other programs and organizations
 - 3.1. NPAFC (Perry)
 - 3.2. ICES (Bychkov)
 - 3.3. SCOR (Perry)
 - 3.4. GLOBEC (Perry)
- 4. Actions on PICES Capacity Building
- 5. PICES Strategic Plan (Perry/Alexander)

Saturday, May 8

- 6. Updates on other planned and proposed symposia (Perry/Bychkov)

- 7. PICES communications
 - 7.1 PICES website
 - 7.2 Summaries of scientific sessions in Annual Reports
- 8. Awards
 - 8.1 Identifying young scientists for the Best Poster Award
 - 8.2 Wooster Award (closed session)
- 9. Process to develop the second major integrating program for PICES
- 10. Update on preparations for PICES XIII
- 11. Other business
 - 11.1 Effective Working Groups
 - 11.2 Committee Vice-Chairman positions
 - 11.3 North Pacific Ecosystem Status Report

SB-IM Endnote 3

**Terms of Reference for the
Climate Forcing and Marine Ecosystem Response (CFAME) Task Team of the CCCC Program**

Objective:

- To synthesize regional and basin-wide studies and provide a forum for the integration of CCCC-related hypotheses and data.

Terms of reference

- 1. The CFAME Task Team is responsible for the promotion, coordination, integration and synthesis of research activities related to the CCCC Program among member nations. This goal could be accomplished by convening meetings, periodic scientific symposia or workshops, or by distributing information designed to foster cooperation and integration among existing or developing programs;
- 2. The CFAME Task Team should provide the scientific body for hypothesis testing of

model experiments, by providing a forum for interaction between data-gathering and distribution programs (MONITOR) and theoretical experimentation and development (MODEL and NEXT) as related to climate change impacts on marine ecosystems;

- 3. Particular emphasis is placed on testing ecosystem-level hypotheses, through review and examination in a collaborative environment, of (i) comparisons between regional and/or basin ecosystems, (ii) linkages in time, space, or seasonality between climate and ecosystems, and (iii) responses of regional ecosystems to basin-scale forcing;
- 4. The CFAME Task Team should encourage establishment of component activities as needed to facilitate synthesis of the CCCC Program.

SB-IM Endnote 4

MONITOR Technical Committee Terms of Reference

- 1 Identify principal monitoring needs of the PICES region;
- 2. Develop approaches to meet these needs, including training and capacity building;
- 3. Serve as a forum for coordination and development of the PICES components of the Global Ocean Observing System (GOOS), including possible method

- development and inter-comparison workshops to facilitate calibration, standardisation and harmonisation of data sets;
4. Serve as the senior editorial board of the North Pacific Ecosystem Status Report, (NPESR), reporting to Science Board;
 5. Recommend interim meetings to address monitoring needs, PICES-GOOS activities, and development of the NPESR;
 6. Provide annual reports to Science Board and the PICES Secretariat on monitoring activities in relation to PICES;
 7. Interact with TCODE on management issues of monitoring data.

SB-IM Endnote 5

Revisions proposed by PICES to the draft proposal for a joint NPAFC-PICES symposium on Pacific salmon

Title: **Pacific salmon as indicators of the state of North Pacific marine ecosystems and climate variability**

Proposed dates: October 11-13, 2005

Proposed location: Seoul, Korea

Convening organizations: NPAFC, PICES (others); NPAFC is expected to take the lead role

Background:

Symposium would serve as follow-up to the broader PICES Ecosystem Report. Timing is appropriate to hold a joint symposium that integrates Pacific salmon into North Pacific marine ecosystems, and examines the extent to which Pacific salmon, since they return to coastal regions, can be used as indicators of conditions in North Pacific marine ecosystems.

Symposium organization:

Main themes:

1. Pacific salmon as indicators of climate variability in the North Pacific

- 1a. Observations: what observations of Pacific salmon populations indicate climate variability most clearly?

- 1b. Mechanisms: how is climate variability transmitted to variability in Pacific salmon populations?

2. Pacific salmon as indicators of conditions in near-shore, continental shelf, and open ocean environments

- 2a. Migration routes, migration timing, and resident areas for populations of Pacific salmon and what they tell us about environmental conditions on small to mid-scales?
- 2b. Spatial scales of salmon and environmental variability: over what spatial scales and regions do salmon act as indicators of environmental variability?

3. How can changes in ocean conditions be observed using Pacific salmon and other methods?

Symposium Steering Committee

- Two Co-Chairmen: one from NPAFC, one from PICES;
- Scientific Steering Committee with as many representatives as each organisation deems needed (to a max. of 5 per organisation).

SB-IM Endnote 6

Draft proposal for a PICES-ICES Young Scientists Conference

Background: In 1999, UNESCO and ICSU co-sponsored the World Conference on Science (WCS) in Budapest (<http://www.unesco.org/general/eng/programmes/science/wcs/>). The report of the WCS called for measures to facilitate the access of young scientists to careers

in science and their greater involvement in the identification of priorities and policy-making in science. The follow-up report to governments by UNESCO on the results of the WCS (*Harnessing Science to Society-Analytical Report* <http://www.unesco.org/science/wcs/>

report_wcs.pdf) includes Section 5.8 *Encouraging the participation of young scientists*. It describes activities undertaken by UNESCO during the WCS and thereafter in support of young scientists. In addition to supporting young scientist fellowships, support for young scientist conferences (e.g., Gdansk, Poland and Moscow, Russia) was an approach followed by UNESCO.

Independently, ICES organized a successful young scientist conference on marine sciences in Denmark in 1999. During his presentation to the Governing Council at the PICES Twelfth Annual Meeting in Seoul, Korea, the General Secretary of ICES proposed that ICES and PICES might jointly organize a Young Scientists Conference that would bring together “early career” scientists from around the globe”. The topic was referred to the PICES Science Board and this draft proposal is the result.

Objectives:

- To provide an international forum where young marine scientists from PICES and ICES member countries could meet at an early stage of their career to experience international scientific cooperation and to begin to establish peer networks; and
- To provide an opportunity for young scientists to contribute to the international scientific work that forms the basis for managing the marine environment.

Location: A PICES or ICES member country to be determined. Factors affecting the decision will include a willing host and a lower than average cost (relative to other locations) per participant. The density of countries within Europe, and the general tendency of balancing national participation at such events, suggests that a European location would likely be the least expensive, followed thereafter by an eastern North American location. For logistical and cost implications, it should be located near a major airport.

Date: June 2006 or 2007, if initial commitments of funds accrue slowly. The final choice of

dates must consider the academic calendar year to allow for strong participation from universities. The duration will be 3 or 4 days, depending on the mix of oral/poster presentations requested and the number of parallel sessions (typically 16-18 oral presentations can be scheduled per day including longer times for invited speakers).

Participants: Post-graduate students up through recently-graduated doctoral researchers (within 2 years of defense) by invitation only. Invitations will be offered based on evaluation criteria established by the Scientific Steering Committee, in consultation with the Organizing Committee.

Scientific Steering Committee: Four senior scientists (two each from ICES and PICES) whose main responsibilities will be to provide advice to the Organizing Committee, to attend the conference, and to offer constructive scientific advice and encouragement to participants.

Keynote speakers: One keynote talk each day related to the topic for the day.

Organizing Committee: The Committee will be responsible for developing the scientific programme and event logistics. Membership will include young scientists selected by the Scientific Steering Committee: one representative each from the ICES and PICES Secretariats, and one Financial Officer. The Financial Officer will manage conference finances and pay the bills.

Publication: Selected papers presented at the Conference will be published in a *Special Issue* of the *ICES Journal of Marine Science* following peer review.

Funding: ICES and PICES delegates will raise sufficient funds to cover the travel and daily costs of all invited participants and organizers. PICES and ICES will share equally the responsibilities for fundraising (about US\$ 150K per organization).

REPORT OF SCIENCE BOARD

The Science Board met on October 17, 2004 (from 12:30-13:30 hours), to review the agenda and discuss initial items relating to the coming PICES scientific sessions. Science Board met again on October 22 (from 08:30-18:00 hours), to deal with the remainder of the agenda, including items with financial implications for 2005 and beyond. Dr. Stewart M. (Skip) McKinnell served as rapporteur for both meetings. (See *SB Endnote 1* for list of participants.)

October 17, 2004

The Science Board Chairman, Dr. Ian Perry, welcomed members and called the meeting to order. The agenda was discussed and adopted as presented (*SB Endnote 2*).

Report on election of new Committee Chairmen (Agenda Item 3)

This item was deferred to October 22 as Committee meetings took place only after this first Science Board meeting.

Election of new Science Board Chairman and Vice-Chairman (Agenda Item 4)

Dr. Kuh Kim (Korea) was elected as the new Science Board Chairman by acclamation. Science Board members expressed their gratitude to Dr. Ian Perry for his leadership and valuable contribution to PICES activities over the years.

Election of the new Science Board Vice-Chairman was deferred until October 22, after the Committee meetings.

Review of procedures for Best Presentation Awards and Closing Session (Agenda Item 5)

Dr. Perry reviewed the criteria for Best Presentation Awards and the procedure for the Closing Session, based on the procedures

adopted for PICES X. It was restated that young scientists should be the recipients of all but the Science Board Award. Young scientists eligible for the award were identified from information they provided on their registration forms. Science Board used a revised procedure to determine the Best Poster Award. Each Committee nominated one member to serve on a Poster Award Committee, which provided Science Board with the name of the winning poster. For PICES XIII, the Poster Award Committee consisted of Drs. Michael J. Dagg (BIO), Sukyung Kang (CCCC), Jin-Yeong Kim (FIS), C. Michael Watson (MEQ), and Yuri I. Zuenko (POC).

It was reiterated that the Closing Session would consist of a brief presentation by the Chairman (Dr. Jacquelynne R. King) of the Study Group on *Fisheries and ecosystem responses to recent regime shifts* (formed to respond to the request for scientific advice from the government of the United States), a look towards PICES activities in the coming year, including the theme and possible topic sessions for the next Annual Meeting, presentation of Best Presentation Awards and PICES service awards to retiring Science Board members, and final words of thanks from the PICES Chairman, Dr. Vera Alexander. Committee Chairmen were reminded to provide a list of Topic Sessions for PICES XIV approved by their Committee to the Science Board Chairman before the Closing Session.

Procedures to enhance documentation of PICES scientific sessions (Agenda Item 6)

The procedures to enhance the documentation of PICES scientific sessions were discussed, following the recommendations of last year's Science Board report (*SB Endnote 3*). Science Board members agreed to be responsible for relevant sessions and to ensure that session convenors completed their descriptions prior to the conclusion of PICES XIII.

Governing Council decisions and Science Board recommendations from PICES XII (Agenda Item 7)

Science Board reviewed and accepted the status report on decisions and recommendations from PICES XII, which were of relevance to Science Board (*SB Endnote 4*).

October 22, 2004

Dr. Perry opened the second Science Board meeting, and welcomed the participation of Drs. Michael J. Dagg (Chairman-elect of BIO), Michael G. Foreman (Chairman-elect of POC) and Phillip R. Mundy (Chairman of MONITOR Technical Committee). Dr. John E. Stein (MEQ) was elected as the new Vice-Chairman of Science Board, for a period of one year. Dr. Vladimir Radchenko (first Science Board Vice-Chairman) was thanked for his contribution to PICES activities.

Reports of Committees and Programs under Science Board, and items with financial implications for 2004 and beyond (Agenda Item 8)

Science Board discussed reports from its Committees and Programs. The following membership changes, new subsidiary groups, inter-sessional meetings, publications, travel support requests, and related items were endorsed by Science Board and forwarded to Governing Council for approval.

Membership changes (Agenda Item 8a)

Science Board recommends the following Chairmanship changes for Committees:

MEQ: Dr. John E. Stein (U.S.A.) to extend his term for one additional year;

TCODE: Dr. Igor I. Shevchenko (Russia) to extend his term for one additional year;

MONITOR: Dr. Phillip R Mundy (U.S.A.) is recommended as the Chairman, and Dr. Sei-ichi Saitoh (Japan) is recommended as the Vice-Chairman for this new Technical Committee; membership is suggested to remain the same as the previous CCCC MONITOR Task Team.

Science Board recommends the following membership changes for the CCCC Program.

MODEL Task Team:

- Dr. Francisco E. Werner to continue as Co-Chairman for one additional year, with Dr. Thomas C. Wainwright (U.S.A.) to serve as Co-Chairman-elect after PICES XIV;
- Drs. Toshio Katsukawa and Hiroaki Saito (Japan) to be replaced by Dr. Goh Onizuka;
- Dr. Hao Wei (China) to join the Task Team as a member;
- Drs. Peter S. Ross (Canada), Jae-Hak Lee (Korea) and Linda Jones (U.S.A.) to formally rotate off the Task Team as they have not participated in recent meetings;
- Additional members from Canada, China, Korea and Russia are needed.

CFAME Task Team:

- Proposed members (pending Governing Council approval) for this new Task Team are: Canada – Drs. Jacquelynne R. King and Gordon A. McFarlane; Japan – Drs. Sanae Chiba, Masahide Kaeriyama, Akihiko Yatsu and Yoshiro Watanabe; Korea – Drs. Hyung-Ku Kang and Sukyung Kang; U.S.A. – Drs. Vera Agostini, Kerim Y. Aydin, Brenda L. Norcross and James E. Overland (a member of POC to facilitate the climate connection); members from Russia and China have yet to be identified.
- Drs. Aydin and Yatsu to serve as initial Co-Chairmen, with a 3-year term and a 2-year term, respectively, to avoid simultaneous rotation of both Co-Chairmen in future years.

Science Board recommends that all membership lists be confirmed prior to each Annual Meeting and be included as Appendices in the Annual Report. This will help maintain a historical record of Committee membership, and may help to improve participation.

Existing and proposed new subsidiary bodies (Agenda Item 8b)

- The Study Group on *Fisheries and ecosystems responses to recent regime shifts* completed its report on time, and it was

presented to the U.S. delegation during PICES XIII. Science Board congratulates the members and Chairman of that group for a job well done, and recommends dissolving the Study Group.

- The Study Group on *Ecosystem-based management science and its application to the North Pacific* submitted its report to the FIS and MEQ Committees, and completed its tasks at PICES XIII. Science Board thanks the Study Group members and recommends the Study Group be concluded, and its report published in the PICES Scientific Report Series.
- The final report of WG 14 on *Effective sampling of micronekton* was accepted by BIO. Science Board recommends that the Working Group be concluded and its members thanked for their participation.
- WG 16 on *Climate change, shifts in fish production and fisheries management* submitted an 85%-complete draft report to FIS. Science Board strongly encourages the completion of this report by the time of PICES XIV.
- WG 17 on *Biogeochemical data integration and synthesis* met at the same time as Science Board. Recommendations from the Working Group are forthcoming for consideration at the third interim Science Board meeting in the spring of 2005.
- WG 18 on *Mariculture in the 21st century - the intersection between ecology, socio-economics, and production* had a very successful first meeting at PICES XIII. Science Board is pleased with its start.
- The *Harmful Algal Bloom (HAB)* Section under MEQ had a very successful 1-day workshop and a 1-day Section meeting at PICES XIII. Science Board is pleased with its progress.
- The Advisory Panel on *Iron fertilization experiment in the subarctic Pacific Ocean* (IFEP-AP; under BASS) continues to be very active. Science Board noted that with the completion of BASS, IFEP-AP needs to have a new parent Committee. It was also noted that another biogeochemistry-related proposal may be forthcoming from WG 17. Science Board recommends that the Science Board Chairman lead an e-mail discussion to

identify the most appropriate “home” for such biogeochemistry-related activities in PICES, which might serve as a link with the new IGBP project on *Integrated Biogeochemistry and Ecosystems Research* (IMBER). One possibility might be a joint activity sponsored by POC and BIO. This proposal should be ready for discussion at the inter-sessional Science Board meeting in 2005. Until then, Science Board recommends that IFEP-AP remain under the CCCC Program.

- The Advisory Panel on *Micronekton sampling inter-calibration experiment* (MIE-AP; under BIO) conducted a very successful field experiment off Hawaii immediately prior to PICES XIII. Plans are being developed to carry out another sampling inter-comparison in the northern North Pacific. Science Board is supportive of this activity, pending submission of a written report of the Hawaii experiment and future plans, and encourages participation by PICES countries not yet represented (China, Korea and Russia).
- The Advisory Panel on *Marine birds and mammals* (MBM-AP; under BIO) has been in existence for 5 years, therefore Science Board requested that BIO review activities of the Panel. BIO rated the accomplishments of MBM-AP highly, and recommended continuation of the Panel for another 5-year term. Science Board supported this recommendation, but did not agree to a change in the terms of reference, suggesting that top fish predators be included as MBM-AP sees appropriate, in the context of marine bird and mammal issues. Science Board noted that even though this is a small group, the Panel pursues activities of wide interest, and encouraged PICES countries to be fully supportive of MBM-AP activities. Science Board asks the PICES Secretariat to include on the website the date of the next review for each on-going Panel or Section (review by the parent committee and Science Board is recommended every 5 years).
- The *North Pacific Data Buoy* Advisory Panel (under POC) is continuing its work, but with the long-lasting difficulties related

to funding for Panel members to attend meetings, the need for an Asian Co-Chairman, and two new Panel members to replace retiring members. Science Board noted there may be progress in identifying an Asian Co-Chairman.

- Science Board noted that this was the last meeting of MONITOR as a CCCC Task Team, and its first meeting as a Technical Committee. Science Board recommends: (1) the Advisory Panel on *Continuous Plankton Recorder Survey in the North Pacific* (CPR-AP) continue to be under the MONITOR Technical Committee; (2) a MONITOR Action Plan be developed for activities over the next 3-5 years, which would include proposals and clear terms of reference for a possible Advisory Panel on GOOS, plans for the North Pacific Ecosystem Status Report, and associated technical workshops on methodologies, etc. Science Board requests that this Action Plan be presented for consideration at the inter-sessional Science Board meeting in the spring of 2005. MONITOR's proposal for an Advisory Panel on GOOS was not approved at this time, as the terms of reference were not specific.

The following new subsidiary bodies are recommended by Science Board:

- Science Board accepted the proposal from the Study Group on *Ecosystem-based management science and its application to the North Pacific* to form a Working Group on this topic, under the direction of FIS and MEQ (see *SB Endnote 5* for terms of reference and suggested membership). Terms of reference with additional information can be found in *SGEBM Endnote 4*.
- Science Board accepted the proposal from POC to form an Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas*, with the inclusion of biological and fisheries research (see *SB Endnote 6* for terms of reference). BIO and MONITOR may wish to co-sponsor this group with POC.

Inter-sessional meetings/workshops in 2005 and beyond (Agenda Item 8c)

- A CCCC/CFAME workshop to develop a CFAME work plan and hypothesis set for CCCC synthesis (*CFAME Endnote 5*), late winter/early spring 2005, location in North America to be decided; this workshop might be also convened in conjunction with the ESSAS Symposium in May 2005, in Victoria, Canada;
- A CREAMS/PICES workshop on "East Asian Seas time series", spring 2005, location in Asia to be decided;
- A symposium, co-sponsored with GLOBEC, on "Climate variability and sub-arctic marine ecosystems", May 16-20, 2005, Victoria, Canada (approved in 2003);
- A workshop to plan "An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean" (*BIO Endnote 4*), late spring 2005, Corvallis, U.S.A.;
- A joint ICES/PICES theme session on "Fisheries, ecology and life history of small pelagic fish" (note the focus is on cold-water pelagics rather than sardine and anchovy) at the ICES Annual Science Conference, September 2005, Aberdeen, Scotland (approved in 2003); Dr. Douglas E. Hay (Canada) is recommended as the PICES co-convenor;
- A joint ICES/PICES theme session on "Comparing and constructing the scientific strategies and output of regional ecosystem projects" at the ICES Annual Science Conference, September 2005, Aberdeen, Scotland (approved in 2003); Dr. Phillip R. Mundy (U.S.A.) is recommended as the PICES co-convenor;
- A CCCC/MODEL workshop to extend NEMURO.FISH to fish stocks in other geographic regions (Europe, Africa, Asia, South America), September or October 2005, location in Japan to be decided (pending successful funding from APN and other sources; the pending APN proposal is titled "Toward quantitative understanding of

natural fluctuations of marine coastal fisheries of sardines and anchovies and their impact on fishing-dependent human communities”);

- A joint ORI/PICES workshop to synthesize results from the second *in situ* iron enrichment experiments in the western subarctic North Pacific (SEEDS-II); and to discuss differences in magnitude, biology and export between SEEDS-I and SEEDS-II, October 2005, Tokyo, Japan;
- A joint NPAFC/PICES symposium on “The status of Pacific salmon and their role in North Pacific marine ecosystems”, in conjunction with the NPAFC Annual Meeting, fall 2005, location in Korea to be decided (approved in 2003; *SB Endnote 7*);
- A CCC Program symposium on “Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis”, April 19-21, 2006, Honolulu, U.S.A.;
- A joint ICES/PICES symposium on “Marine bioinvasions”, spring 2006, location on the east coast of the United States to be decided (approved in 2003; *SB Endnote 8*); Dr. Yasuwo Fukuyo (Japan) is recommended as the PICES co-convenor; Science Board believes that this is an important global issue which would benefit from collaboration with ICES;
- A workshop/symposium celebrating the 50th anniversary of sampling along Line P, summer 2006, Victoria, Canada; a detailed proposal is expected by the inter-sessional Science Board meeting in the spring of 2005;
- A CREAMS/PICES workshop on “East Asian marginal seas circulation: What we know and how well can we forecast?”, summer 2006, near Vladivostok, Russia (approved in 2003; postponed from 2005);
- A 4th International Zooplankton Production Symposium, co-sponsored by GLOBEC and ICES, May 28-June 1, 2007, Hiroshima, Japan; Dr. Michael J. Dagg (U.S.A.) is recommended as the PICES co-convenor and Dr. David L. Mackas (Canada) as a member of the Scientific Steering Committee.

Proposed sessions and workshops for PICES XIV (Agenda Item 8d)

Proposals for scientific sessions and workshops at PICES XIV were discussed, and are presented below under Agenda Item 9.

Travel support requests (Agenda Item 8e)

Travel support requests are listed in priority order (highest to lowest) within each Committee; those marked with * were identified by Science Board to have higher overall priorities. It is also expected that approximately \$5,000 per Committee, CCC Program, and the Science Board theme session will be allocated for invited speakers at PICES XIV.

BIO

- 4 scientists (2 from Asia and 2 from North America) to attend the workshop on “An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean”*;
- MIE-AP members to participate in the next micronekton inter-calibration cruise (request pending formal reports of panel activities and future plans);
- 2 scientists to attend the CREAMS/PICES workshop on “East Asian Seas time series (EAST-I)”*;

FIS

- Dr. Akihiko Yatsu to travel to Canada to work with Dr. Richard J. Beamish to complete the WG 16 report;
- Dr. Douglas E. Hay to convene the joint ICES/PICES theme session on “Fisheries, ecology and life history of small pelagic fish” at the 2005 ICES Annual Science Conference.

MEQ

- Chinese HAB Section member to attend PICES XIV;
- 3 scientists to participate in the HAB Section workshop on “Review of selected harmful algae in the PICES region” at PICES XIV*;

SB-2004

- 1 scientist to attend the meeting of the ICES/IMO/IOC Working Group on *Ballast waters and other ship vectors*, to be held in March 2005, in Norway; potential attendees include Drs. Yasuwo Fukuyo (Japan) and Mark Wells (U.S.A.).

POC

- A member of POC to attend the 2005 CFAME inter-sessional workshop;
- A POC representative to participate in the NEAR-GOOS meeting, fall 2005*.

TCODE

- A member of TCODE to attend the Ocean Biodiversity Data Symposium, late November 2004, Hamburg, Germany;
- 2 scientists to participate in two workshops of the “Federated metadata project”, to build a demonstration shared metadata system between Korea and the United States (*TCODE Endnote 4*); complete costs are estimated to be US\$16,000, of which PICES is requested to support one-quarter (US\$4,000) on travel*.

MONITOR

- 2-3 invited speakers to the MONITOR workshop on “Filling the gaps in the PICES Ecosystem Status Report” at PICES XIV;
- Dr. Phillip R. Mundy to convene the joint ICES/PICES theme session on “Comparing and constructing the scientific strategies and output of regional ecosystem projects” at the 2005 ICES Annual Science Conference.

CCCC

- 1 invited speaker to the IFEP/MODEL workshop on “Modelling and iron biogeochemistry: How far apart are we?” at PICES XIV*;
- 2 scientists to attend the 2005 CFAME inter-sessional workshop*;
- 2 Canadian scientists to participate in the 2005 APN/MODEL workshop (contingent on APN funding);
- 1 scientist to attend the 2005 NPAFC/PICES Symposium on “State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems”*;

- 1 invited speaker to the 2005 SEEDS-II synthesis workshop.

Science Board also noted the need for the Asian Co-Chairman of the CCCC Program to have national support to attend the third inter-sessional Science Board meeting in spring 2005.

Science Board:

- Funding for the Science Board Chairman to attend the third inter-sessional Science Board meeting and PICES XIV*;
- 2-4 scientists to participate in the NPAFC/PICES symposium on the “State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems”.

Proposed publications (Agenda Item 8f)

PICES Scientific Report Series, 2005:

- Final report of the Study Group on *Fisheries and ecosystem responses to recent regime shifts*;
- Final report of the Study Group on *Ecosystem-based management science and its application to the North Pacific*;
- Micronekton of the North Pacific (Final Report of WG 14 on *Effective sampling of micronekton to estimate ecosystem carrying capacity*);
- Proceedings of the 2004 Workshop on “*In situ* iron enrichment experiments in the eastern and western subarctic Pacific”;
- Guide to best practices for oceanic CO₂ measurements and data reporting (WG 17);
- Final report of WG 16 on *Climate change, shifts in fish production, and fisheries management*.

PICES Scientific Report Series, 2006:

- Findings of the “Data-sharing project for federated metadata on North Pacific ecosystems” (TCODE).

PICES Special Publications, 2004-2005:

- Marine ecosystems of the North Pacific (North Pacific Ecosystem Status Report);
- Report and web page development for the Census of Marine Life on “Marine life in the North Pacific Ocean: The known, unknown and unknowable”.

Special issues of primary journals, 2005-2007:

- *ICES Journal of Marine Science* (2005) – selected papers from the 2004 symposium on “Quantitative ecosystem indicators for fisheries management”;
- *Deep-Sea Research II* (2005) – selected papers from the 2003 CCCC workshop on “Linkages between open and coastal systems”;
- *Ecological Modelling* (2005) – selected papers on NEMURO and NEMURO.FISH models;
- *Progress in Oceanography* (2006) – selected papers from the PICES XIII Topic Session on “Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?”;
- *Deep-Sea Research II* (2006) – selected papers from the PICES XIII Topic Session on “Hot spots and their use by migratory species and top predators in the North Pacific”;
- A leading international journal (2006 or 2007) – based on the 2003 and 2004 MBM-AP workshops on “Combining data sets on diet of marine birds and mammals”.

Other publications, 2005

- Advisory report on “Fisheries and ecosystem responses to recent regime shifts in the North Pacific” (brochure);
- “The journey to PICES: Scientific cooperation in the North Pacific” (book on the history of PICES).

Other items with financial implications (Agenda Item 8g)

Science Board wishes to draw the attention of Governing Council to the following items:

- The BIO Advisory Panel on *Micronekton sampling gear inter-calibration experiment* is planning another field experiment, pending funding from proposals or other sources.
- The CCCC MODEL Task Team has submitted a second grant proposal to the Asia Pacific Network for a workshop to extend NEMURO.FISH to fish stocks in other geographic regions. They have requested PICES to support travel of 2

Canadian scientists to this workshop (if APN grant is approved).

- Following discussions with the North Pacific Research Board, PICES is planning to submit a proposal to NPRB requesting their funding support for updates to the PICES North Pacific Ecosystem Status Report. Timing of this proposal should be as soon as the report is published.
- PICES agreed to provide funding for one additional member (from the North Pacific) to participate in the SCOR Working Group on *Global comparisons of long-time series zooplankton data*, which will have a 3-year duration starting in early 2005.

High priority projects (Agenda Item 8h)

No such projects were discussed.

Relations with other organizations and programs (Agenda Item 8i)

The *Standing List of International and Regional Organizations and Programs* facilitates PICES interactions with other programs and indicates high priority organizations/programs to whose meetings PICES should regularly send a representative. Science Board recommends the following additions to the List: International Association of Marine Science Libraries, Pacific Science Association and Fisheries Committee of APEC (See *SB Endnote 9* for the revised list).

PICES Committees and Programs identified the following organizations/programs as having the highest priority:

BIO: CLIVAR, GLOBEC, ICES/WGZE, GOOS, IWC
 MEQ: ICES, AMAP, SCOR/GEOHAB, APEC/MRC
 FIS: AFS/CAR, IPCC, ICES, NPAFC, GLOBEC/SPACC
 POC: CLIVAR, Argo, CREAMS, WESTPAC, NEAR-GOOS, JGOFS, GOOS, GCOS, WMO/DBCP;
 CCCC: GLOBEC, ICES, GOOS (and its regional activities), IGBP/IMBER, CoML, NPAFC, IATTC, IPHC, SAHFOS, GEM, NPRB
 TCODE: IOC, IODE, CoML, GLOBEC, GOOS

SB-2004

Additional proposed recommendations (Agenda Item 8j)

- Science Board endorsed a request from CFAME that a letter from PICES be sent to Dr. William T. Peterson (U.S.A.) supporting his efforts to develop an international “Year of the euphausiid” study (*SB Endnote 10*). Science Board recommended that Dr. Peterson work with the PICES Secretariat and Science Board Chairman to prepare such a draft letter, so that it can be used to seek funding;
- Science Board endorsed the request by the HAB Section for PICES to send a letter to IOC recommending a formal partnership on the HAE-DAT (Harmful Algal Event – Database) project;
- Science Board supported the request by the HAB Section for PICES to send a letter to the U.S. NCDDC (National Coastal Data Development Center) asking for assistance with the IOC HAB data efforts;
- Science Board suggests that NPAFC regularly present information on the state of Pacific salmon to PICES. Such information could be presented to FIS or MONITOR, and be a contribution to the North Pacific Ecosystem Status Report.

Documentation of PICES science (Agenda Item 8k)

Summaries of the sessions and workshops held at PICES XIII are included elsewhere in this Annual Report.

PICES Fourteenth Annual Meeting (Agenda Item 9)

The theme of this meeting will be “Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions”. The following list of sessions and workshops to be convened at (or in conjunction with) PICES XIV was endorsed:

Science Board Symposium (³/₄-day)

Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions. (SB Endnote 11)

MEQ/HAB Workshop (1-day)

Review of selected harmful algae in the PICES region: I. Pseudo-nitzschia & Alexandrium; the workshop will be preceded by a ½-day laboratory demonstration (HAB-S Endnote 4)

MEQ Workshop (1-day)

Introductions of marine species in the North Pacific (MEQ Endnote 4)

CCCC/CFAME Workshop (1-day)

East-west comparison of community structure, productivity and biodiversity under climate change scenarios (CFAME Endnote 7)

IFEP/MODEL Workshop (½-day)

Modelling and iron biogeochemistry: How far apart are we? (IFEP-AP Endnote 4)

MONITOR Workshop (1-day)

Filling the gaps in the PICES Ecosystem Status Report (MONITOR Endnote 5)

BIO Topic Session (½-day)

Comparative life history of euphausiids around the Pacific Rim (BIO Endnote 5)

BIO Topic Session (1-day)

Use of top predators as temporal indicators of changes in oceanographic conditions and prey population (MBM-AP Endnote 5)

CCCC/CFAME Topic Session (1-day)

Comparative response of differing life history strategists to climate shifts (CFAME Endnote 6)

CCCC/MODEL Topic Session (½-day)

Modeling climate and fishing impacts on fish recruitment (MODEL Endnote 4; possibly joint with FIS)

CCCC Poster Session

GLOBEC, and GLOBEC-like studies in the North Pacific: observing pattern and inferring process (CCCC-IP Endnote 3)

FIS/CCCC Topic Session (1-day)

Evidence of distributional shifts in demersal fish in relation to short and long term changes in oceanographic conditions (FIS Endnote 3)

FIS Paper Session (1/2-day)MEQ Topic Session (1/2-day)

Ecological effects of offshore oil and gas development and oil spills (MEQ Endnote 3)

MEQ/FIS Topic Session (1-day)

Ecosystem indicators and models (SGEBM Endnote 5)

MEQ/FIS Topic Session (1/2-day)

Current and emerging issues of marine and estuarine aquaculture in the Pacific region: Carrying capacity, ecosystem function, and socioeconomics (WG 18 Endnote 5)

POC Paper Session (1-day)TCODE Topic Session (1/2-day)

Data management and delivery systems to support ecosystem monitoring (TCODE Endnote 3)

Selection of PICES XV theme (Agenda Item 10)

Science Board decided that the theme for PICES XV (October 2006, Japan) should be “Boundary Current Ecosystems” (SB Endnote 12).

Discussion of a Vice-Chairman position for each Committee (Agenda Item 11)

Following a brief discussion, there was no consensus on this issue. The issue was referred to the third interim Science Board meeting in the spring of 2005 for a more complete discussion.

Discussion of how Committees will contribute to a PICES Action Plan (Agenda Item 12)

Not all Committees were able to discuss this item at their meetings. Science Board therefore asked that all Committees discuss this issue by correspondence and prepare their draft Plan, which will be presented and discussed at the third interim Science Board meeting in the spring of 2005. The Science Board Chairman should develop and circulate a template (or sample) for such Action Plans so that they contain similar components.

Contributions by Committees to the PICES website (Agenda Item 13)

All Committees were asked to provide scientific and administrative content related to their activities to the Secretariat for posting on the PICES website. A tentative “Web Publications Committee” was formed to review material posted to the website to ensure high quality and common formats (where possible). Members nominated for this *ad hoc* committee are Drs. Harold P. Batchelder (CCCC, and Chairman), Gordon H. Kruse (FIS), Julia Parrish (MEQ), Igor I. Shevchenko (TCODE), Michael J. Dagg (BIO), with members from POC and MONITOR still to be nominated.

PICES capacity building opportunities (Agenda Item 14)

A proposal to organize a PICES/ICES Young Scientists Conference generated considerable discussion regarding participation by young scientists in PICES. All Committees except one were either in favour or strongly in favour of this proposal. Funding was noted as the major constraint to developing further participation by young scientists. Drs. Suam Kim and Sei-ichi Saitoh were recommended as PICES senior scientists to help develop this proposal and raise funds. “Early-career” scientists recommended to serve on the Steering Committee were Drs. Sukyung Kang (Korea) and Franz Mueter (U.S.A.), and Ms. Julie Keister (U.S.A.). It was indicated that the numbers of senior and “early-career” scientists representing PICES on this Symposium Steering Committee should be the same as the number appointed by ICES. “Early-career” scientists are also recommended to be the convenors of sessions and to run the meeting.

Discussion of topics for the next major PICES integrating scientific program (Agenda Item 15)

As not all Committees were able to discuss this issue, it was postponed until the third inter-sessional Science Board meeting in spring of 2005.

**Inter-sessional Science Board meeting
(Agenda Item 15)**

The second inter-sessional Science Board meeting, with the participation of Governing Council, was held at the Hyatt Regency Hotel, Jeju, Korea, from May 6-8, 2004. The report from this meeting is included elsewhere in this Annual Report.

Science Board recommends a third inter-sessional meeting be held in spring 2005. Several items warrant further discussion:

- Principal issue is development of the PICES Draft Action Plans for each Committee;
- Review of MONITOR Strategic and Action Plans, proposals for GOOS and Ecosystem Status Report activities, and integration of other activities;
- Discuss how to develop next major integrating program for PICES (potential topics and possible approaches), and how to include human dimensions;
- Review WG 17 proposals and discuss how best to include biogeochemical issues within PICES (*e.g.*, WG 17 and IFEP-AP);
- Review and discuss recommendations from the PICES/CLIVAR workshop in October 2004;
- A workshop or symposium to celebrate the 50th anniversary of sampling along Line P in the NE Pacific;

- PICES/ICES Young Scientist Conference
- NPAFC/PICES Symposium.

Best Presentation and Poster Awards

Dr. Akihiko Yatsu (Japan) won the Best Presentation Award in the Science Board Symposium for his oral presentation (co-authored with Masatoshi Moku, Hiroshi Nishida, Kaoru Takagi, Norio Yamashita and Hiroshi Ito), titled “Possible ecological interactions between small pelagic and mesopelagic fishes in the Kuroshio – Oyashio Transition Zone and Kuroshio Extension in spring”.

Dr. Oleg Katugin (Russia) received an Honourable Mention in the Science Board Symposium for his oral presentation (co-authored with Gennady Shevtsov), titled “Patterns of distribution and biology of the North Pacific oceanic squid *Berryteuthis anonychus* with implications for the species life cycle”.

The Best Poster Award went to Dr. Katsuya Suzuki (Japan) for his poster (co-authored with Tsutomu Takagi, Shinsuke Torisawa and Kazushi Miyashita), titled “Video analysis of the schooling behavior of Japanese surfsmelt (*Hypomesus japonicus*) under light and dark conditions using a mathematical model”.

SB Endnote 1

Participation List

Members

Harold P. Batchelder (Co-Chairman, CCCC-IP)
Yukimasa Ishida (Chairman, FIS)
Kuh Kim (Chairman, POC)
Suam Kim (Co-Chairman, CCCC-IP)
R. Ian Perry (Chairman, Science Board)
Vladimir I. Radchenko (Chairman, BIO)
Igor I. Shevchenko (Chairman, TCODE)
John E. Stein (Chairman, MEQ)
Jin-Ping Zhao (China)

Invited observers

Michael J. Dagg (Chairman-elect of BIO; October 22 only)
Michael G. Foreman (Chairman-elect of POC; October 22 only)
Phillip R. Mundy (Chairman of MONITOR Technical Committee; October 22 morning only)
Stewart (Skip) M. McKinnell (PICES Deputy Executive Secretary; rapporteur)

SB Endnote 2**Science Board Agenda*****October 17, 2004 (12:30 – 13:30)***

1. Welcome and opening remarks
2. Adoption of agenda
3. Report on elections of new Committee Chairmen
4. Election of new Science Board Chairman and Vice-Chairman
5. Review of procedures for Best Presentation Awards and Closing Session
6. Review of procedures to enhance documentation of PICES scientific sessions
7. Completion of Science Board recommendations Governing Council decisions from PICES XII

October 22, 2004 (08:30 – 17:30)

8. Reports of the Science Board Chairman, Scientific and Technical Committees, CCCC IP, Working and Study Groups with regard to activities, proposals, and items having financial implications for 2004 and beyond:
 - a) Brief summary report of the group's activities in the past year, including membership changes
 - b) Proposed list of any future groups along with terms of reference and a list of potential members
 - c) Inter-sessional meetings proposed for 2004 and beyond (symposia, workshops, Working Group, Section, and CCCC Program meetings)
 - d) Proposed scientific sessions and workshops for the next Annual Meeting, including draft session descriptions and proposed Convenors
 - e) Travel support requests

- f) Proposed publications
- g) Other items with financial implications
- h) High priority projects
- i) Relations with other international organizations and programs
- j) Proposed recommendations and draft text on other items to be included in the Science Board report to Council (e.g., recommendations for letters of support to various research efforts)
- k) Tabling of Summaries from the PICES XIII Scientific Sessions
- l) Other items
9. Develop PICES XIV draft schedule of scientific sessions and workshops
10. Selection of PICES XV theme and description
11. Discussion of developing a Vice-Chairman position for Scientific and Technical Committees
12. Discussion of how Committees will contribute to a PICES Action Plan
13. PICES website: Contributions from each Committee; procedures for the "Web Publications Committee"
14. Discussion of PICES capacity building opportunities and PICES/ICES Young Scientists Conference
15. Discussion of potential topics towards next major PICES integrating scientific program
16. Possible inter-sessional Science Board meeting
17. Other business
18. Adoption of the Science Board report and recommendations to Council

SB Endnote 3**Review of procedures to enhance documentation of PICES scientific sessions**

(From: 2001 PICES Annual Report, SB Endnote 11, p. 52)

For the last few years, PICES has only included information of the proposed Topic Sessions for the upcoming year in its Annual Report, and has not provided details regarding the actual scientific sessions after their conclusion, particularly with regard to any key discussions

or recommendations that such sessions might have generated. It became clear to those who are preparing reviews of PICES scientific accomplishments over the last decade, that we have not well-documented the science contained in our Annual Meetings, with the exception of

SB-2004

papers that were compiled later into PICES Scientific Reports or other publications.

If we are to better track the state of our knowledge and future needs for improvement, it seems we should have a better system for documenting our scientific sessions and the discussions and recommendations that come from those. One possible system would be that employed by ICES in their Annual Report. (See a copy of their latest annual report on the web at <http://www.ices.dk/products/AnnualRep/2001annualreport.pdf>). The section devoted to the Annual Science Meeting puts forth the following information:

- keynote lectures and abstracts
- science meeting agenda (session schedules)
- details of each scientific session

The last item, details of each scientific session, contains an organized description of each session that includes:

- purpose of the session (derived from the initial session description);
- details of the content of the papers presented in summary form;

- summary of the discussions and conclusions of the session with regard to: research gaps that need to be filled; recommendations for future sessions or groups, or work; recommendations for other actions; and
- list of the documents (author and title) presented.

PICES has struggled to enhance the discussions at our Topic Sessions, and if we ask convenors to document the sessions and the discussions, we may see a better organization of Topic Sessions in this regard. We would also have a more organized way to provide scientific recommendations for action to the parent Committee(s) that sponsored the session.

Recommendation: Session convenors be asked to provide a summary of their session that includes the four points listed above, and these summaries be included in the PICES Annual Report. Also, session convenors should be requested to include a fixed amount of discussion time at the end of their sessions (15 minutes) in order to provide for discussion of the papers and issues raised by the papers.

SB Endnote 4

Completion of PICES XII decisions and recommendations

Inter-sessional meetings and meetings in conjunction with PICES XIII (03/S/1)

The following inter-sessional meetings were convened or co-sponsored:

- A 3-day PICES/CoML workshop on “Marine life in the North Pacific Ocean: The known, unknown and unknowable”, November 17-19, 2003, Victoria, Canada;
- A 3-day workshop on “Development of pilot coastal monitoring program(s) in the NE Pacific” (co-sponsored by PaCOS, EVOS and AOOS), November 20-22, 2003, Victoria, Canada;
- A 5-day MODEL workshop on “Summary and synthesis of contributions from NEMURO and NEMURO.FISH” (funded by the Fisheries Research Agency of Japan), December 4-6, 2003, Yokohama, Japan;
- A 4-day IOCCP/NIES/PICES workshop on “Ocean surface $p(\text{CO}_2)$, data integration and database development”, January 14-17, 2004, Tsukuba, Japan (44 scientists from 12 countries);
- A 2-day meeting of the PICES Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* (FERRRS), February 9-10, 2004, Victoria, Canada;
- A 3-day PICES-IFEP workshop on “*In situ* iron enrichment experiments in the eastern and western subarctic Pacific”, February 11-13, 2004, Victoria, Canada (25 scientists from 3 countries);
- A 1½-day Canada-SOLAS/PICES-IFEP Session on “Response of the upper ocean to meso-scale iron enrichment” at the TOS/ASLO 2004 Ocean Research Conference, February 17-18, Honolulu, U.S.A.;

- A 4-day symposium on “Quantitative ecosystem indicators for fisheries management” (co-sponsored by IOC, SCOR, PICES, ICES, GLOBEC, etc.), March 31-April 3, 2004, Paris, France (250 scientists from 42 countries);
 - A 3-day interim Science Board/Governing Council meeting, May 7-9, 2004, Jeju, Republic of Korea;
 - A 3-day NOAA/GCP/PICES workshop on “Understanding North Pacific carbon-cycle change: Data synthesis and modeling”, June 2-4, 2004, Seattle, U.S.A. (60 scientists from 5 countries);
 - A 3-day meeting of the FERRRS Study Group, June 14-16, 2004, Seattle, U.S.A.;
 - A 4-day MODEL workshop on “The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific” to document and distribute the NEMURO model code, and to edit *Ecological Modeling* manuscripts (co-sponsored by the Japan Fisheries Research Agency), August 20-23, 2004, Seattle, U.S.A.
 - A 2-day PICES-CLIVAR workshop on “Scale interactions of climate and marine ecosystems”, October 23-24, 2004.
- Preparation and arrangements are in progress for:
- A 5-day GLOBEC symposium on “Climate variability and sub-arctic marine ecosystems”, May 16-20, 2005, Victoria, Canada (PICES is represented on the Scientific Steering Committee and the Local Organizing Committee; PICES Secretariat is responsible for local arrangements for the meeting);
 - A 3-day NPAFC/PICES symposium on “The status of Pacific salmon and their role in North Pacific marine ecosystems”, fall 2005, Republic of Korea;
 - A 3-day PICES/GLOBEC symposium on “Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis”, April 19-21, 2006, Honolulu, U.S.A.

Travel support (03/S/2)

The following workshops were convened in conjunction with PICES XIII in Honolulu, U.S.A.:

- A 4-day APN/PICES workshop on “Climate interactions and marine ecosystems” and young investigator training, October 10-13, 2004;
- A 1-day MIE-AP post-cruise workshop on “Micronekton sampling gear inter-calibration experiment”, October 14, 2004;
- A 1-day MBM-AP workshop on “Combining data sets on diets of marine birds and mammals - Phase II”, October 14, 2004;
- A 1-day CCCC/REX workshop on “Seasonal cycles of plankton production in continental shelf waters around the North Pacific Rim”, October 14, 2004;
- A 1-day MEQ workshop on “Developing a North Pacific HAB data resource”, October 15, 2004;
- A 2-day CCCC workshop on “Linking open ocean and coastal ecosystems II”, October 15-16, 2004;
- Full travel support was provided to all members (except NOAA employees) of the FERRRS Study Group to attend the first^t (February 2004, Victoria, Canada) and second (June 2004, Seattle, U.S.A.) meetings of the group;
- Drs. Ian Perry (Science Board Chairman) and Jeffrey Polovina (invited speaker) participated in the Symposium on “Quantitative ecosystem indicators for fisheries management” in March 2004, in Paris, France;
- Partial travel support from the Trust Fund was provided to 2 scientists from the People’s Republic of China, and 1 scientist from the Republic of Korea, to attend the Symposium on “Quantitative ecosystem indicators for fisheries management” in March 2004, in Paris, France;
- Science Board Chairman traveled for the second interim Science Board/Governing Council Meeting (May 2004, Jeju, Republic of Korea) and for PICES XIII (October 2004, Honolulu, U.S.A.);

- Full travel support was provided to 1 scientist from the Republic of Korea and 1 scientist from Russia to participate in the NOAA/GCP/PICES workshop on “Understanding North Pacific carbon-cycle change: Data synthesis and modeling” in June 2004, in Seattle, U.S.A.;
- Partial travel support was provided to Dr. Francisco Werner (MODEL Task Team Co-Chairman) to attend the MODEL workshop on “The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific” in August 2004, in Seattle, U.S.A.;
- Full travel support was provided to 2 Canadian scientists to attend the APN/PICES Workshop on “Climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food webs and implications for marine fish production in the North Pacific Ocean and marginal seas” held in conjunction with PICES XIII;
- Full travel support was provided for 1 invited speaker to the REX Workshop on “Seasonal cycles of plankton production in continental shelf waters around the North Pacific Rim”, 1 invited speaker to the MBM-AP Workshop on “Combining data sets on diets of marine birds and mammals - Phase II”, 2 invited speakers to the CCCC Workshop on “Linking open ocean and coastal ecosystems II”, and 9 invited speakers to the PICES/CLIVAR Workshop on “Scale interactions of climate and marine ecosystems” (funding for 5 speakers was allocated by the U.S. CLIVAR and for 2 speakers by WCRP) at PICES XIII;
- Full or partial travel support was provided to 21 invited speakers to scientific sessions at PICES XIII;
- Full travel support from the Trust Fund (funding is allocated by SCOR) was provided to 1 Russian and 1 Chinese scientist to attend the MEQ workshop on “Developing a North Pacific HAB data resource II” at PICES XIII;
- Partial travel support was provided to 1 Canadian, 8 Chinese, 3 Japanese, 6 Korean, 1 Mexican, 12 Russian and 8 U.S. scientists to attend PICES XIII. The majority of these scientists are younger than 35 years of age;
- Dr. Elizabeth A. Logerwell (U.S. member of FIS) represented PICES at the 11th NPAFC Annual Meeting, held in October 2003, in Honolulu, U.S.A.;
- Dr. Sei-ichi Saitoh (Co-Chairman, MONITOR Task Team) represented PICES at the POGO Annual Meeting held in November 2003, in Tokyo, Japan. He will also represent at the 9th NEAR-GOOS Coordinating Committee meeting to be held in November 2004, in Sendai, Japan;
- Dr. Suam Kim (Co-Chairman CCCC Program) represented PICES at the 8th Session of the IOC/WESTPAC Coordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS-CC) held in December 2003, in Beijing, China;
- Drs. Yasuwo Fukuyo and Mark Wells (Harmful Algal Blooms Section) represented PICES at the meetings of the ICES/IOC/IMO Working Group on *Ballast Waters and Other Ship Vectors* and the ICES Working Group on *Introductions and Transfers of Marine Organisms* held consecutively in March 2004, in Cesenatico, Italy;
- Dr. Phillip R. Mundy (Co-Chairman, MONITOR Task Team) represented PICES at the meeting of the ICES-GOOS Steering Group held in April 2004, in Tenerife, Spain;
- Dr. Gennady Moiseenko (Russian member of TCODE) represented PICES at the meeting of the ICES-IOC Study Group on *Development of marine data exchange systems using XML* held in May 2004, in Oostende, Belgium;
- Dr. Suam Kim (Co-Chairman, CCCC Program) represented PICES at the 7th North Pacific Rim Fisheries Conference held in May 2004, in Pusan, Republic of Korea;
- Dr. Ian Perry represented PICES at the 2004 ICES Annual Science Conference held in September 2004, in Vigo, Spain.

Publications (03/S/3)

Publications produced after PICES XII include:

Special issues of primary journals in 2004

- *Marine Environmental Research* (Vol. 57, Nos. 1-2, Feb.-Mar. 2004) - papers resulting from the 1999 MEQ Practical Workshop (Guest editor: R. Addison);
- *Journal of Oceanography* (Vol. 60, No. 1, Feb. 2004) - invited papers on “Synthesis of JGOFS North Pacific Process Study” (jointly with JGOFS) (Guest editors: Toshiro Saino, Alexander Bychkov, Chen-Tung A. Chen and Paul J. Harrison);
- *Progress in Oceanography* (Vol. 61, No. 2-4, May-June, 2004) - selected papers from the PICES/CREAMS workshop on “Recent progress in studies of physical processes and impact to the Japan/East Sea ecosystem” (Guest editors: Stewart M. McKinnell, Alexander Bychkov, Kyung-Ryul Kim and Makoto Terazaki);
- *ICES Journal of Marine Research* (Vol. 61, No. 1, June 2004) - selected papers from the 3rd Zooplankton Production Symposium (Guest editors: Luis Valdez, Roger Harris, Tsutomu Ikeda, Stewart M. McKinnell and William Peterson);
- *Journal of Marine Systems* (Vol. 50, Nos. 1-2, September 2004) - selected papers from the 2002 BIO/POC/FIS Topic Session on “The importance of biophysical coupling in concentrating marine organisms around shallow topographies” (Guest editors: Richard D. Brodeur and John Dower).

A peer-review process was initiated for three special issues (publication is expected in early 2005):

- *Deep-Sea Research II* – selected papers from the 2003 PICES workshop on “Linkages between open and coastal systems” (Guest editors: Stewart M. McKinnell and Gordon A. McFarlane);
- *Ecological Modelling* – selected papers on NEMURO and NEMURO.FISH models (Guest editors: Shin-ichi Ito, Michio Kishi, Bernard Megrey and Francisco Werner);
- *ICES Journal of Marine Research* – selected papers from the 2004 symposium on “Quantitative ecosystem indicators for fisheries management” (Guest Editor: Neils Daan).

PICES Scientific Report Series

- PICES Scientific Report No. 26 (September 2004): Proceedings of the Third PICES workshop on the Okhotsk Sea and adjacent areas;
- PICES Scientific Report No. 27 (publication is expected in December 2004): PICES-GLOBEC International Program on Climate Change and Carrying Capacity Program - Report of the 2003 MODEL Task Team second workshop to develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes;
- PICES Scientific Report No. 28 (publication is expected in December 2004): Report of the Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts*;
- Publication of proceedings from the 2003 MONITOR workshop on “Examine and critique a North Pacific Ecosystem” is cancelled;
- Publications of the proceedings of the 2004 Workshop on “*In situ* iron enrichment experiments in the eastern and western subarctic Pacific”, “Guide to best practices for CO₂ measurements and data reporting”, and the final report of WG 14 are postponed until 2005;
- Publication of the report for the Census of Marine Life on “Marine life in the North Pacific Ocean: The known, unknown and unknowable” is moved to a new series “PICES Special Publications”.

PICES Special Publications

- North Pacific Ecosystem Status Report (pre-publication available on the PICES website);
- Executive summary of the Report of the Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* (publication is expected in December 2004);
- Report on “Marine life in the North Pacific Ocean: The known, unknown and unknowable” (publication of the baseline report and detailed web version is expected in December 2004).

PICES Press – Newsletters

- Two regular issues: Vol. 12, No. 1 (January 2004) and Vol. 12, No. 2 (July 2004).

Future of current Working Groups and Scientific Programs (03/S/4)

Working Groups and the CCCC Program are continuing, with the following changes:

- concluding the BASS and REX Task Teams,
- establishing a new Task Team on *Climate Forcing and Marine Ecosystem Response* (CFAME), and
- moving the MONITOR Task Team outside the CCCC Program to become a Technical Committee directly under Science Board.

SB Endnote 5

Proposal for a Working Group on *Ecosystem-based management science and its application to the North Pacific*

Proposal: Working Group under FIS & MEQ

Title: Working Group on *Ecosystem-based management science and its application to the North Pacific*

Short title: WG-EBM

Duration: November 2004 - October 2007

Terms of reference:

1. Describe and implement a standard reporting format for ecosystem-based management (EBM) initiatives (including more than fishery management) in each PICES country, including a listing of the ecosystem-based management objectives of each country;
2. Describe relevant national marine ecosystem monitoring approaches and plans and types of models for predicting human and environmental influences on ecosystems; identify key information gaps and research and implementation challenges;
3. Evaluate the indicators from the 2004 Symposium on “Quantitative Ecosystem Indicators for Fisheries Management” for usefulness and application to the North Pacific;
4. Review existing definitions of “eco-regions” and identify criteria that could be used for defining ecological boundaries relevant to PICES;
5. Hold an inter-sessional workshop in Year 2 or 3 of the WG’s mandate that addresses the

New PICES Groups (03/S/5)

- Formation of a Study Group on *Ecosystem-based management science and its application to the North Pacific* jointly under FIS and MEQ;
- Formation of a joint FIS and MEQ Working Group on *Mariculture in the 21st century – The intersection between ecology, socio-economics, and production*;
- Formation of a Section on *Harmful algal blooms and their impacts* under MEQ.

status and progress of EBM science efforts in the PICES region, with the deliverable being either a special journal issue or a review article;

6. Recommend to PICES further issues and activities that address the achievement of EBM in the Pacific.

The following scientists are suggested as members of the Working Group based on their experience, qualifications, and active participation to date (key participants are italicized; recommended Co-Chairmen are marked by *):

Canada

*Glen Jamieson**, Robert O’Boyle, Ian Perry

Japan

Tokio Wada

People’s Republic of China

Xian-Shi Jin, Wei Hao

Republic of Korea

Jae-Bong Lee, Inja Yeon, *Chang-Ik Zhang**

Russia

Vladimir Radchenko

U.S.A.

*Patricia Livingston**, Christopher Harvey

SB Endnote 6

**Proposal for an Advisory Panel on
*CREAMS/PICES Program in East Asian Marginal Seas***

Proposal: Advisory Panel under POC (and possibly BIO and MONITOR)

Title: Advisory Panel on a *CREAMS/PICES Program in East Asian marginal seas*

Short Title: CREAMS-AP

Duration: November 2004 to October 2008

Terms of reference:

1. To initiate and oversee a program to study the:
 - a. hydrography, circulation, and biology and their variability in East Asian marginal seas in the PICES area;

- b. effect of climate and long-term changes in the abiotic and biotic environments of this region;
2. To facilitate the establishment of permanent observation and data exchange networks in this region;
3. To convene workshops to evaluate and compare results from the program.

Co-Chairmen and potential members are to be recommended prior to the third inter-sessional Science Board meeting in 2005.

SB Endnote 7

**Joint NPAFC/PICES Symposium on
“The status of Pacific salmon and their role in North Pacific marine ecosystems”**

Title: “The status of Pacific salmon and their role in North Pacific marine ecosystems”

Proposed dates: in conjunction with the NPAFC Annual Meeting, October 2005

Proposed location: location in Korea to be determined

Convening organizations: NPAFC, PICES (others?); NPAFC is expected to take the lead role

Background

Timing is appropriate to hold a joint symposium that integrates Pacific salmon into North Pacific marine ecosystems, and examines the extent to which Pacific salmon, since they return to coastal regions, can be used as indicators of conditions in North Pacific marine ecosystems. Symposium would serve as follow-up to the broader PICES Ecosystem Report.

Symposium organization

Main themes:

1. Status of Pacific salmon, trends in abundance and biological characteristics:

- 1a. What is the current status of Pacific salmon populations throughout the North Pacific?

- 1b. How can changes in ocean conditions be observed using Pacific salmon and other methods?

2. Role of Pacific salmon in the function of North Pacific marine ecosystems:

- 2a. Migration routes, migration timing, and resident areas for populations of Pacific salmon and what they tell us about environmental conditions on small to mid-scales.
- 2b. Spatial scales of salmon and environmental variability (*i.e.*, over what spatial scales and regions do salmon act as indicators of environmental variability?)

3. Pacific salmon as indicators of climate variability in the North Pacific:

- 3a. Observations: what observations of Pacific salmon populations indicate climate variability most clearly?
- 3b. Mechanisms: how is climate variability transmitted to variability in Pacific salmon populations?

With a 3-day meeting, proposal is to have one theme per day, with sub-themes in morning and

SB-2004

afternoon. First day would additionally have an Opening Ceremony, and last day would have a Closing Ceremony.

Symposium Steering Committee

- Two Co-Chairmen: one from NPAFC (Richard J. Beamish), one from PICES (Vladimir I. Radchenko);

- Scientific Steering Committee with membership from NPAFC: Jack Helle, Ichiro Kanto, Vladimir Karpenko, Chae-Sung Lee, Katherine Myers, Toru Nagasawa and Vladimir Sviridov; and from PICES: Yukimasa Ishida, Suam Kim, R. Ian Perry and John E. Stein.

SB Endnote 8

ICES-PICES symposium on “Marine bioinvasions”

Marine bioinvasions are a recognized and growing threat to our native biodiversity. They are a major threat to marine habitats, and have negatively impacted economic use of marine resources. Scientific understanding is needed to identify, control, and prevent marine bioinvasions. Transport and introduction of non-indigenous species is a world-wide conservation issue, and also represents a fascinating scientific challenge requiring new approaches and techniques. The ICES and PICES scientific communities have a great deal to contribute on this issue, and there are genuine opportunities for partnership with researchers associated with other organizations and programmes.

A 3-day symposium on “Marine bioinvasions” will be held at a location to be decided on the east coast of the United States in early 2006.

Topics to be addressed include:

- patterns and distribution of marine bioinvasions,
- ecological impacts,
- evolutionary consequences,
- transfer vectors and pathways,
- risk assessment,
- molecular approaches,
- biological control, and
- special topics.

This will be a symposium with a limited number of invited keynote or plenary speakers, who will provide perspective, insight, and challenges to the participants. Presentations selected from submitted abstracts will include about 60 20-minute talks. Presenters will be asked to submit papers for publication in a special issue of the *ICES Journal of Marine Science*.

SB Endnote 9

Revised 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. The 2004 additions to the list are the Fisheries Working Group of Asia Pacific Economic Cooperation (APEC-FWG), International Association of Marine Science Libraries (IAMSLIC), and Pacific Science Association (PSA). 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 (AMAP)
AOOS*	Alaska Ocean Observing System (AOOS)
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)
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
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)
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)
IOC*	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IPCC*	International Panel on Climate Change
IPHC	International Pacific Halibut Commission
IWC	International Whaling Commission
NAFO	North Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NEAR-GOOS*	North East Asian Regional GOOS
NOWPAP*	Northwest Pacific Action Plan
NPAFC*	North Pacific Anadromous Fish Commission
NPRB*	North Pacific Research Board
PSA	Pacific Science Association
PaCOS*	Pacific Coast Observing System (PaCOS)
PNW-IOOS*	Pacific Northwest Integrated Ocean Observing System
PORSEC	Pacific Ocean Remote Sensing Conference
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
SAHFOS*	Sir Alister Hardy Foundation for Ocean Science
SCOPE	Scientific Committee on Problems of the Environment
SCOR*	Scientific Committee on Oceanic Research
SOLAS*	Surface Ocean Low Atmosphere Study

SB-2004

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 10

**Proposal to develop an international “Year of the euphausiid” study: Comparative life history of euphausiids in continental shelf and slope waters around the Pacific Rim
(by William T. Peterson)**

Background

Euphausiids are among the most important links in coastal and oceanic food webs, transferring energy from primary and secondary producers to higher trophic level animals such as salmon, herring, sardines, mackerels, Pacific whiting, sablefish, many rockfish species, auklets, shearwaters, and whales. Given their importance in the food chain, euphausiids may be regarded as a keystone sentinel taxa. Some may find it surprising to learn that we have information on the seasonal cycles of abundance, feeding, and reproduction or growth rates of these animals from only a few places around the Pacific Rim. Far more comparative studies will be needed if we are to understand their trophic status and how climate change may affect their population dynamics.

Many scientists within PICES have made great progress in applying NEMURO and ECOSIM models to the study of ecosystem dynamics, **but estimates of euphausiid biomass and rates in these models represent “best guesses” in most cases.** PICES would greatly benefit from a program that will provide the euphausiid biomass and rates needed to parameterize properly the euphausiid component of these models. Improvements to the models will result in a tool that will allow us to investigate quantitatively the role of euphausiids in food chain dynamics.

At PICES XIII, we have seen the power of NEMURO coupled to 3-D physical models (Komatsu, Yamanaka). Their work is exciting

because it demonstrates that we are close to being able to examine potential impacts of climate variability and climate change on plankton population dynamics. We need to include euphausiids (ZP) in those models.

Both NEXT and CFAME call for efforts to compare life histories of key species in coastal ecosystems around the Pacific Rim. Euphausiids would be a great choice for a comparative study.

Proposal

PICES scientists are uniquely capable of increasing our understanding of euphausiids because many oceanographic transect lines are routinely sampled for hydrography and zooplankton. However sampling of euphausiids is not generally carried out. With some training, PICES scientists could learn how to include sampling of euphausiids and could add measurements of reproduction, molting and growth rates to their monitoring programs.

Standardization of sampling methods will be necessary and that could be accomplished by following written sampling protocols. Training in how to carry out rate measurements can be done during a PICES-sponsored “hands-on” training session at a marine laboratory or at sea, and/or through visits by individual scientists to laboratories where such work is routinely done (*e.g.*, the Peterson lab in Newport, Oregon).

Should PICES agree that it is a good idea to improve our understanding of euphausiids, one

species of euphausiid is of special interest - *Euphausia pacifica*. This species ranges from the cool upwelling regions off Mexico, north through the waters of California, Oregon, Washington and British Columbia, into the downwelling environment of the Gulf of Alaska, and across the Pacific in the Transition Zone, then south through the western Pacific from Russia to China. In the western Pacific this species inhabits regions where temperatures range from sub-arctic to sub-tropical (the Oyashio, the Kuroshiro, the Japan/East Sea, and the East China and Yellow Seas). There are few species that occupy such a wide variety of ecosystems and such a wide range of latitudes. Thus, we ask:

- “What are the unique characteristics of the life history of this cosmopolitan euphausiid species that allows it to not only populate,

but dominate such a wide variety of ecosystems?”

- How do populations in the eastern and western Pacific respond to ENSO and PDO cycles?
- How do individuals manage to survive year-round in the very warm water regions of the Yellow Sea, East China Sea and Japan/East Sea?
- How do they deal with low primary production in winter in the Northern California Current, Gulf of Alaska and Transition Zone?

Finally, members of the genus *Thysanoessa* are key components of coastal systems in cooler regions around the Pacific Rim and thus should be part of a comparative study.

SB Endnote 11

PICES XIV Annual Meeting Theme (Vladivostok, Russia)

“Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions”

There are many examples of statistical correlations that demonstrate relations between climate or human impacts and ecosystems. While retrospection may be informative in revealing patterns, it rarely leads to mechanistic understanding required for eventual prediction. This Science Board Symposium instead will focus on physical and biological mechanisms in the marginal seas and shelf regions. Many coastal species have life histories/cycles that rely on specific geographic features and they may be particularly vulnerable to the effects of human activities and climate variability. In order to predict the impacts of climate and human activities we need to understand the mechanisms responsible for shifts in ecosystem structure and function. We will consider “wind to whales” in

this session. This theme will provide opportunities to address questions such as: How widespread is bottom-up control of fluxes? At what spatial and temporal scales are: (i) trophodynamic demands and food supply in balance?, (ii) signals amplified in food webs? and (iii) physical processes most important in impacting marine populations? The human impacts that could be considered include, fishing and fisheries enhancement, changes in biodiversity, petroleum development, eutrophication, mariculture, non-point source pollution, and others.

Convenors of this session are the members of Science Board.

SB Endnote 12

**Theme for PICES XV (Japan)
“Boundary Current Ecosystems”**

The North Pacific is surrounded by boundary currents (*e.g.*, Kuroshio, Tsushima, Oyashio, California, Alaska, Bering Slope) that support a diversity of ecosystems. These ecosystems are highly variable in space and time due to combinations of climate change, decadal “regime” shifts, ENSO and other interannual variability, seasonal and event meso-scale dynamics. This variability has led to dramatic changes at both low and high trophic levels, including productivity, range extensions and species dominance. This theme will provide opportunities to address questions such as:

- How will climate variation and projected climate change influence the dynamics and variability of boundary currents?

- How will boundary current ecosystems respond to these physical property and transport changes?
- How does human activity (*e.g.*, fishing, hatcheries) alter the sensitivity of boundary current ecosystems to natural environmental forcing?
- What are appropriate management strategies to maintain healthy, sustainable living marine resources in boundary current systems that experience large environmental variations?

Presentations that describe, compare and/or contrast biology, fisheries, physics, and geochemistry of boundary currents and the ecosystems they support are encouraged.

REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

03

03

The meeting of the Biological Oceanography Committee (BIO) was held from 13:30-17:45 hours on October 17, 2004. The Chairman, Dr. Vladimir I. Radchenko, called the meeting to order and welcomed members and guests (*BIO Endnote 1*). Attendees were informed that Dr. Young-Shil Kang became the new BIO member from Korea, replacing Dr. Jae-Hyung Shim. However, she left the meeting one day earlier for another engagement.

The Committee reviewed the agenda, and some items were added. Dr. Tsutomu Ikeda suggested moving the discussion of the new scientific project “An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean” from Agenda Item 10 (“High priority projects”) to Agenda Item 6 (“Items with financial implications”), since presenters would like to propose a workshop in the near future. Dr. Sinjae Yoo informed the Committee about a request from CREAMS (*Circulation Research in East Asian Marginal Seas*) to endorse an Advisory Panel for a CREAMS/PICES Program with the inclusion of biological and fisheries research, and asked to have this item included in the agenda. The revised agenda is presented as *BIO Endnote 2*. Dr. Angelica Peña agreed to serve as rapporteur.

Election of new BIO Committee Chairman (Agenda Item 3)

Since the PICES Executive Secretary must be present for the election of the Committee Chairman, this item was postponed and discussed after Agenda Item 13. Dr. Radchenko reviewed the PICES Rules of Procedure on elections and informed the Committee members on nomination procedures. Dr. Michael J. Dag (U.S.A.) was elected as the new BIO Chairman by acclamation, with the term of his appointment (2004-2007) to begin immediately after the close of the PICES Thirteenth Annual Meeting.

Progress reports of existing subsidiary bodies and proposals for new subsidiary bodies (Agenda Item 4)

WG 14 on *Effective sampling of micronekton*

Dr. Richard D. Brodeur informed the Committee that the final draft of the WG 14 report was completed this summer and sent to BIO and Working Group members for review. At the end of August 2004, this draft report was placed on the PICES website. Now the final report is ready to be published. Dr. Patricia A. Wheeler complemented the report but suggested some editorial changes. The Committee officially approved the WG 14 report for publication in the PICES Scientific Report Series.

Dr. Brodeur also reported that a special issue of *Journal of Marine Systems* on “The role of biophysical coupling in concentrating marine organisms around shallow topographies” was published in September 2004 (Vol. 50, Nos. 1-2). This volume comprises of selected papers from the BIO/POC/FIS Topic Session convened at PICES XI (October 2002, Qingdao, China).

Advisory Panel on *Micronekton sampling inter-calibration experiment (MIE-AP)*

Dr. Michael P. Seki, MIE-AP Co-Chairman, reported on a pilot micronekton inter-calibration cruise conducted onboard the NOAA ship *Oscar Elton Sette* in central North Pacific waters off the west side of Oahu Island, and the follow-up MIE-AP workshop on “Micronekton sampling gear inter-calibration experiment” with attendance of all cruise participants. The report of the MIE-AP meeting/workshop is included elsewhere in this Annual Report. A presentation was given on the preliminary results from the cruise. Different gears resulted in different catches since they had different mesh sizes. The question has arisen – what is the standard to be selected for future studies?

After the successful pilot cruise, MIE-AP is planning a new field experiment in the Bering Sea or subarctic Pacific. To be better prepared for the next cruise, the Panel requested some changes in the current membership and chairmanship:

- Dr. Evgeny Pakhomov (Canada) to continue as MIE-AP Co-Chairman;
- Dr. Michael Seki (U.S.A.) to step-down as Co-Chairman, but to remain as a member of the Panel;
- Dr. Orio Yamamura (Japan) to be added to the Panel and become a Co-Chairman;
- Additional members from under-represented countries be nominated to the Panel.

The Committee supported these recommendations and will direct them to Science Board.

Advisory Panel on Marine bird and mammals (MBM-AP)

Dr. Hidehiro Kato reported on MBM-AP activities during the interim period, and Dr. William J. Sydeman presented the results of the MBM-AP workshop on “Combining data sets on diet of marine birds and mammals II” held October 14, 2004, immediately prior to the Panel meeting. The report of the MBM-AP meeting and the summary of the workshop are included elsewhere in this Annual Report.

MBM-AP is asking for a special PICES issue in a peer-reviewed journal such as *Progress in Oceanography*. About 10 papers presented at the 2003 and 2004 MBM-AP workshops on “Combining data sets on diet of marine birds and mammals” are available for this publication. For PICES XIV (October 2005, Vladivostok), MBM-AP proposed a 1-day workshop on “Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea” (*MBM-AP Endnote 4*) and a 1-day Topic Session (to be convened jointly by BIO, FIS and POC in collaboration with MONITOR and TCODE) “Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations” (*MBM-AP Endnote 5*).

MBM-AP has completed five years of its work, and at the 2004 interim Science Board meeting,

BIO was requested to review and evaluate the Panel’s progress to date. The Committee received some feedback on new directions, goals, and updated terms of reference from the MBM-AP Co-Chairmen (*BIO Endnote 3*). It was suggested that fish species, which are top predators in the North Pacific ecosystems, be also included in the MBM-AP scope of studies to attract new members from countries other than Japan and the United States. Dr. Dagg raised the question of how to solve problems of standardizing observations due to different observers? Dr. Sydeman responded that if there is interest, MBM-AP could train observers from different countries. After the discussion, the MBM-AP performance was highly evaluated, and a new 5-year term for the Panel was approved. The Panel was requested to develop a Strategic Plan and a vision for the next term.

Proposals for new subsidiary bodies

No new subsidiary bodies were proposed. Dr. Radchenko briefly informed the Committee on the recommendation of the Study Group on *Ecosystem-based management science and its application to the North Pacific* to establish a Working Group on this topic, under the direction of FIS and MEQ.

Business from the last year’s meeting (Agenda Item 5)

Dr. Radchenko reviewed the status of inter-sessional meetings, publications and travel requests proposed at PICES XII.

The PICES-IFEP workshop on “*In-situ* iron enrichment experiments in the eastern and western subarctic Pacific” was held February 11-13, 2004, in Victoria, Canada. The goal of the workshop was to review the results and outstanding questions from previous iron enrichment experiments, and to discuss plans for the second longer-term experiment (SEEDS-II) in the western subarctic Pacific. 26 scientists from Canada, Japan and U.S.A. attended the meeting. The results of the workshop have been reported in PICES Press (July 2004, Vol. 12, No. 2), and will be published as a PICES Scientific Report in 2004 or early 2005.

Travel funds for invited speakers provided by PICES upon the request of BIO, were divided between the two Topic Sessions at PICES XIII on “Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?” and on “Role of gelatinous zooplankton in coastal and oceanic ecosystems”. Dr. George L. Hunt emphasized that the former Topic Session also received financial support from the Alaska Fisheries Science Center and other U.S. agencies, and that ensured good attendance and will be helpful in preparing a special PICES issue of *Progress in Oceanography* for publication. Full travel support was also provided for 1 invited speaker to the MBM-AP workshop at PICES XIII on “Combining data sets on diets of marine birds and mammals - Phase II”.

There are no special publications from last year’s BIO Topic Sessions. The status of supported publications is as follows:

- The final WG 14 report will be published in the PICES Scientific Report Series in early 2005;
- A special issue of *Journal of Marine Systems* on “The role of biophysical coupling in concentrating marine organisms around shallow topographies” (Guest Editors: J.F. Dower and R.D. Brodeur) was published in September 2004 (Vol. 50, Nos. 1-2);
- The North Pacific Ecosystem Status Report (the Jeju edition) is now available on the PICES website.

Items with financial implications (Agenda Item 6)

Inter-sessional meetings proposed for 2005 and beyond

Dr. Hunt emphasized the importance of the forthcoming GLOBEC Symposium (co-sponsored by PICES) on “Climate variability and sub-Arctic marine ecosystem” (May 16-20, 2005, Victoria, Canada).

Drs. Charles B. Miller and Tsutomu Ikeda presented a multi-national project entitled “An east-west comparative study of lower trophic

level pelagic ecology in the subarctic Pacific Ocean” (*BIO Endnote 4*). Groups of scientists on the respective sides of the ocean will develop programs for their regions, sustaining communication between the groups. A workshop is proposed in the spring of 2005 (with participation of approximated 20 scientists, 10 from each side of the Pacific) to initiate this communication and to examine all of the basic issues, looking toward actual expeditions in 2007 or 2008. PICES was asked for endorsement and financial support for the 2005 spring workshop (maybe two persons from each side of the Pacific). The proposal was well received by BIO members. It fits well into PICES objectives, and therefore the Committee requested as much support as possible from PICES.

Dr. Peña reported on the request to PICES for logistical support and minor travel support (1 or 2 invited speakers) for a 3-day symposium celebrating the 50th anniversary of sampling along Line-P and at Station PAPA planned for 2006, or 2007. The Committee recommended continuing the discussion of this request at the 2005 interim Science Board meeting.

Support for a new SCOR Working Group on Global comparisons of zooplankton time series

Dr. Peña informed the Committee that SCOR approved the formation of a Working Group on *Global comparisons of zooplankton time series* (Co-Chairmen: Drs. David L. Mackas and Hans Verheye). At the 2004 interim meeting, Science Board suggested that PICES provide funding for one additional member (from PICES) to participate in this Working Group, should it be accepted by SCOR. BIO members strongly supported this recommendation.

Proposed publications for 2005 and beyond

Three publications are expected from this year’s BIO Topic Sessions and workshops:

- A *Progress in Oceanography* special issue based on selected papers presented at the BIO Topic Session on “Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?”;

- A *Deep-Sea Research II* special issue based on selected papers presented at the BIO/FIS Topic Session on “Hot spots and their use by migratory species and top predators in the North Pacific”;
- A special volume of a leading international journal resulting from the 2003 and 2004 MBM-AP workshops on “Combining data sets on diet of marine birds and mammals”.

Travel support requests

The Committee supports the following requests:

- Travel funds for MIE-AP cruise participants, if another micronekton sampling inter-comparison will be carried out;
- 1 invited speaker for the proposed MBM-AP workshop on “Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea” at PICES XIV;
- 2 invited speakers for the proposed Topic Session on “Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations” at PICES XIV.

Other items with financial implications

On behalf of CREAMS, Dr. Yoo asked for endorsement of an Advisory Panel for a 3-year CREAMS/PICES Program on East Asian Marginal Seas, with the inclusion of biological and fisheries research. A proposed workplan for the Panel includes convening three joint CREAMS/PICES workshops in 2005-2007 (*POC Endnote 4*). Minor travel support was requested from PICES for the first workshop on “East Asian Seas Time Series” to be held in the spring of 2005. BIO supported the formation of the Advisory Panel and the request for travel.

The Committee discussed and prioritized requests for workshops and travel:

- The first priority is the start-up workshop for the project “An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean”;
- The second priority is the micronekton inter-calibration cruise (MIE-AP was requested to present a formal report on Panel activity and future directions as condition for this

support). Another second level priority item is the 2005 CREAMS/PICES workshop on “East Asian Seas Time Series”;

- The third priority is the MBM-AP workshop at PICES XIV. This workshop, could be deferred for 1 year if there are not enough funds.

Dr. Radchenko noted that travel funds being allocated by PICES for invited speakers are traditionally distributed among sessions sponsored by the Committee.

Scientific sessions supported by BIO at PICES XIII (Agenda Item 7)

At PICES XIII, BIO convened four sessions, and each session had a Committee member among conveners:

- a 1½-day BIO Topic Session (S2) on “Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?” (Dr. Kishi);
- a ½-day BIO Topic Session (S3) on “Role of gelatinous zooplankton in coastal and oceanic ecosystems” (Dr. Brodeur);
- a 1-day BIO/FIS Topic Session (S4) on “Hot spots and their use by migratory species and top predators in the North Pacific” (Dr. Kato);
- ½-day BIO Paper Session (Dr. Radchenko).

Summaries of all sessions are included elsewhere in this Annual Report. Science Board recommended that the winner of the BIO Best Presentation Award be selected from eligible papers presented at the Topic Sessions S2 and S3, and at the BIO Paper Session.

Topic Session proposals for PICES XIV (Agenda item 8)

Two Topic Sessions were proposed for PICES XIV:

- a 1-day BIO/FIS Topic Session on “Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations” (*MBM-AP Endnote 5*);
- a ½-day BIO Topic Session on “Comparative life history of euphausiids around the Pacific rim” (*BIO Endnote 5*).

It was emphasized that the approved list of PICES XIV Topic Sessions (including draft descriptions and potential conveners) must be presented to the Science Board Chairman before the Closing Ceremony.

It was also reiterated that BIO supports the MBM-AP request to convene a 1-day workshop on “Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea” (*MBM Endnote 4*).

Theme for PICES XV (Agenda item 9)

The Committee suggested two potential themes for PICES XV (October 2006, Japan):

- Linking scientific disciplines to understand and predict ecosystems;
- North Pacific links to global processes/issues.

High priority projects (Agenda item 10)

A proposal for a multi-national project entitled “An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean” (*BIO Endnote 4*) was considered under Agenda Item 5 and strongly supported by BIO.

Discussion of the PICES Strategic Plan and BIO Committee contribution to the PICES Action Plan (Agenda Item 11)

Discussion focused on several questions:

- How will the Committee contribute to the PICES Action Plan?
- What are the priority issues of BIO for the next 3-5 years (these issues must be reflected in the BIO Strategic Plan, which is developed but needs to be updated)?
- How will the Committee address the goals of PICES and BIO?

Dr. Wheeler suggested including benthos, and Dr. Peña recommended elaborating more on the use of satellite data (particularly ocean color data) in point 4 of the existing Strategic Plan. Both issues could be covered in the section on “understudied” areas. Efforts to validate satellite ocean color data could be carried out in

collaboration with SYMBIOS, which is working on comparing satellite imagery with shipboard data already in hand. This work can be undertaken together with the new MONITOR Technical Committee.

The Committee agreed to work by e-mail with the aim to refine the BIO Strategic (Action) Plan, and prioritize efforts for the next 3 years before the interim Science Board meeting in the spring of 2005. As a part of this work, the Committee should also discuss PICES Capacity Building opportunities (Agenda Item 16).

Discussion of potential topics toward the next major PICES scientific program(s) (Agenda Item 12)

It was agreed that the North Pacific Ecosystem Status Report might serve as a source of guidance and ideas for future major PICES programs.

PICES website: Contributions from BIO (Agenda item 13)

The BIO Chairman will be submitting information for the PICES website. It was suggested that a temporary site be set up where material could be posted for Committee members’ review and approval before formal appearance on the BIO web page.

Discussion of developing a Vice-Chairman position for BIO (Agenda item 14)

BIO members see no need for appointing a Vice-Chairman unless this person will serve as the next Committee Chairman, and can attend Science Board meetings.

Another suggestion was to have a Vice-Chairman with a term of appointment shifted for one year relative to the Chairman’s term. It would facilitate the exchange of experience and knowledge with the new Chairman (or Vice-Chairman) and ensure a good continuity within the Committee.

It was recommended that the discussion of this issue be continued within the Science Board.

Relations with international organizations and programs (Agenda item 15)

Committee members again emphasized the importance of closer links with GLOBEC International, CLIVAR, GOOS and ICES for BIO activities.

Dr. Kato, PICES representative to the International Whaling Commission (IWC), reported on the 2004 IWC Scientific Committee meeting. There were no items considered that were related to PICES activities. However, IWC indicated their intention to encourage development of a scientific project for future cooperation with PICES. BIO approved the report by Dr. Kato and suggested continuing the connection with IWC.

Discussion of PICES Capacity Building opportunities (Agenda Item 16)

Dr. Dagg commented that the biggest problem with capacity building is to find out what can be done using a “no cost” approach, because PICES is unlikely to have additional resources to devote to this. One proposal was to have a social session (1-2 hr) that involves BIO members and students interested in biological oceanography who are already at the Annual Meeting. It was also proposed that students awarded the best presentation at the Topic Sessions should obtain funds to attend the next PICES scientific meetings or symposia.

BIO Endnote 1

Members

Richard D. Brodeur (U.S.A.)
Michael J. Dagg (U.S.A.)
Tsutomu Ikeda (Japan)
Hidehiro Kato (Japan)
Michio J. Kishi (Japan)
Angelica Peña (Canada, rapporteur)
Vladimir I. Radchenko (Russia, Chairman)
Patricia A. Wheeler (U.S.A.)
Sinjae Yoo (Korea)
Ming-Yuan Zhu (China)

2004 BIO Best Presentation Award (Agenda item 17)

Akinori Takasuka (Japan) won the BIO Best Presentation Award for his paper “Differential optimal temperatures for growth of larval anchovy and sardine” (co-authored by Yoshioki Oozeki, Ichiro Aoki, Ryo Kimura, Hiroshi Kubota and Takashi Yamakawa). Honourable Mention from BIO went to Vladlena Gertseva (U.S.A.) for her paper “Juvenile salmon survival in coastal waters of the Northeast Pacific Ocean: Top-down or bottom-up control?” (co-authored by Thomas Wainwright and Vladimir Gertsev). Both papers were given at the Topic Session on “Mechanisms that regulate North Pacific ecosystems: Bottom-up, top-down, or something else?”.

Other business (Agenda Item 18)

The Committee recommended two PICES representatives to serve on the Steering Committee of the 4th Zooplankton Production Symposium (2007, Hiroshima, Japan), co-sponsored by PICES, ICES and GLOBEC: Dr. Michael J. Dagg (as a PICES Convenor) and Dr. David L. Mackas (as a member).

Preparation of report to Science Board (Agenda Item 19)

Dr. Radchenko expressed his great appreciation to Dr. Peña for serving as the rapporteur.

Participation List

Observers

Harold P. Batchelder (U.S.A.)
George L. Hunt (U.S.A.)
Oleg N. Katugin (Russia)
Charles B. Miller (U.S.A.)
Kazushi Miyashita (Japan)
Jeffrey Napp (U.S.A.)
R. Ian Perry (Science Board Chairman)
Michael P. Seki (U.S.A.)
Phillip Taylor (U.S.A., NSF)
William T. Peterson (U.S.A.)
Alexander Bychkov (PICES Exec. Secretary)

BIO Endnote 2

BIO Meeting Agenda

1. Welcome and introduction of members
2. Approval of agenda
3. Election of new BIO Committee Chairman
4. Progress reports of existing subsidiary bodies and proposals for new subsidiary bodies:
 - a. WG 14 on *Effective sampling of micronekton*
 - b. Advisory Panel on *Micronekton sampling inter-calibration experiment*
 - c. Advisory Panel on *Marine birds and mammals*
 - d. Proposals for new subsidiary bodies
5. Other business from last year's meeting
6. Items with financial implications:
 - a. Inter-sessional meetings proposed for 2005 and beyond
 - b. Support for a new SCOR Working Group on *Global comparison of zooplankton time series*
 - c. Proposed publications for 2005 and beyond
 - d. Travel support requests
 - e. Other items with financial implications
7. Scientific sessions supported by BIO:
 - a. *Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?*
 - b. *Role of gelatinous zooplankton in coastal and oceanic ecosystems*
 - c. *Hot spots and their use by migratory species and top predators in the North Pacific*
 - d. *BIO Paper Session.*
8. Topic session proposals for PICES XIV in Vladivostok, Russia
9. Theme for PICES XV
10. High priority projects
11. Discussion of the PICES Strategic Plan and BIO Committee contribution to the PICES Action Plan
12. Discussion of potential topics toward next major PICES scientific program(s)
13. PICES website: Contributions from BIO
14. Discussion of developing a Vice-Chairman position for BIO
15. Relations with international organizations and programs
16. Discussion of PICES Capacity Building opportunities
17. 2004 BIO Best Presentation Award
18. Other business
19. Preparation of report to Science Board

BIO Endnote 3

Advisory Panel on *Marine bird and mammals*: Evaluation and future activities (submitted by MBM-AP Co-Chairmen, Drs. Hidehiro Kato and William J. Sydeman)

Future directions

BIO is the parent committee of the Advisory Panel on *Marine bird and mammals* (MBM-AP). At the MBM-AP meeting held at PICES XIII (October 14, 2004), attendees supported the continuation of the Panel beyond the initial 5-year term as a specialist group for BIO and the PICES community in general.

The current terms of reference for MBM-AP are as follows:

- Provide information and scientific expertise to BIO, CCCC Program, and when necessary, to other scientific and technical

committees with regard to the biology and ecological roles of marine mammals and seabirds;

- Identify important problems, scientific questions, and knowledge gaps in assessing the roles of marine mammals and seabirds in marine ecosystems;
- Assemble relevant information on the biology of marine mammals and seabirds and disseminate it to the PICES community through scientific reports and symposia;
- Develop strategies to improve collaborative, interdisciplinary research with marine mammal and seabird researchers and PICES.

MBM-AP members believe that these terms of reference accurately reflect the general goals of the group. However, these are flexible and may require minor revision with changes in other PICES activities. Furthermore, it is noted that many fish (*e.g.*, herring, salmonids, tunas) feed on the same trophic levels as many marine birds and mammals, and apex predators (*e.g.* sharks). Therefore, greater linkage between MBM-AP and FIS is desirable. MBM-AP is also working closely with MONITOR and the CPR Advisory Panel on the Pacific Continuous Plankton Recorder – Marine Bird and Mammal Program (see below). MBM-AP would also enhance links with other PICES groups (MODEL).

Evaluation

Over the past 5 years, MBM-AP has been productive, hosting 4 workshops and 2 Topic Sessions. The workshop at PICES IX (October 2000, Hakodate, Japan) focused on methods to estimate densities of marine birds and mammals at sea. The workshop at PICES XI (October 2002, Qingdao, China) addressed the effects of prey availability on top predators, from fish to marine mammals. The two most recent workshops at PICES XII (October 2003, Seoul, Korea) and PICES XIII (October 2004, Honolulu, U.S.A.) investigated spatial and temporal variability in food habits for well-studied marine birds and mammals in the North Pacific.

The Topic Sessions hosted by BIO at PICES XIII, with support of MBM-AP, were: “Mechanisms that regulate North Pacific ecosystems: bottom-up, top-down, or something else?” and “Hotspots and their use by migratory species and top predators in the North Pacific”.

Finally, starting in June 2002, observations of marine birds and mammals were added to the North Pacific CPR survey lines. The bird and mammal observation augment the CPR program by providing a more comprehensive perspective of change in North Pacific marine ecosystems. Eight trans-Pacific surveys have been conducted

to date, with plans in place to continue tri-annual surveys through March of 2006. This project will provide new information on top predator densities across the North Pacific, and how their distribution and abundance varies by season and year. These data will be used to address seasonal and inter-annual variation in prey consumption and will provide information on ecosystem “health”, which may be useful in fisheries management.

Vision statement

MBM-AP will continue and enhance its strategic goal of understanding spatio-temporal patterns of ecosystem variations in the PICES region in relation to physical oceanography and climate change. Specifically, our strategic efforts for the next 5-10 years are as follows:

- calibration of the use of top predators as North Pacific ocean climate, ecosystem, and food web indicators and samplers;
- application of top predator time series and habitat models in ecosystem-based fisheries and regional ocean management (*e.g.*, marine conservation areas), addressing the primary question -- how and when can top predator time-series be used in marine ecological forecasting and fisheries stock prediction?;
- examination of oceanographic and marine ecological factors affecting the biogeography of top predators in the North Pacific;
- development of technology for operational oceanography: using top predators as sampling platforms;
- augmentation of long-term fisheries oceanography programs with the addition of marine bird and mammal datasets, to provide a deeper context for understanding coupled climate-ecosystem fluctuations;
- updating the report of WG 11 on *Consumption of marine resources by marine birds and mammals in the PICES region* (PICES Scientific Report No. 14, 2000) by 2012.

BIO Endnote 4

Proposal for a project on “An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean” (by Drs. Charles B. Miller and Tsutomu Ikeda)

PICES has designated the subarctic zone of the Pacific Ocean as its focal interest for fisheries management and ocean ecology. Oceanic sectors of this region have been conclusively shown by the SERIES and SEEDS iron-enrichment experiments to have iron-limited production at least part of the year, which explains in a general way their “high-nitrate, low-chlorophyll” (HNLC) character. Unanswered questions remain about lower trophic level production throughout the region. We ask PICES to assist in promoting observational studies to answer these questions.

First, west and east sectors differ in the seasonal sequence of production events. In much of the western gyre, represented by Site H studied by Japanese scientists, there is a strong April – May phytoplankton bloom after water column stabilization, followed by an iron-limited production regime through summer and autumn. In the east, iron-limitation is continuous, but the same spring period of water column stabilization sustains a sharp increase in primary production rates without a phytoplankton stock increase. Fully exploring the contrast between these ecosystems, particularly the difference in natural (unaugmented) iron availability to phytoplankton, requires comparative examination of the two oceanic sectors during their spring transition periods, preferably in the same year.

Second, the eastern sector with continuous iron limitation shows approximately 6-10 day oscillations in phytoplankton stock (~ 0.15 to $0.5 \mu\text{g chlorophyll L}^{-1}$) and ammonia. As phytoplankton stock goes down, ammonia goes up, then the reverse. The upper limit for the typical nanophytoplankton may be set by iron availability (not directly nitrogen, since nitrate is always $6 \mu\text{M}$); whereas there is no clear idea of what sets the lower limit, why phytoplankton stocks do not go lower. Microheterotroph (protozoan) grazing is coupled to this cycle, certainly causing the periodic recycling of nitrogen. Some feature of that grazing, possibly

protozoans eating each other when phytoplankton becomes scarce, could regulate the low points of the cycle. Understanding these rapid oscillations of HNLC trophic relations will be best approached through time series analysis of phytoplankton, nutrients and grazers during the spring transition when the system goes through its greatest variation in overall productivity.

Third, the spring transition in both ecosystems supports the annual growth periods of four species (three *Neocalanus* spp. and *Eucalanus bungii*) of interzonal migrating copepods, the main contributors to subarctic mesozooplankton biomass, during the spring transition. In the west they can feed on the abundant diatom production of the spring bloom. In the east they are more food-limited, primarily eating protozoa and reaching smaller sizes at their entry to diapause (with associated descent to depth, the so-called interzonal migration). Comparative west and east studies of their growth rates would show the differential effects of high versus low food abundance for these species. Newly developed, biochemical estimators of growth rate, tools not available to earlier studies, would facilitate the comparison.

All of these objectives, and others as well, could be achieved by comparative expeditions during the spring transitions in the western and eastern subarctic Pacific gyres, preferably in the same year. These would be long cruises, probably 50 or more days, possibly of two legs each. Scientists from Asia would most readily mount the western one, workers from Canada and the United States undertake the eastern one. The necessary levels of cooperation and communication to achieve fully comparable studies in each area can be greatly facilitated by PICES. Therefore, we respectfully request that the Biological Oceanography Committee (BIO) endorse this project and recommend it to the attention of the Governing Council. We are still searching for an excitement-generating name for this project and will forward it to BIO soon.

Groups of scientists on the respective sides of the ocean will develop programs for their regions, sustaining communication between the groups. We propose to initiate this communication with a workshop to examine all

of the basic issues in the spring of 2005, looking toward actual expeditions in 2007 or 2008. We also ask that BIO endorse this workshop, for which we will seek support from national funding agencies.

BIO Endnote 5

Proposal for a 1/2-day BIO Topic Session at PICES XIV on “Comparative life history of euphausiids around the Pacific Rim”

Euphausiids are among the most important links in coastal and oceanic food webs, transferring energy from primary and secondary producers to higher trophic level animals such as salmon, herring, sardines, mackerels, Pacific whiting, sablefish, many rockfish species, auklets, shearwaters, and whales. Given their importance in the food chain, euphausiids may be regarded as a keystone sentinel taxa. Moreover, many PICES scientists are interested in formulating ecosystem models that parameterize better the euphausiid component. This session will invite scientific papers that

review and discuss results of research on the ecology and life history of euphausiids in the North Pacific Ocean, with a focus on comparative studies in continental shelf and slope waters around the Pacific Rim.

Recommended convenors: William T. Peterson and Michael J. Dagg (U.S.A.), and Anatoly F. Volkov (Russia).

Travel support is requested for two invited speakers.

REPORT OF FISHERY SCIENCE COMMITTEE



The meeting of the Fishery Science Committee (FIS) was held from 13:30-17:30 hours on October 17, 2004. The Chairman, Dr. Yukimasa Ishida, called the meeting to order and welcomed the participants. The meeting was attended by 12 FIS members and 21 observers representing all PICES member countries except China (*FIS Endnote 1*). Dr. Michael Schirripa kindly served as rapporteur.

The Chairman reviewed the proposed agenda (*FIS Endnote 2*) and noted that Agenda Item 17 (PICES website: contributions from FIS) and Agenda Item 19 (Discussion of potential topics towards next major PICES science program) should be discussed by e-mail due to time limitation. The agenda was approved as presented.

Implementation of PICES XII decisions (Agenda Item 3)

At PICES XIII, FIS co-sponsored a 1-day FIS/BIO Topic Session on “Hot spots and their use by migratory species and top predators in the North Pacific” and a ½-day FIS Paper Session. Summaries of the sessions are included elsewhere in this Annual Report.

Progress report of WG 16 on *Climate change and fisheries management* (Agenda Item 4a)

Dr. Richard Beamish submitted an electronic copy of the draft WG 16 report to the FIS Chairman. The report is approximately 85% complete. The contribution by the United States is not yet complete, and forthcoming. A final draft will be completed in the summer of 2005, and the report will be ready for publication in the PICES Scientific Report Series later in 2005. Some issues need to be addressed prior to the finalization of this report. These include the necessity to properly match FAO catches, standardization of the use of species names among countries, and standardized report formatting.

Progress report of WG 18 on *Mariculture in the 21st century* (Agenda Item 4b)

The FIS/MEQ Working Group 18 on *Mariculture in the 21st century – The intersection between ecology, socio-economics and production*, met on October 16, 2004, and had a successful meeting. The WG 18 Co-Chairman, Dr. Carolyn S. Friedman, described the results of the meeting and a workplan. Also, she outlined a possible related session to be convened at PICES XIV. The WG 18 report is included elsewhere in this Annual Report.

Progress report of SG on *Ecosystem-based management science and its application to the North Pacific* (Agenda Item 4c)

The MEQ/FIS Study Group on *Ecosystem-based management science and its application to the North Pacific* (SGEBM), met on October 14, 2004, and the report of this meeting is included elsewhere in this Annual Report. The SGEBM Co-Chairman, Dr. Glen Jamieson, made a presentation on the progress of the Study Group. Dr. George Boehlert noted that the discussion at the Study Group meeting was very broad and could cover a large number of subject areas. Dr. Beamish asked the question “who is actually doing ecosystem-based management today?” Nonetheless, ecosystem-based management remains a goal in many countries. The presentation concluded with a suggestion for a joint MEQ/FIS Topic Session, either half or full day, on “Ecosystem indicators and models” (*SGEBM Endnote 4*).

Proposal for a new Working Group (Agenda Item 5)

Based on the report from the Study Group on *Ecosystem-based management science and its application to the North Pacific*, FIS discussed a possible new Working Group on *Ecosystem-based management science* (WGEBM). It was pointed out that although ecosystem-based

management is a difficult topic, ICES has had some success in its efforts, as shown in a presentation by Dr. Chris Frid at PICES XII. The ICES General Secretary, Dr. David Griffith, welcomed PICES scientists to work with the ICES effort in this area. In general, FIS members from all countries represented at the meeting supported this proposal (*SCEBM Endnote 3*) but noted that the terms of reference are a bit broad, given the time available. Some FIS members wondered whether the ecosystem effects of fishing should be made a focus. It was suggested to clarify the proposal and recommended that habitat degradation and protection be included in the terms of reference. In conclusion, FIS agreed to support the establishment of the Working Group on *Ecosystem-based management science and its application to the North Pacific*, under the direction of FIS and MEQ.

Inter-sessional meetings (Agenda Item 6)

No inter-sessional meetings are proposed.

Topic Session and workshop proposals for PICES XIV (Agenda Item 7)

The theme for PICES XIV is “Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions”. Four session topic proposals were considered by FIS:

- a 1-day FIS/CCCC Topic Session on “Evidence of distributional shifts in demersal fish in relation to short- and long-term changes in oceanographic conditions” (*FIS Endnote 3*); this topic was supported, however, it was suggested that demersal invertebrates as well as human impacts that may lead to changes in distribution should be included;
- a ½-day MEQ/FIS Topic Session on “Current and emerging issues of marine and estuarine aquaculture in the Pacific Region: carrying capacity, ecosystem function and socioeconomics” (*WG 18 Endnote 5*); there was general support for this topic from all members;
- a 1-day MEQ/FIS Topic Session on “Ecosystem indicators and models” (*SCEBM Endnote 4*); FIS suggests that this

session would be premature for PICES XIV but should be considered for the following PICES Annual Meeting;

- a ½-day “Modeling climate and fishing impacts on fish recruitment” (*MODEL Endnote 4*); FIS members felt that this topic might be more appropriate as a workshop.

FIS was reminded that a Topic Session entitled “Cold and deep sea corals” will be proposed for the 2006 Annual Meeting due to a conflict with another symposium on corals in 2005.

FIS considered the issue of maintaining a FIS Paper Session. Some members thought that this was a good way to keep opportunities open for students to give presentations. There was general support for holding the FIS Paper Session in 2005 for a half-day.

Requests for travel support (Agenda Item 8)

FIS expects that funds (~CDN \$5,000) will be available for invited speakers of FIS-supported Topic Sessions at PICES XIV.

The WG 16 Co-Chairmen pointed out that, to date, there were no inter-sessional meetings for this working group. To facilitate the rapid completion of the WG 16 report, funds are requested for Dr. Akihiko Yatsu (WG 16 Co-Chairman) to travel to Canada to work with Dr. Beamish. This request is made in addition to the funding that is normally used to support invited speakers to the Annual Meeting. FIS members supported this request.

Proposed publications (Agenda Item 9)

It is expected that the final report of WG 16 will be completed and published in the PICES Scientific Report Series in 2005.

The work of SCEBM could also produce a publication. FIS discussed the format for such a publication. Assuming that the report is not too long, the Science Board Chairman suggested that it could be published as part of the 2004 PICES Annual Report. It was also suggested that it could be published in electronic form on the PICES website.

FIS was advised that a publication in an international journal may result from this year's BIO/FIS Topic Session on "Hot spots and their use by migratory species and top predators in the North Pacific".

Proposals with financial implications (Agenda Item 10)

There were no additional proposals for other items with financial implications.

High priority projects (Agenda Item 11)

No projects are recommended.

Relations with other international programs and organizations (Agenda Item 12)

Dr. Loh-Lee Low (NPAFC) provided information on the joint NPAFC-PICES Symposium on "The status of Pacific salmon and their role in North Pacific marine ecosystems" to be held in conjunction with the 2005 NPAFC Annual Meeting.

Dr. Kuh Kim informed FIS on a proposed CREAMS/PICES program to better understand circulation, climate change and the ecosystems of East Asian marginal seas.

Dr. Douglas E. Hay provided information on the jointly sponsored ICES/PICES session on "A multidisciplinary approach to stock identification of small pelagic fishes" to be convened at the 2005 ICES Annual Science Conference.

Recommendations and draft text on other items to be included in the FIS report to Science Board (Agenda Item 13)

Recommendations and requests are included under each item as required. There are no additional recommendations.

Theme for PICES XV (Agenda Item 14)

FIS suggested the following three potential themes for PICES XV (2006) to be held in Japan:

- Sustainable ocean use;
- Understanding ecosystem processes; and
- Comparison of the ecosystem of the Western and Eastern Gyres.

Discussion of how FIS will contribute to a PICES Action Plan (Agenda Item 15)

Several questions motivated the FIS discussion. Dr. Elizabeth Logerwell asked, "Now when we know that environmental variability affects fish stocks, what do we do?" Dr. Hay asked, "What advice can PICES provide to member nations?" FIS already established (jointly with MEQ) WG 18 on *Mariculture in the 21st century – The intersection between ecology, socio-economics and production*, and recommended (again jointly with MEQ) to form a Working Group on *Ecosystem-based management science and its applications to the North Pacific*, and work by these groups will represent much of the FIS activities over the next few years. Future directions, critical questions, and needs for new research should be included in the terms of references of these Working Groups.

Discussion of developing a Vice-Chairman position for FIS (Agenda Item 16)

Dr. Boehlert asked whether a Vice-Chairman position is necessary. Would this position support and help the Chairman with the meeting work details? Dr. Hay suggested that a Vice-Chairman could be a useful position, with the Chairman from either the west or the east, and the Vice-Chairman from the other side of the Pacific. Dr. Beamish warned about creating a bureaucracy. In general, FIS did not support the idea, and instead suggested that the Chairman should feel free to call upon any of the committee members for help with the workload. FIS representatives from various countries let it be known that they could be called on to help.

PICES website: Contributions from FIS (Agenda Item 17)

The FIS Chairman will work with the PICES Secretariat to provide information to fit the proposed template, and will seek assistance from other FIS members as needed by e-mail.

Discussion of PICES Capacity Building opportunities (Agenda Item 18)

The FIS Chairman expressed concern about the large amount of funding involved and does not necessarily support the idea of a separate Young Scientists Conference with ICES. It was noted that the PICES community already has a program to support young scientists to attend PICES Annual Meetings. FIS members generally agreed with this assessment and believed that PICES is making progress in this direction. Dr. Logerwell offered other suggestions to continue this progress, such as holding workshops on proposal writing and similar topics to help the junior scientist get started on their careers. Russia agreed that, while PICES has such a program, it could go further in helping young scientists. Overall, FIS feels that it is better to continue to support young scientists' involvement in PICES, and FIS does not support the proposal for a separate conference.

FIS Endnote 1

Discussion of potential topics towards next major PICES science program(s) (Agenda Item 19)

FIS members will exchange ideas by e-mail.

Other business (Agenda Item 20)

FIS Best Presentation Award and Poster Award Committee

Following practices of previous years, the convenors of the FIS-sponsored sessions were asked to make the selection. The 2004 FIS Best Presentation Award went to Scott M. Gende (National Park Service, Glacier Bay Field Station) for his paper entitled "Persistence of prey 'hot spots' in southeast Alaska" (co-authored by Mike Sigler).

FIS thanks Dr. Jin Yeong Kim, who served as a member on the Best Poster Award Committee.

Participation List

Members

Richard J. Beamish (Canada)
George W. Boehlert (U.S.A.)
Elena P. Dulepova (Russia)
Douglas E. Hay (Canada)
Alexander I. Glubokov (Russia)
Jin-Yeong Kim (Korea)
Elizabeth A. Logerwell (U.S.A.)
Yukimasa Ishida (Japan, Chairman)
Gordon H. Kruse (U.S.A.)
Takashi Minami (Japan)
Toshikuni Nakatani (Japan)
Laura Richards (Canada)

Observers

Alexander Buslov (Russia)
Vincent Gallucci (U.S.A.)
Churchill Grimes (U.S.A.)
David Griffith (ICES)
Masahide Kaeriyama (Japan)
Oleg Katugin (Russia)
Jacquelynn R. King (Canada)
Sergey Korostelev (Russia)
Nikolina Kovacheva (Russia)
Jae-Bong Lee (Korea)
Loh Lee Low (U.S.A.)
Skip McKinnell (PICES)
Gordon A. McFarlane (Canada)
Alec MacCall (U.S.A.)
R. Ian Perry (Science Board Chairman)
Yasunori Sakurai (Japan)
Michael Schirripa (U.S.A., Rapporteur)
Mikhail Stepanenko (Russia)
Tokio Wada (Japan)
Akihiko Yatsu (Japan)
In-Ja Yeon (Korea)
Oleg Zolotov (Russia)

FIS Endnote 2

FIS Committee Meeting Agenda

1. Welcome and introduction of new members, and nomination of a rapporteur
2. Adoption of agenda
3. Implementation of PICES XII decisions
4. Report of the existing Working Group's activities in the past year, including membership changes
 - a. WG 16 on *Climate change, shift in fish production, and fisheries management*
 - b. WG 18 on *Mariculture in the 21st century*
 - c. SG on *Ecosystem-based management science and its application to the North Pacific*
5. Proposals for new Working Groups
6. Inter-sessional meetings proposed for 2005 and beyond
7. Topic Session and workshop proposals for PICES XIV
8. Travel support requests
9. Publications proposed for 2005 and beyond
10. Other items with financial implications
11. High priority projects
12. Relations with other international programs and organizations
13. Proposed recommendations and draft text on other items to be included in the FIS report
14. Theme for PICES XV
15. Discussion of how FIS will contribute to a PICES Action Plan
16. Discussion of developing a Vice-Chairman position for FIS
17. PICES website: contributions from FIS
18. Discussion of PICES Capacity Building opportunities
19. Discussion of potential topics towards next major PICES scientific program(s)
20. Other business
21. Adoption of FIS report and recommendations to the Science Board

FIS Endnote 3

Proposal for a 1-day FIS/CCCC Topic Session at PICES XIV on "Evidence of distributional shifts in demersal fish in relation to short- and long-term changes in oceanographic conditions"

Demersal fish, either on the continental shelves, slopes or sea mounts, support major fisheries in both the eastern and western Pacific. These include such fish as the rockfishes (genus *Sebastes*), thornyheads (genus *Sebastolobus*) and many flounders (family Pleuronectidae). These species are known to exhibit periodic shifts in their distribution either latitudinally (moving north-south) or longitudinally (moving east-west). While these shifts can at times be attributed to such things as life history characteristics, often they are due to changes in the fish's environment. Changes in the fish's environment can be the result of short-term phenomena, such as seasonal depletions in oxygen levels, or long-term phenomena, such as decadal climate shifts. Shifts in the spatial distribution of these species due to changes in the fish's environment, can cause these populations to move into and out of the areas traditionally covered by the fisheries they support, as well as the surveys that seek to assess their abundance. Consequently, resource

surveys designed to develop annual indices of abundance for these species can produce erroneous trends, and as a result, the stock assessments that depend on these surveys will be inaccurate. If the causes of these distributional changes were known, indices of abundance could be modeled so as to account for these changes in ways other than changes in overall stock abundance. This session invites papers that describe the changes in demersal fishes distributions with specific emphasis on those changes due to changes in climate, either short- or long-term. The goal of the session will be to provide sound evidence for ecosystem-based distributional shifts that can be used to account for some of the year-to-year variability in survey trends of demersal fish that may currently be attributed to changes in overall abundance.

Recommended convenors: Gordon A. McFarlane (Canada), Michael J. Schirripa (U.S.A.) and Mikhail Stepanenko (Russia).

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

3

3

The meeting of the Marine Environmental Quality Committee (MEQ) was held from 13:30-17:30 hours on October 17, 2004. The Chairman, Dr. John E. Stein, called the meeting to order and welcomed the participants (*MEQ Endnote 1*). The Committee reviewed the draft agenda (*MEQ Endnote 2*), and it was adopted.

Business from the 2003 meeting (Agenda Item 3)

There were no pressing issues for the Committee pending from the 2003 meeting in Seoul, Korea. The Chairman summarized in some detail the report of the inter-sessional Science Board meeting, with the participation of the Governing Council, held May 6-8, 2004, in Jeju, Korea.

Membership and chairmanship of MEQ (Agenda Item 4)

The Committee expressed again its concern that there was no participation in MEQ from China this year, nor has there been for the previous few years. While MEQ members from Japan were not able to participate, observers from Japan were in attendance, and MEQ appreciates their contribution.

There continues to be an overall issue of having full participation in MEQ by all PICES member countries. At this meeting, only 7 of the 17 members of MEQ were in attendance. The Committee acknowledged Korea's review of membership on the Scientific Committees of PICES, and welcomed the appointment and active participation of new members, Dr. Hak-Gyoon Kim and Prof. Kee-Hyum Kim.

This was the fourth year of Dr. Stein's chairmanship of MEQ, and it was the intent of the Committee to elect a new Chairman at this year's meeting. However, after serious efforts to identify a candidate from the western Pacific, the Committee was not successful. Dr. Stein was requested to serve for an additional year,

and he agreed to do so while the Committee identifies a candidate from the western Pacific, if possible; if not, then the Committee will consider candidates from the eastern Pacific. A new Chairman of MEQ will be elected at PICES XIV.

On a related matter, the Committee agreed with the proposal to establish a Vice-Chairman position for each of the Standing Committees.

Reports from subsidiary bodies under the direction of MEQ (Agenda Item 5 - 7)

HAB Section: Dr. Vera L. Trainer, Section Co-Chairman, presented a report of Harmful Algal Bloom Section (HAB-S) activities since PICES XII. Her presentation included reports on the HAB-S meeting held October 16, 2004, and a report on the MEQ Workshop on "Developing a North Pacific HAB data resource II" held October 15, 2004. These two reports are included elsewhere in this Annual Report.

EBM Study Group: Dr. Glen Jamieson, Co-Chairman of the MEQ/FIS Study Group on *Ecosystem-based management and its applications to the North Pacific* (SGEBM), reported on the activities of the Study Group in 2004, and their meeting held October 14, 2004. The report of this meeting is included elsewhere in this Annual Report. The Study Group completed its terms of reference and prepared a report which describes current efforts and programs on EBM in PICES member countries. SGEBM proposed to establish a Working Group on *Ecosystem-based management* (see below), under the direction of FIS and MEQ, which MEQ endorsed and forwarded the proposal to Science Board. The Study Group also requested the consideration of publishing their final report in the PICES Scientific Report Series. The Committee agreed to present this proposal to Science Board with the change that the request is to pursue publication of the report in an appropriate venue.

Working Group 18 on mariculture: Dr. Carolyn S. Friedman, Co-Chairman of the MEQ/FIS Working Group 18 on *Mariculture in the 21st century – The intersection between ecology, socio-economics and production*, reported on Working Group activities in 2004. This was the first year for WG 18, and their activities focused on preparation of country reports on the status and projected trends in marine aquaculture. The Working Group received reports from all countries, except Russia, and looks forward to getting this report in the very near future. The report of the WG 18 meeting is included elsewhere in this Annual Report.

MEQ inter-sessional activities in 2004 and interactions with ICES (Agenda Items 8, 9 and 17)

Last year, ICES requested that PICES consider co-sponsoring a major 3-day symposium on “Marine bioinvasions” to be held in spring 2006, at a location on the east coast of the United States to be decided. Science Board supported this request, and it was approved by Governing Council. Dr. Yasuwo Fukuyo (Japan) was recommended as the PICES co-convenor for the symposium.

Following PICES XII, there was further communication with ICES to foster interactions on bioinvasions. The results were that:

- Drs. Yasuwo Fukuyo and Mark L. Wells (U.S.A.) represented PICES at the meetings of the ICES/IOC/IMO Working Group on *Ballast Waters and Other Ship Vectors* (WGBOSV) and ICES Working Group on *Introductions and Transfers of Marine Organisms* (WGITMO), held consecutively in March 2004, in Italy;
- ICES accepted an invitation to co-sponsor a Topic Session on “Introduction of marine species” at PICES XIII by identifying and covering travel expenses of an invited speaker and convenor; Dr. Stephan Gollasch (Chairman of WGITMO and WGBOSV) served as the ICES co-convenor for this session.

Introductions and spread of non-indigenous species is an area of considerable interest to the

Committee both scientifically and for building collaboration with ICES.

MEQ proposals for new subsidiary bodies (Agenda Item 10)

The Committee supported the proposal from the Study Group on *Ecosystem-based management science and its application to the North Pacific* to form a Working Group on this topic, under the direction of FIS and MEQ. Terms of reference with additional information together with suggested membership and chairmanship can be found in *SGEBM Endnote 4*.

Proposed Topic Sessions and Workshops for PICES XIV (Agenda Item 11)

The following Topic Sessions and workshops are proposed for PICES XIV:

- a ½-day Topic Session on “Ecological effects of offshore oil and gas development and oil spills” (*MEQ Endnote 3*);
- a ½-day Topic Session, jointly with FIS, on “Current and emerging issues of marine and estuarine aquaculture in the Pacific region: Carrying capacity, ecosystem function, and socioeconomics” (*WG 18 Endnote 5*);
- a 1-day workshop on “Review of selected harmful algae in the PICES Region: I. *Pseudo-nitzschia* & *Alexandrium*”, preceded by a ½-day laboratory demonstration on algal toxins detection techniques (*HAB-S Endnote 4*);
- a 1-day workshop on “Introduced species in the North Pacific” (*MEQ Endnote 4*). A request was formulated during discussion at the MEQ Topic Session at PICES XIII on “Introductions of marine species”; there was strong support for this request from all PICES countries (see Agenda Item 20).

Both MEQ and FIS Committees discussed the proposal from SGEBM to convene a 1-day Topic Session on “Ecosystem indicators and models” at PICES XIV (*SGEBM Endnote 5*). The Committees concluded that the session should be considered next year as a session at PICES XV.

Theme for PICES XV (Agenda Item 12)

The Committee had no specific suggestions for a theme for the PICES Annual Meeting two years hence, because of a lack of clarity among Committee members on which country will host the meeting. However, the Committee expressed some support for the following theme: “Ecosystem protection and sustainable use”.

PICES Strategic Plan and developing an MEQ Action Plan (Agenda Items 13 and 16)

Dr. Stein reviewed the PICES Strategic Plan and noted the need for each Committee to begin developing an Action Plan that reflects activities of the Committee for the next 3 – 5 years that will meet the goals and objectives of the Strategic Plan. MEQ committed to develop, by e-mail, a list of action items organized by PICES strategic goals.

Developing the next major PICES scientific program (Agenda Item 14)

Last year, the Committee suggested the broader ecological issues of harmful algae as a candidate for a major scientific program in PICES, and offers the same suggestion this year. Additionally, the Committee recommended that ecosystem-based management and sustainable use of living marine resources is another strong candidate that would highlight the human dimension. Other potential topics are:

- Biological invasions - effect on ecological structure and function and interaction with climate change;
- Establishing a PaCOS-type coastal/shelf ocean observing system in the western Pacific; the main interest here was the focus of PaCOS on monitoring of living marine resources; and
- The human dimension issue of how the health of the ocean can have direct and indirect public health risks. In the United States, a Presidential appointed Ocean Commission has highlighted the need for increased attention and research on “oceans and human health”, in which the interest is both in how humans affect the health of the ocean and then how ocean health increases

public health risks. This topic is of increasing interest internationally and in the United States; the US Congress is funding a major *Ocean and Human Health Initiative* again in 2005.

PICES website: MEQ contribution (Agenda Item 15)

At PICES XII, Dr. Alexander Tkalin agreed to be a lead for posting scientific content on the MEQ web page. Unfortunately, Dr. Tkalin could not attend this year’s meeting nor spend much time on the web page content due to a change in his employment. MEQ will need to identify another member to serve on a “Web Publications Committee” recommended by Science Board. MEQ encouraged the HAB Section and WG 18 to examine reports and presentations from PICES XIII for possible inclusion on the Committee’s web page.

Items with financial implications (Agenda Item 18)

MEQ requests support for the following activities:

- Travel support for three specialists to speak and demonstrate techniques at the workshop on “Review of selected harmful algae in the PICES Region: I. *Pseudo-nitzschia* & *Alexandrium*” proposed to be held in conjunction with PICES XIV. Those being considered as invitees are: D. Anderson, expert on *Alexandrium*; S. Bates, expert on *Pseudo-nitzschia*; and M. Quilliam, expert on HPLC measurement of biotoxins;
- Travel support for an MEQ representative to attend the ICES/IOC/IMO SGBOSV meeting, to be held the 3rd week of March 2005, in Norway. Potential attendees are Drs. Wells and Fukuyo;
- Publication of the SGEEM report as either a PICES Scientific Publication Series or alternative venue.

2004 MEQ Best Presentation Award (Agenda Item 19)

The MEQ Best Presentation Award was given to Jennifer Boehme (University of Maine) for her

paper (co-authored with M. Wells) on “Ballast water exchange verification using the optical characterization of dissolved organic matter” presented at the MEQ Topic Session on “Introductions of marine species”.

Other business (Agenda Item 20)

MEQ Topic Session on “Introductions of marine species”: The joint PICES/ICES Topic Session on “Introductions of marine species” was convened at PICES XIII, on October 20, 2004. The report of this session is included elsewhere in this Annual Report. In the discussion held at the session, participants requested that MEQ holds a 1-day workshop at the next Annual Meeting on topics related to introductions of marine species. The workshop should include reports by each member country on the status in developing inventories of introduced organisms; reports of activities related to research on natural (current and organisms such as turtles and birds), and anthropogenic (ballast water, hull fouling, fisheries, *etc*) vectors; and reports of activities related to the Ballast Water Management Convention, especially measurement of compliance of ballast water exchange, and measurement of effectiveness and development of systems of ballast water treatment.

The workshop also aims to have a discussion on the establishment of a Working Group on species introductions under the direction of MEQ. Terms of reference for the Working Group may include, but are not limited to:

- Establish an inventory of biological invasions in the PICES region;
- Establish cooperative work with the ICES Working Group on *Introductions and Transfers of Marine Organisms* and the

ICES/IOC/IMO Working Group on *Ballast and Other Ship Vectors*;

- Create campaign materials to increase scientist interest in this topic as well as materials to increase public awareness.

Recognizing that some member countries do not have many research reports and scientists working on the subjects listed in item 1, one year of preparation is needed before holding the workshop. Additionally, during the next year’s session participants will work to increase awareness among their countries’ scientists and obtain information related to introductions of marine organisms. Dr. Yasuwo Fukuyo (Japan) and one scientist from Canada or U.S.A. (TBD) will serve as co-convenors of the workshop.

CREAMS/PICES Program: Prof. Kee-Hyun Kim gave a brief presentation on the status of CREAMS and requested consideration by MEQ for CREAMS to become a more integral program of PICES. The Committee thanked Prof. Kim for his presentation, and recommends to Science Board that the CREAMS/PICES Program on East Asian Marginal Seas be considered, as appropriate, for more formal inclusion in the science program of the Organization.

Young Scientists Conference: The Committee discussed the proposal of holding a joint PICES-ICES Young Scientists Conference in 2007, and recommended that PICES continue supporting the conference. The Committee will work by e-mail to identify a young scientist associated with MEQ to serve on the Conference Steering Committee. MEQ members agreed that such a conference provides an important opportunity for young scientists to make contact with peers that could lead to longer-term international collaboration.

MEQ Endnote 1

Participation List

Members

Tatyana Belan (Russia)
Glen Jamieson (Canada)
Hak-Gyoon Kim (Korea)
Kee-Hyun Kim (Korea)
John E. Stein (U.S.A., Chairman)
C. Michael Watson (U.S.A.)
Dong-Beom Yang (Korea)

Observers

Alexander Bogdanovsky (Russia)
Elena Borozdinova (Russia)
Eun Seob Cho (Korea)
Ik Kyo Chung (Korea, WG 18 Co-Chairman)
Jian-Guang Fang (China)
Carolyn S. Friedman (WG 18 Co-Chairman)
Stephan Gollasch (Germany, ICES)
Toyomitsu Horii (Japan)
Ichiro Imai (Japan)
Sook Yang Kim (Korea)
Olga Lukyanova (Russia)
John Moores (Canada)
Michael Rust (U.S.A.)
Vera L. Trainer (U.S.A., HAB-S Co-Chairman)
Yasunori Watanabe (Japan)

MEQ Endnote 2

MEQ Meeting Agenda

1. Welcome and introductions
2. Approval of agenda
3. Business from the 2003 meeting
4. Discussion of:
 - a) developing a Vice-Chairman position for MEQ Committee
 - b) status of MEQ Chairmanship
5. Report from Harmful Algal Bloom Section
6. Report from Working Group 18 on *Mariculture in the 21st Century*
7. Report from Study Group on *Ecosystem-based management science and its application to the North Pacific*
8. Report on proposed joint ICES/PICES symposium on "Marine bio-invasions"
9. Report on inter-sessional meetings
10. Proposals for new subsidiary bodies (require Terms of Reference and list of potential members)
11. Topic session proposals for PICES XIV
12. Theme for PICES XV
13. MEQ Strategic Plan – review
14. Discussion of steps towards next major PICES scientific program(s)
15. PICES website – contribution from MEQ
16. Discussion of future MEQ activities (e.g., Inter-calibration of data, such as HAB data, chemical contaminants, habitat, aquaculture related, *etc.*)
17. Relations with other international programs and organizations
18. Items with financial implications
 - a) Proposed inter-sessional meetings for 2004 and beyond
 - b) Proposed publication for 2004 and beyond
 - c) Travel support requests
 - d) Other items
19. 2004 MEQ Best Presentation Award
20. Other business
21. Preparation of report and recommendations to Science Board

MEQ Endnote 3

Proposal for a 1/2-day MEQ Topic Session at PICES XIV on “Ecological effects of offshore oil and gas development and oil spills”

In recent years, offshore oil and gas production expanded to new areas of the world ocean. Unfortunately, oil and gas exploration and extraction can be associated with negative ecological consequences. For example, seismic surveys may interfere with commercial fishing, installation of platforms disturb habitats of marine fish and invertebrates, and the discharge of drilling muds introduce a number of contaminants into the surrounding waters. Oil spills associated with offshore operations or with tanker accidents also threaten the marine environment. Recent spills have demonstrated

vulnerability of coastal communities. Oil slicks at sea can kill or otherwise adversely affect marine birds and mammals, zooplankton, as well as the eggs and larvae of fish and invertebrates. The goal of this session is to bring together marine scientists working on these issues and to discuss what steps can be taken to minimize adverse ecological effects of offshore oil and gas production.

Recommended co-conveners: Kazuichi Hayakawa (Japan) and John Wardrop (Australia/Russia).

MEQ Endnote 4

Proposal for a 1-day MEQ Workshop at PICES XIV on “Introduced species in the North Pacific”

The workshop will include presentations on the status of introduced organisms in member countries and progress in developing inventories of introduced species; reports of activities related to research on vectors, including natural (currents and organisms such as turtles and birds), and anthropogenic (ballast water, hull fouling, fisheries, etc) ones; and reports of activities related to the Ballast Water Management Convention, especially

measurement of compliance with ballast water exchange protocols, and measurement of effectiveness and development of systems of ballast water treatment. The workshop aims to have a discussion on the establishment of a Working Group on introduced species under MEQ.

Recommended co-conveners: Yasuwo Fukuyo (Japan) and Glen Jamieson (Canada).

REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

☞

☞

The meeting of the Physical Oceanography and Climate Committee (POC) was held from 13:30-17:00 hours on October 17, 2004. The Chairman, Dr. Kuh Kim, called the meeting to order and welcomed members and observers (*POC Endnote 1*). Dr. Michael G. Foreman served as rapporteur. The Chairman informed the Committee that Dr. Steven J. Bograd has replaced Dr. David L. Musgrave as a U.S. member, and Drs. Young-Gyu Park and Hee-Dong Jeong have replaced Drs. Sang-Kyung Byun and Jae-Yul Yun as Korean members. The Committee reviewed and adopted the draft agenda (*POC Endnote 2*).

Election of POC Chairman (Agenda Item 3)

Dr. Alexander Bychkov, PICES Executive Secretary, reviewed the PICES Rules of Procedure on elections and informed Committee members on nominations received prior to the meeting. Dr. Michael G. Foreman (Canada) was unanimously elected for a 3-year term as the new Chairman of POC. The term of Dr. Foreman's appointment was to begin immediately after the closing of the PICES Thirteenth Annual Meeting. The Committee expressed its gratitude to Dr. Kim for his leadership and valuable contribution to POC activities over the years.

Completion of PICES XII decisions (Agenda Item 4)

- A *Progress in Oceanography* special issue on "Physical and chemical processes in the Japan/East Sea and their influence on its ecosystem", resulting from the 2002 CREAMS/PICES workshop, was published in August 2004 (Vol. 61, Nos. 2-4). Guest editors for this issue, Drs. Stewart M. McKinnell, Alexander Bychkov, Makoto Terazaki and Kyung-Ryul Kim, were congratulated on publishing the volume

prior to PICES XIII. The issue includes 9 papers by authors from Japan, Korea, Russia and the United States.

- A joint IOCCP/NIES/PICES workshop on "Ocean surface $p(\text{CO}_2)$, data integration and database development" was held January 14-17, 2004, in Tsukuba, Japan, and brought together 44 scientists from 12 countries. A brief report of the workshop was published in PICES Press (July 2004, Vol. 12, No. 2).
- A joint NOAA/GCP/PICES workshop on "Understanding North Pacific carbon cycle change: Data synthesis and modeling" was held June 2-4, 2004, in Seattle, U.S.A., and was attended by about 60 scientists from 5 countries. A brief report of the workshop will appear in the next issue of PICES Press (January 2005, Vol. 13, No. 1). The synthesis manuscripts generated from the workshop are expected to be published as a *Journal of Geophysical Research* special issue in 2005 on in early 2006.
- The following two POC Topic Sessions and workshop were convened at PICES XIII:
 - a 1-day POC/MONITOR Topic Session (co-sponsored by Argo) on "Application of Global Observing Systems to physics, fisheries, and ecosystems";
 - a 1-day POC Topic Session (co-sponsored by IOCCP) on "The impacts of climate change on the carbon cycle in the North Pacific";
 - a 2-day PICES/CLIVAR workshop on "Scale interactions of climate and marine ecosystems".

Summaries of both sessions and the workshop are included elsewhere in this Annual Report.

Report of WG 17 on Biogeochemical data integration and synthesis (Agenda Item 5a)

The Co-Chairman of WG 17, Dr. Andrew G. Dickson, reviewed Working Group activities

since PICES XII, specifically with respect to their terms of reference, and plans for the one year remaining in its tenure. The report of the WG 17 meeting at PICES XIII is included elsewhere in the Annual Report.

With respect to the first term of reference, *developing a North Pacific database for ocean CO₂ and related parameters in association with existing data centres*:

- A new North Pacific database/inventory for oceanic CO₂ and CO₂-related data (PICNIC – PICES CO₂ Related Data Integration for the North Pacific) was created by the joint efforts of two data centres (CDIAC, U.S.A. and MIRC, Japan). Web access to the PICNIC inventory has been established and the usage of LAS (Live Access Server) as a data viewer is being implemented. A brief article on this activity will be published in the next issue of PICES Press (January 2005, Vol. 13, No. 1);
- A workshop entitled “Understanding North Pacific carbon-cycle change: Data synthesis and modeling” was held June 2–4, 2004, in Seattle, U.S.A.

With regard to the second term of reference, *preparing a written guide of best practices for oceanic CO₂ measurements and data reporting, and carrying out, as needed, inter-laboratory method comparisons to assure future measurement quality*:

- A draft of a “Guide to best practices for oceanic CO₂ measurements and data reporting” was completed and was presented at the WG 17 meeting on October 22, 2004. The publication of the guide is expected in 2005;
- A workshop entitled “Ocean surface *p*(CO₂), data integration and database development” was held January 14–17, 2004, in Tsukuba, Japan.

With respect to the third term of reference, *developing a strategy to co-ordinate the planning of future North Pacific measurement programs and to encourage the timely release of new data*, discussions have begun, but no strategy has yet been developed. Although the United States is adopting a policy which will

make data available more quickly, there is reticence to adopt this policy on a broader scale.

Finally, with regard to the fourth term of reference, *organizing a symposium or annual meeting session on the impacts of climate change on the carbon cycle in the North Pacific*, a 1-day session on this topic was held at PICES XIII in October 2004, in Honolulu, U.S.A. Convenors for the topic session were Drs. Kitack Lee (Korea) and Christopher L. Sabine (U.S.A.)

Progress report of North Pacific Data Buoy Advisory Panel (Agenda Item 5b)

A report was prepared by the Panel Technical Coordinator, Mr. Ron McLaren, and presented to POC by Dr. Kim (*POC Endnote 3*). The same outstanding issues from the previous year remain, namely, difficulty in getting Panel members together for meetings, the need for an Asian Co-Chairman for the Panel, and with more pending retirements, the necessity to nominate new Panel members.

Proposals for new subsidiary bodies (Agenda Item 5c)

1. Dr. Dickson informed the Committee that the agenda for the upcoming WG 17 meeting includes an item to discuss the need for a permanent group to co-ordinate North Pacific CO₂ issues in international projects such as CLIVAR, IMBER and SOLAS. A recommendation has been made to form a section under POC for this purpose. Permission was requested to return to POC with a proposal to this effect after the WG 17 meeting was held on October 22, 2004. POC agreed to consider the proposal and suggested that the details be discussed at the next inter-sessional Science Board meeting in April 2005.
2. Dr. James E. Overland presented information about the new Climate Forcing and Marine Ecosystems (CFAME) Task Team formed under the CCC Program (a report from the inaugural meeting of CFAME is included elsewhere in the Annual Report). POC discussed how to establish a

closer relationship with this Task Team and proposed that Dr. Overland, who is already serving as a POC member, be appointed as a “physical–climate” Co-Chairman for CFAME, so that the underlying reasons and causality of climate change can be better investigated and understood.

Science Board issues (Agenda Item 6)

The Chairman briefly reviewed the PICES Strategic Plan and pointed out the necessity for POC to discuss development of its own Action Plan for current and future activities that fit within the Strategic Plan. This Action Plan should identify how to implement the ideas in the Strategic Plan on the short (annual) to medium (~5 years) time scale. POC members agreed to work by correspondence to prepare a draft Action Plan by the inter-sessional Science Board/Governing Council meeting where all Committee Action Plans will be discussed and merged into one PICES Action Plan.

A Science Board proposal to organize a joint PICES/ICES Young Scientists Conference in 2007 was presented. POC agreed to support the conference.

The need of a Vice-Chairman for POC was discussed and approved. Dr. Foreman suggested that the Chairman and Vice-Chairman should be from the opposite sides of the North Pacific.

PICES scientific program (Agenda Item 7)

Dr. Kim presented a proposal for the CREAMS/PICES Program on *East Asian Marginal Seas* (POC Endnote 4), as agreed at the second inter-sessional Science Board/Governing Council meeting (May 7–9, 2004, Jeju, Korea). Funding for specific investigations would come from individual countries, and PICES would provide infrastructure support to host workshops and publish reports. POC strongly endorsed the proposal and requested Science Board to establish an Advisory Panel to oversee the CREAMS/PICES Program.

An international CREAMS/PICES workshop on “East Asian Seas Time Series” (co-sponsored by

RIO/SNU) was proposed for 2005, and PICES support was requested.

Two other workshops planned under the CREAMS/PICES program are:

- A workshop on “East Asian Marginal Seas circulation: What we know and how well can we forecast?”, to be held in the summer of 2006 in Vladivostok, or at PICES XV;
- A workshop on “Progress in studies of physical processes and their impacts to the Japan/East Sea ecosystem” to be held in conjunction with the PICES Fifteenth Annual Meeting in 2007.

Planning PICES XIV (Agenda Item 8)

No topic session was proposed in order to encourage contributions to a 1-day POC Paper Session at PICES XIV (October 2005, Vladivostok, Russia). POC is also willing to co-sponsor a joint session that will include POC issues with another committee.

PICES XV theme (Agenda Item 9)

PICES XV will be convened in either Japan or Canada in 2006. POC recommended that the theme for PICES XV be “Boundary Currents” or “Boundary Current Ecosystems”, which would be an appropriate theme for either country.

Relations with international organizations and programs (Agenda Item 10)

Dr. Vyacheslav B. Lobanov presented a report on NEAR–GOOS and the GOOS Regional Alliances Networking Development (GRAND) project. The current strategy of NEAR–GOOS is to shift toward a more durable alliance of the four member countries (China, Japan, Korea and Russia) in order to develop a sustained regional monitoring system, strengthen the databases, and expand the project outreach.

Proposals with financial implications (Agenda Item 11)

Inter-sessional meetings

- To co-sponsor jointly with RIO/SNU an international CREAMS/PICES workshop on

“East Asian Seas Time Series”, to be held in spring of 2005, in Seoul, Korea;

- To co-sponsor, under the CREAMS/PICES Program, a workshop (with training component) on “East Asian Marginal Seas circulation: What we know and how well can we forecast?”, to be held in the summer of 2006 in Vladivostok (postponed from 2005), or at PICES XV.

Publications

- To publish a “Guide to best practices for oceanic CO₂ measurements and data reporting”, prepared by WG 17, in the PICES Scientific Report Series (partial support for this publication is provided by IOCCP (International Ocean Carbon Coordinated Project) via IOC (Intergovernmental Oceanographic Commission).

Requests for travel support

- 3–4 invited speakers for the POC Paper Session at PICES XIV;
- a PICES representative (from POC or MONITOR) to attend the NEAR-GOOS meeting in fall of 2005.

POC Best Presentation Award (Agenda Item 12)

Following practices of previous years, the convenors of the POC-sponsored sessions were asked to make a selection. Drs. Foreman,

POC Endnote 1

Lobanov and Dickson made their decisions based on presentations given in Topic Sessions on “Application of Global Observing Systems to physics, fisheries, and ecosystems” and on “The impacts of climate change on the carbon cycle in the North Pacific”. The 2004 POC Best Presentation award went to Sabine Mecking (Woods Hole Oceanographic Institution, Woods Hole, U.S.) for her paper “Age and AOU increases at the North Pacific subtropical–subpolar gyre boundary”, co-authored with Mark Warner and John Bullister.

POC members thanked Dr. Yury I. Zuenko, who volunteered to serve on the Best Poster Award Committee.

Other business (Agenda Item 13)

On behalf of Dr. Howard J. Freeland and Mr. Frank A. Whitney (Institute of Ocean Sciences, Fisheries and Oceans Canada), Dr. Foreman presented a proposal for a 3-day symposium to be held in 2006 to celebrate the 50th anniversary of sampling along Line-P and at Station Papa. PICES is requested to co-sponsor the symposium by providing logistical and minor travel support. Participants from other long time series would be invited and a more detailed proposal will be presented at the 2005 inter-session Science Board/Governing Council meeting next spring.

Participation List

Members

Steven J. Bograd (U.S.A.)
Michael G. Foreman (Canada, rapporteur)
Hee-Dong Jeong (Korea)
Kuh Kim (Korea, Chairman)
Vyacheslav B. Lobanov (Russia)
James E. Overland (U.S.A.)
Stephen C. Riser (U.S.A.)
Ichiro Yasuda (Japan)
Jin-Ping Zhao (China)
Yury I. Zuenko (Russia)

Observers

Jack A. Barth (U.S.A.)
Alexander Bychkov (PICES Executive Secretary)
Andrew G. Dickson (WG 17 Co-Chairman, U.S.A.)
W. John Gould (U.S.A.)
Dong-Chull Jeon (Korea)

POC Endnote 2

POC Meeting Agenda

1. Welcome and opening remarks
2. Adoption of agenda
3. Election of new POC Chairman
4. Completion of PICES XII decisions
5. Reports of existing subsidiary bodies and proposals for new subsidiary bodies
 - a. Progress report of WG 17 on *Biogeochemical data integration and synthesis*
 - b. Progress report of North Pacific Data Buoy Advisory Panel
 - c. Proposal for new subsidiary bodies
6. Discussion of Science Board issues including developing a Vice-Chairman position for POC
7. Discussion of next major PICES scientific programs including CREAMS-III as a pilot project under PICES
8. Planning PICES XIV
9. PICES XV theme
10. Relation with other international programs and organizations
11. Items with financial implication
 - a. Proposed inter-sessional meetings for 2005 and beyond
 - b. Proposed publication for 2005 and beyond
 - c. Travel support requests
 - d. Other items
12. 2004 POC Best Presentation Award
13. Other business
14. Adoption of POC report to Science Board

POC Endnote 3

Report of the North Pacific Data Buoy Advisory Panel for 2003/2004

The NPDBAP was officially accepted as an entity reporting to the Data Buoy Co-operation Panel (DBCP) and PICES at the DBCP XVIII meeting held October 2002. This is the second Annual Report as an official body of the DBCP.

During the period September 1, 2003, to August 31, 2004, an average of 66 drifting buoys reporting to the Marine Environmental Data Centre (MEDS) were active in the North Pacific Ocean (30.00°N to 65.00°N and 110.00°E to 110.00°W). A total of 268,374 messages were received during the period. As of August 2004, 68 buoys were reporting to MEDS, 28 with barometric pressure. Please refer to the complete Annual Report for details, tables and figures showing the number of buoys in operation and the number of buoy messages received during the period.

A web page (<http://npdbap.noaa.gov>) hosted by NOAA/ NBBC is operational with a portal to MEDS to get the data. The MEDS site also has an animation showing recent buoy tracks.

Planned buoy deployments for the next year include: 156 for Japan (in various oceans, not just the North Pacific), 40 for the United States, and 6–12 for Canada. In addition, several buoys will be upgraded to include barometers.

Meetings

October 11, 2003

A meeting of the Panel was scheduled during the PICES Twelfth Annual Meeting held October 10–18, 2003, in Seoul, Korea. Unfortunately, an insufficient number of Panel members were present to have a meeting. An information session was held instead to review the 2003 NPDBAP Annual Report. Ron McLaren presented the complete 2003 Annual Report to the Physical Oceanography and Climate Committee (POC) session.

October 21, 2003

A meeting was held during the DBCP XIX meeting in Angra dos Reis, October 21, 2003. Panel and DBCP representatives from Canada, Japan, Korea and the United States, the WMO were in attendance.

October 17, 2004

The Third Annual Meeting of the NPDBAP was held October 17, 2004, prior to the twentieth session of the Data Buoy Co-operation Panel (DBCP XX). The meetings took place in Chennai, India, at the kind invitation of the National Institute of Ocean Technology (NIOT), Department of Ocean Development. Representatives from Canada, United States and the WMO (DBCP) were in attendance. Al Wallace (Meteorological Service of Canada) was elected as the North American Co-chair and Craig Engler (Global Drifter Program) was

elected as Technical Coordinator. The position of Asian Co-chair has not been filled.

Time and place of next meeting

The NPDBAP meeting will be held prior to DBCP XXI, in Cape Town, South Africa, October 17–21, 2005. The date for the NPDBAP will be determined in consultation with other action groups holding meetings prior to the DBCP. It was felt that this would permit maximum attendance of active Panel members while minimizing travel costs to attend a meeting in a different location.

POC Endnote 4

CREAMS/PICES Program on *East Asian Marginal Seas*

Program objectives

1. To understand the hydrography and circulation and their variability in the East Asian marginal seas;
2. To understand the effect of climate and long-term changes in physical and chemical environments on the East Asian marginal seas ecosystems;
3. To establish permanent observation stations and a data exchange network in East Asian marginal seas.

The initial focus of the Program will be on the Japan/East Sea. The schedule and observational plan for the program is given in the following.

Time Table

- Dec. 2004: Establish CREAMS/PICES Advisory Panel
- Mar. 2005: 132°E cruise
- Spring 2005: Open CREAMS/PICES Office and hold 1st workshop on East Asian Seas Time-series, co-

sponsored by PICES and RIO/SNU

- Spring 2006: 132°E cruise; start of permanent stations
- June 2006: Hold 2nd workshop on “East Asian Marginal Seas circulation: What we know and how well can we forecast?”
- Spring 2007: 132°E cruise
- Oct. 2007: Hold 3rd workshop on “Progress in studies of physical processes their impacts to the Japan/East Sea ecosystem” at PICES XVI.

Observation Plan

1. Hydrography baseline: 132°E;
2. Permanent stations: EAST-I (Ulleung Basin) and EAST-II (Western Japan Basin);
3. Mooring stations: Western Japan Basin and Ulleung Basin;
4. Profiling floats, surface drifters, SST and satellite data.

REPORT OF TECHNICAL COMMITTEE ON DATA EXCHANGE

03

03

The meeting of the Technical Committee on Data Exchange (TCODE) was held from 13:30 – 18:00 hours on October 17, 2004. The Chairman, Dr. Igor I. Shevchenko, called the meeting to order and welcomed the participants (*TCODE Endnote 1*). The Committee reviewed the draft agenda and it was adopted as provided (*TCODE Endnote 2*).

Review progress on items in the 2003/2004 Workplan (Agenda Item 3)

TCODE/HAB-S work on HAE-DAT database

Mr. Robin Brown reported on the results of the joint PICES/IOC workshop on “Developing a North Pacific HAB data resource – II” at PICES XIII, and the trial with the IOC/ICES Harmful Algal Event Database (HAE-DAT; <http://ioc.unesco.org/hab/data3.htm>). Each country entered data from their nation for one year (selection of year varied by country) and reviewed their experiences using a “report card” approach. Several issues were identified:

- There were some variations in the definition of “event” used by each country;
- There were some difficulties in separating the coastline of each country into segments as recommended by IOC/ICES. Each country took a somewhat different approach, based on the length of their coastline and existing administrative area structures;
- Duration of a single event was often hard or impossible to determine;
- Each country reported that there were many blank fields in the database that they were unable to complete due to lack of data. The distribution of “blank fields” was highly variable amongst countries. For example, the only data that Canada could report was toxicity data from their shellfish monitoring program, and no data on taxonomic composition of harmful blooms was available. Russia, on the other hand,

contributed taxonomic and abundance data on potentially harmful blooms, but has no toxicity data;

- Some countries reported that it was difficult to consolidate the data from within their nation, due to the high volume of data and/or administrative barriers.

There was an active discussion about the strengths and weaknesses of the HAE-DAT approach, but the workshop participants agreed that (within the limitations discussed), this was a useful approach and should be adopted by PICES member countries. The plan for 2004/2005 is for each country to enter data from a common year (2000) plus as many years after 2000 as is feasible. The participants also agreed that it is important that each country prepare a short, high-level description of the characteristics of the data entered for their country to allow users to interpret any data retrievals. This metadata could be provided on the PICES website and/or the HAE-DAT website.

GLOBEC/TCODE interactions on data management

Dr. Shevchenko reported that no replies were received from the GLOBEC International Project Office (IPO) on his queries about the data management activities. It appears that changes in personnel at the IPO have stalled these activities. After some discussion, the Committee agreed to drop this item from the TCODE Workplan for 2004/2005, with the suggestion that this could be re-introduced if there were signs of activity at the GLOBEC IPO. Members also noted that GLOBEC or GLOBEC-like programs in some countries were fully completed or approaching completion, and that the opportunity to efficiently inventory and archive the GLOBEC data holdings was rapidly disappearing.

North Pacific Ecosystem Metadatabase

Dr. Bernard A. Megrey and Mr. Allen Macklin reported on the status and ongoing activities with this database (<http://www.pmel.noaa.gov/np/mdb/index.html>). Specific activities include:

- Alaska Fisheries Science Center staff are continuing to actively search for and add records to the database;
- Automated processes are now in place to e-mail record contributors and solicit updates to the records they have submitted;
- Search queries have been modified and updated;
- Capabilities for “federated searching”, where multiple metadatabases may be searched with a single query are being implemented. Dr. Megrey presented plans to implement this capability between the North Pacific Ecosystem Metadatabase and databases at the Korean Oceanographic Data Centre as a demonstration project across the PICES region. He submitted a proposal for this activity and a request for partial support from PICES (*TCODE Endnote 4*). The Committee endorsed this proposal;
- Dr. Megrey and Mr. Macklin worked with the Gulf of Alaska Ecosystem Monitoring (GEM) project to use a new standard (Ecological Metadatabase Language – EML; <http://knb.ecoinformatics.org/software/eml/>) which is better suited to *in situ* biological observational data;
- Mr. Macklin reminded the committee that there was an extensive article on the North Pacific Ecosystem Metadatabase in a recent issue of PICES Press (July 2004, Vol. 12, No. 2; http://pices.int/publications/pices_press/volume12/July04/pp_30_33.pdf).

The Committee noted that the North Pacific Ecosystem Metadatabase is supported through a variety of “soft money” sources and this makes the system somewhat vulnerable.

Updating TCODE web pages

Dr. Shevchenko reported on the updates to TCODE web pages (<http://tcode.tinro.ru>). All national reports and supporting documents for TCODE activities will be placed on this web.

Electronic Poster Session at PICES XIII

Dr. Thomas C. Royer reported that nine submissions were received for the TCODE Electronic Poster session on “Data visualization of open ocean processes in the North Pacific) at PICES XIII. A summary of the session is included elsewhere in this Annual Report and posted on the TCODE web page.

Interactions with ICES-IOC Study Group on the Development of marine data exchange systems using Extensible Markup Language (XML)

Dr. Shevchenko reported on activities of the ICES-IOC Study Group on XML (this language is considered as a standard for data exchange). Dr. Georgiy Moiseenko attended a meeting of this group (May 2004, in Oostende, Belgium) as a PICES TCODE representative. Mr. Brown and Mr. Macklin offered to gather further information on the progress made by the ICES-IOC Study Group and provide this information to the TCODE Chairman for circulation. Dr. Shevchenko will post all these reports and links to supporting materials on the TCODE web page.

Annual reports and updates on data management activities in PICES member countries (Agenda Item 4)

Mr. Brown reported on key contacts and sources for data, software and educational/outreach material in Canada. In addition, he provided copies of the DFO Policy for management of scientific data to the Committee members. In terms of new data management activities in Canada, he noted that the VENUS and NEPTUNE cabled ocean observatories will require an advanced data management and archival system, and may present some interesting new opportunities.

Mr. Ling Tong reported that data management and exchange (including standards) is an acknowledged challenge in China, and they are working on a plan to address this issue. He noted that biological data are a particular challenge. Policies on charging for data (internally and externally) are further complicating the issue.

Dr. Kenji Asano reviewed the key data management contacts in Japan (JODC for oceanographic data and the Fisheries Research Agency for biological data). He also introduced a new Japan Fisheries Oceanography database implemented by the National Research Institute of Fisheries Science that will soon be publicly available.

Mr. Hae-Seok Kang reviewed the principal data management agencies for Korea (KORDI, NFRDI and NORI). He further reported that KORDI will assume responsibilities for real-time data, while NFRDI will focus on delayed-mode data.

Dr. Shevchenko reported on a workshop on “Mathematical modelling and information technologies in ocean studies” held in 2004 in Vladivostok (Russia). He also provided information on the recently published “Atlas of quantitative distribution of nekton species in the Okhotsk Sea”.

Mr. Macklin reported on the Alaska Ocean Observing System (AOOS) and the central role that data management will play in this system. A pilot project will be undertaken in 2005 to integrate the Prince William Sound data sources. Key components of this data management system will be: metadata standards (FGDC), open data transport (OpenDAP), and Live Access Server (LAS) to browse data.

TCODE noted that all new mentioned projects require an advanced data management.

Second inter-sessional Science Board Meeting (Agenda Item 5)

Dr. Shevchenko provided a short report from this meeting.

Discussion of TCODE activity in relation to the PICES Strategic Plan and development of a draft Action Plan for current and future activity (Agenda Item 6)

Dr. Shevchenko and Mr. Brown agreed to prepare a draft TCODE Strategic/Action Plan

for circulation and review by TCODE members, prior to the interim Science Board Meeting in April 2005.

Discussion of capacity building opportunities (Agenda Item 7)

TCODE noted that the PICES Capacity Building includes several items which have direct connections to TCODE’s terms of reference: sharing data, methodologies, computing power, *etc.*

TCODE nominated Dr. Franz J. Mueter (Joint Institute for the Study of the Atmosphere and the Oceans, University of Washington, U.S.A.) as a potential member of an Organizing Committee of the proposed PICES/ICES Young Scientists Conference (2007).

PICES website (Agenda Item 8)

Ms. Julia Yazvenko (PICES Secretariat) reported on the new, much expanded PICES website and solicited feedback and advice from TCODE members. The Committee congratulated the Secretariat on the revised website, which is much more comprehensive and up-to-date than formerly. Dr. Megrey suggested that web-based collaboration software (SharePoint) might be a good investment for the PICES website, to more fully support the activities of various PICES groups. However, this software has a disadvantage – it works only with the MS Internet Explorer browser. It was proposed to provide services at the PICES website for the news subscription and website monitoring.

Discussion of steps towards next major PICES scientific program(s) (Agenda Item 9)

The Committee felt that implementation of the Global Ocean Observing System (GOOS) in the open ocean and the continental seas of the North Pacific would provide a major focus for PICES activities over the next five years. This would require close coordination between MONITOR and TCODE to ensure that data management challenges are fully addressed.

Topic session proposals for PICES XIV (Agenda Item 10)

TCODE recommends a ½-day Topic Session on “Data management and data delivery systems to support ecosystem monitoring” (*TCODE Endnote 3*).

PICES XV theme (Agenda Item 11)

The Committee had no recommendation for the PICES XV theme.

Relations with other international programs and organizations (Agenda Item 12)

The Committee recommended adding IODE, CoML Ocean Biological Information System (<http://www.obis.org/>) and the IOC Marine XML project (<http://marinexml.net>) to the PICES Standing List.

Membership and Chairmanship of TCODE (Agenda Item 13)

TCODE has several ex-officio members who provide tremendous support to all Committee activities. The Committee supported the recommendation that a Vice-Chairman of TCODE be appointed to represent the Committee at selected meetings and help the Chairman with the duties of planning and running the committee business on an on-going basis throughout the year. The Vice-Chairman could potentially be eligible for election to Committee Chairman once the Chairman’s term has been completed.

The Committee unanimously supported the extension of Dr. Shevchenko’s term as TCODE Chairman for one additional year.

Summary of items with financial implications (Agenda Item 14)

TCODE requests:

- travel support for one invited speaker (an ICES XML expert) for the TCODE Topic Session on “Data management and data delivery systems to support ecosystem

monitoring” at PICES XIV (*TCODE Endnote 3*);

- travel support for a TCODE representative to attend the International Conference on “Marine Biodiversity Data Management” (November 29 - December 1, 2004, Hamburg, Germany) to get a better understanding and linkage of such initiatives as the Generic Information Retrieval (DiGIR), OBIS, MarineXML, Global Biodiversity Information Facility (GBIF), etc., with TCODE activities;
- support for the pilot project to “Federate Metadata on North Pacific Ecosystems”, and for publishing findings from this project in 2006 (*TCODE Endnote 4*).

TCODE Workplan for 2004/2005 (Agenda Item 16)

TCODE Workplan for 2004/2005:

- Convene a ½-day Topic Session on “Data management and data delivery systems to support ecosystem monitoring” at PICES XIV;
- Carry out a pilot project to “Federate Metadata on North Pacific Ecosystems”;
- Develop TCODE Action Plan to complement the PICES Strategic Plan and Capacity Building initiative;
- Update TCODE web pages, including information on annual national reports, metadata languages, etc.;
- Provide assistance to the Section on *Ecology of harmful algal blooms in the North Pacific* with database activities and publicize HAB database activity;
- Coordinate TCODE activities with the new MONITOR Technical Committee;
- Develop improved understanding of the Ocean Biological Information Systems and other related projects.

TCODE Endnote 1

Participation List

Members

Robin Brown (Canada)
Hee-Dong Jeong (Korea)
Hae Seok Kang (Korea)
Bernard A. Megrey (U.S.A)
Thomas C. Royer (U.S.A)
Igor I. Shevchenko (Russia, Chairman))
Ling Tong (China)

Observers:

Kenji Asano (Japan)
Tatsu Kishida (Japan)
S. Allen Macklin (U.S.A)
Thomas Malone (U.S.A)
Phillip Mundy (U.S.A., MONITOR Chairman)

TCODE Endnote 2

TCODE Meeting Agenda

1. Welcome and introduction of members
2. Adoption of agenda
3. Review progress on items in the 2003/2004 Workplan
 - a. TCODE/HAB-S work on HAE-DAT database
 - b. GLOBEC IPO/TCODE interactions on data management
 - c. North Pacific Ecosystem Metadatabase
 - d. Updating TCODE web pages
 - e. Electronic Poster Session at PICES XIII
 - f. Interactions with ICES-IOC Study Group on the Development of marine data exchange systems using Extensible Markup Language (XML)
4. Annual reports and updates on data management activities in PICES member countries
5. Second inter-sessional Science Board Meeting
6. Discussion of TCODE activity in relation to the PICES Strategic Plan and development of a draft Action Plan for current and future activity
7. Discussion of capacity building opportunities
8. PICES website
9. Discussion of steps towards next major PICES scientific program(s)
10. Topic session proposals for PICES XIV
11. PICES XV theme
12. Relations with other international programs and organizations
13. Membership and Chairmanship of TCODE (including possibility of having a Vice-Chairman position)
14. Summary of items with financial implications
15. New business
16. TCODE Work plan for 2004/2005

TCODE Endnote 3

Proposal for a ½-day TCODE Topic Session at PICES XIV on “Data management and delivery systems to support ecosystem monitoring”

A stated objective of PICES is to provide data in exchangeable formats to better enable the evaluation of North Pacific ecosystems status and trends, and to support other strategic pursuits. PICES scientists face challenges in managing and delivering data in a shareable way. Furthermore, a growing number of ocean observing systems require data management and

communication methodologies that conform to rigid standards and protocols. For the most part, traditional science education of the past century offered little training in data management. Today’s typical scientist, although supportive of data exchange, lacks the background to understand techniques to facilitate it.

This session will acquaint PICES scientists with state-of-the-art information about metadata description, data delivery and data browsing techniques, with emphasis on existing standards and web services recommended for ocean observing systems. Basic to advanced methods will be presented in a graduated format. Presenters and participants will describe and explore existing, successful systems. Participants will learn ways to map existing data structures into conformant, exchangeable formats using no-cost, open-source applications.

Presenters and participants will describe and explore existing successful systems. Participants will learn ways to map existing data structures into conformant, exchangeable formats using no-cost, open-source applications.

Recommended convenors: S. Allen Macklin (U.S.A.), Bernard A. Megrey (U.S.A.) and Igor I. Shevchenko (Russia).

Suggested resources: 5-10 work stations with Internet connection.

TCODE Endnote 4

PICES TCODE data-sharing pilot project to “Federate Metadata on North Pacific Ecosystems”

Informal discussions between the Korean Oceanographic Data Center (KODC) and the North Pacific Ecosystem Metadatabase (NPEM) have taken place over the past year. The goal of these discussions is to ultimately connect PICES member nations’ metadatabase systems into one integrated resource. In this way, a user of any one metadata inventory will have the ability to search for data catalogued by any and all other participating system with a single search request. Using modern data management techniques to cross-search separate metadatabases provides the advantages of shared metadata without compromising national ownership, data integrity, or security of national metadata products.

Our informal discussions indicated that this project is feasible and worthy of immediate pursuit. TCODE has adopted a pilot KODC-NPEM federation as part of its 2005 work plan. We plan to initiate a series of meetings, open to all PICES member nations, to discuss the required technical details. During the process of outlining and discovering the technical hurdles and the means to address and solve problems with KODC and other participants, we intend to document our findings in a report, to be published during 2006, that can be used by other PICES countries wishing to join the federation. In this way, success with this project should easily scale up to similar efforts with other PICES countries with a nominal investment of time and planning.

We believe this project is compatible with the PICES Strategic Plan and PICES scientific interests. It accomplishes capacity sharing because all subscribing systems will possess the ability to virtually expand their holdings to those of the complete network. Data sharing between PICES countries helps to advance PICES science.

We ask PICES to support this project on a shared-cost basis. Korea and U.S.A. will contribute ~37% of the total cost for two meetings of four persons from each organization. TCODE requests that PICES pay 25%. Other participants are welcome to join the meetings, as possible.

Projected budget:

Total cost:	US\$ 16,000
Two 2-day meetings with 4 people from each country (2 managers, 2 technical staff) at US\$ 2,000/person/trip.	
Contribution from U.S.A.:	US\$ 6,000
Contribution from Korea:	US\$ 6,000
Contribution from PICES:	US\$ 4,000

Proponents of the proposal:

Hee-Dong Jeong (KODC/NFRDI, Korea)
Hae-Seok Kang (KORDI, Korea)
S. Allen Macklin (NOAA PMEL, U.S.A.)
Bernard A. Megrey (NOAA AFSC, U.S.A.)

REPORT OF SECTION ON ECOLOGY OF HARMFUL ALGAL BLOOMS IN THE NORTH PACIFIC



The Section on *Ecology of harmful algal blooms in the North Pacific* (HAB-S) met on October 16, 2004. The meeting was attended by 18 participants representing all PICES member countries (*HAB-S Endnote 1*). The agenda for the meeting was approved as presented (*HAB-S Endnote 2*).

Meeting summary

The terms of reference for the HAB Section can be found in *HAB-S Endnote 3*. Because the scope of the Section is large, it was agreed that representatives from each PICES member country would be needed to provide expertise in the following areas: (1) current science projects in their countries, (2) state-of-the-art methods and new technologies, (3) future national plans for HAB research and monitoring, and (4) types of monitoring projects and data availability. Some suggestions for the expanded membership are provided under “Recommendations”.

Presentations on subjects of interest in HAB research were given by scientists from all PICES member countries (see *HAB-S Endnote 2*).

The Section Co-Chairman, Dr. Vera L. Trainer reported on the successful joint PICES/IOC workshop on “Developing a North Pacific HAB data resource – II”, held on October 15, 2004. The main goal of the workshop was to provide an interim “report card” on the use of the IOC/ICES HAE-DAT database by PICES member countries. The agenda included nine presentations and an extensive discussion on the usefulness and possible modifications to HAE-DAT for PICES member countries. The summary of the workshop can be found elsewhere in this Annual Report.

Proposals generated during the discussion of HAB Section future tasks are included under “Recommendations”.

Recommendations to Science Board

- Request additions to the existing HAB Section membership to fill gaps in expertise that have been recognized by this year’s members. Experts are needed in:
 - phytoplankton taxonomy (suggested additions: Yasuwo Fukuyo of Japan, and Rita Horner of U.S.A.);
 - phytoplankton mitigation strategies (suggested addition: expert on clay deposition from Korea);
 - plankton physiology of such species as *Pseudo-nitzschia*, *Heterosigma*, *Alexandrium*, *Chattonella* (suggested addition: Charles Trick of Canada);
 - marine pollution and molecular biomarkers (suggested addition: Olga Lukyanova of Russia);
- Encourage participation in HAB Section activities by researchers from Hong Kong and Mexico;
- Integrate efforts of the PICES HAB Section with NOWPAP and NEAR-GOOS and their relevant programs and groups;
- Partner formally PICES data efforts with IOC/ICES HAE-DAT database, and request NCDDC assistance with HAB data efforts;
- Link PICES HAB database contributions on the IOC website to PICES website;
- Encourage HAB managers (especially from China) to participate in PICES HAB data efforts;
- Convene a 1-day workshop at PICES XIV on “Review of selected harmful algae in the PICES region: I. *Pseudo-nitzschia* and *Alexandrium* spp.” preceded by a ½-day laboratory demonstration on algal toxins detection techniques (*HAB-S Endnote 4*);
- Convene a 1½-day HAB Section meeting at PICES XIV (including ½-day for a HAB data demonstration by Henrik Enevoldsen (IOC) and discussion of PICES HAB data efforts);

HAB-S-2004

- Provide travel funds for 3 specialists to speak/demonstrate at the proposed workshop on “Review of selected harmful algae in the PICES region: I. *Pseudo-nitzschia* and *Alexandrium* spp.” [possibly D. Anderson

(*Alexandrium*), S. Bates (*Pseudo-nitzschia*), and M. Quiliam (HPLC)], and 1 Chinese scientist to attend the HAB Section meeting at PICES XIV.

HAB-S Endnote 1

Participation List

Members

William Cochlan (U.S.A.)
Ichiro Imai (Japan)
Hak-Gyoon Kim (Korea, Co-Chairman)
Tatiana Yu. Orlova (Russia)
Angelica Peña (Canada)
Vera L. Trainer (U.S.A., Co-Chairman)
Yasunori Watanabe (Japan)
Mark L. Wells (U.S.A.)
Ming-Yuan Zhu (China)

Observers

Nicolaus G. Adams (U.S.A.)
Jeanne Allen (U.S.A.)
Brian D. Bill (U.S.A.)
Eun-Seob Cho (Korea)
Henrik Enevoldsen (IOC)
John E. Stein (U.S.A., MEQ Chairman)
Michelle Tomlinson (U.S.A.)
Dong-Beom Yang (Korea)
Ying-Lin Zou (China)

HAB-S Endnote 2

HAB Meeting Agenda

1. Welcome and introductions
2. Country reports
 - Ming-Yuan Zhu et al. (China): The occurrences of HAB in Chinese coastal waters in last three years
 - Ichiro Imai et al. (Japan): Monitoring of the shellfish-killing dinoflagellate *Heterocapsa circularisquama* in Japanese coastal sea by indirect fluorescent antibody technique
 - Angelica Peña (Canada): Preliminary proposal of a Canadian Program on the Ecology and Oceanography of Harmful Algal Blooms
 - Tatiana Yu. Orlova (Russia): Harmful algal bloom data for the Russian east coast
 - Hak-Gyoon Kim et al. (Korea): Recent approaches for the prediction and

- mitigation of *Cochlodinium polykrikoides* blooms in Korean waters
 - Vera L. Trainer et al. (U.S.A.): Ecological linkages between physical and oceanographic conditions and the seasonal growth and distribution of *Pseudo-nitzschia* blooms on the U.S. west coast
 - Michelle C. Tomlinson et al. (U.S.A.): The use of remote sensing and meteorological data for monitoring HABs through ecological associations
 - Ying-Lin Zou et al. (China): Monitoring toxic HAB in the Chinese waters during the last three years
3. Summary of the PICES XIII workshop on “Developing a North Pacific HAB Data Resource – II”.
 4. Discussion of HAB Section future tasks

HAB-S Endnote 3

Terms of Reference for the Section on *Ecology of harmful algal blooms in the North Pacific*

1. To develop and implement annual bloom reporting procedures that can be consistent with ICES procedures and therefore

incorporated into HAE-DAT and used to update the North Pacific Ecosystem Status Report. This will be important in assessing

- impacts of HAB events and as a research tool to understand patterns that will eventually lead to an increased prediction capability.
2. To exchange national reports of HAB incidents and development in order to inform PICES 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 synthesis might include:
 - a. Mitigation practices to reduce the impact of HABs;
 - b. Numerical model development of harmful algal bloom initiation and transport for predictions and forecasts;
 - c. Relationship between oceanographic processes and HAB formation (*e.g.*, how the physics of nutrients, trace metals tie into bloom formation);
 - d. Organism identification using molecular biological techniques;
 - e. Discussion of possible changes to certain monitoring techniques (for example, cell numbers *vs.* toxin levels);
 - f. Species introductions including issues of anthropogenic sources (*e.g.*, ballast water) or natural systems (*e.g.*, species range extension).
 4. Together with TCODE, to develop a meta-database 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 biology and ecology of HAB organisms. For example, an in-depth study and documentation of selected HAB species (“top ten”) could include information about physiology, taxonomy, etc., of each of the species.

HAB-S Endnote 4

Proposal for a workshop at PICES XIV on “Review of selected harmful algae in the PICES region: I. *Pseudo-nitzschia* and *Alexandrium* spp.”

This workshop is the beginning of an annual series in which harmful algal bloom (HAB) species that impact all or most countries in the North Pacific are discussed in detail. In 2005, we will focus on two genera, *Pseudo-nitzschia* and *Alexandrium*. Topics will include detection methods, ecosystem comparison, and new advancements in physiology and ecology from each of the PICES member countries. In particular, we would like to stress those factors which need additional study in order to develop a predictive capacity for these HAB species. Specific subjects will include: a comprehensive listing of both macro- and micro-nutrient requirements, toxin production, light and temperature requirements, environmental

conditions, species and strain variability, cyst formation, shellfish species impacted, modeling and genetics. We will document our knowledge on the ecophysiology of these HAB species as a result of this workshop. During future workshops we anticipate discussing additional species, such as *Cochlodinium*, *Heterosigma akashiwo*, *Dinophysis*, *Heterocapsa*, *Chattonella*, *Gymnodinium catenatum* and *Karenia mikimotoi*. This 1-day workshop will be preceded by a ½-day laboratory demonstration on detection techniques for algal toxins at the TINRO-Center.

Recommended co-convenors: Tatiana Orlova (Russia) and Mark Wells (U.S.A.).

REPORT OF WORKING GROUP 17 ON BIOGEOCHEMICAL DATA INTEGRATION AND SYNTHESIS

83

84

The meeting of Working Group 17 (WG 17) was held from 08:30 – 17:00 hours on October 22, 2004. After a brief welcome by the Co-Chairman, Dr. Andrew G. Dickson (see *WG 17 Endnote 1* for attendance) and a discussion of the proposed agenda (*WG 17 Endnote 2*), the meeting continued with a series of status reports and technical presentations.

Workshop on “Ocean surface $p\text{CO}_2$ database and data integration (Agenda item 3)

Dr. Dickson presented a report on the workshop on “Ocean surface $p(\text{CO}_2)$ database and data integration” held January 14–17, 2004, in Tsukuba, Japan. This workshop was sponsored by the National Institute for Environmental Studies, the International Ocean Carbon Coordination Project (IOCCP), and PICES Working Group 17. Support for this workshop was provided by a grant from NIES/MEX and by the US National Science Foundation Award No. OCE-0245278 to SCOR.

The workshop included 44 participants from 12 countries. The goals of this workshop were (i) to understand potential sources of error and differences in ocean $p(\text{CO}_2)$ systems; (ii) to develop guidelines for improving the systems and measurement practices; (iii) to reach agreements on data and metadata formats and data exchange practices; and (iv) to discuss ways in which we could begin to connect existing activities into a coordinated global network capable of producing high-quality, global data sets of $p(\text{CO}_2)$ and air-sea flux of CO_2 . While much of the workshop focused on technical issues, it also addressed the need to go beyond simply connecting existing activities through common practices, and to develop an international implementation strategy for a global network of observations. The results of the workshop include:

- A technical report of the inter-comparison experiment, to be published by CDIAC, entitled “The International Indoor Seawater Pool $p(\text{CO}_2)$ inter-comparison - Results and recommended practices”. A more concise version of the report may be developed for publication in a peer-reviewed journal;
- The development of an IOCCP recommendation for metadata and data formats;
- Agreements on data center coordination and data management;
- Agreements on public data release and a system of acknowledgement for data use;
- Agreements on the coordination of data integration, synthesis and modeling activities;
- Plans for the development of an implementation strategy for a coordinated global network of surface $p(\text{CO}_2)$ observations.

A more detailed description of the workshop including the full workshop report is available on the IOCCP website at <http://ioc.unesco.org/ioccp/Tsukuba2004Results.htm> (see also *PICES Press*, Vol. 12 (2), 25-29). In the discussion of the workshop, it became clear that the final technical report on the Hazaki inter-comparison experiment was not yet available, however WG 17 members were optimistic that this could be completed, and some follow-up is needed.

Workshop on “Understanding North Pacific carbon-cycle change: Data synthesis and modeling” (Agenda Item 4)

Dr. Christopher L. Sabine gave a brief overview of this workshop co-sponsored by NOAA, the Global Carbon Project (GCP) and PICES Working Group 17. The workshop was held June 2-4, 2004, in Seattle, and attended by about 60 scientists from 5 countries (Canada, Japan,

Korea, Russia and the United States). The workshop was organized using a three-step approach with active coordination, communication and collaboration among the participants before, during, and after the actual meeting. It provided a venue for significant interactions between scientists who brought their measurement results and ideas to the workshop for discussion and for synthesis. Many of the interactions at this workshop were focused on planning and carrying out work that was presented at PICES XIII in the POC Topic Session S8 (see below). A brief report of the workshop will appear in the next issue of PICES Press (January 2005, Vol. 13, No. 1). The synthesis manuscripts generated from the workshop are expected to be published as a *Journal of Geophysical Research* special issue in 2005.

Topic Session on “The impacts of climate change on the carbon cycle in the North Pacific” (Agenda Item 5)

One of the activities arranged by Working Group 17 for the PICES XIII meeting was the POC Topic Session S8 on “The impacts of climate change on the carbon cycle in the North Pacific”. This session was co-sponsored by the IOCCP, and the session convenors were Christopher Sabine (U.S.A.) and Kitack Lee (Korea). It was held on the afternoon of October 20 and the morning of October 21, and comprised of 18 oral presentations (including 2 invited talks) together with a number of posters. The report of the session is included elsewhere in this Annual Report. As noted above, this session provided a forum for presentation of new insights into such links between climate change and the carbon cycle as are manifest in the North Pacific, and showcased – in part – the results from a synthesis and modeling workshop that took place in June 2004.

Guide to best practices for oceanic CO₂ measurements and data reporting (Agenda Item 6)

Dr. Dickson summarized the current status of this project. It is still progressing at a very slow pace as it relies on his writing the parts

personally. At the meeting, he expressed the hope that it would be complete by the end of 2004. (Events have proved otherwise.)

The completed sections include methods for (a) sampling, (b) measurement of total inorganic carbon, and (c) measurement of total alkalinity. The statements on data reporting are based on guidelines proposed by PICES WG 13 and WG 17. In addition, drafts exist for an overview of the current status of methodology for the various measurements and indicating the rationale for the proposed “best practices”. The parts that are presently missing are methods for pH (this is problematic as there is a possible calibration problem in the thermodynamics of the commonly used indicator dyes that still needs to be clarified), and for $p(\text{CO}_2)$ – here a “best practice” would be based on the results from the various inter-comparisons and the Tsukuba workshop mentioned above.

Planning for the future of carbon cycle studies within PICES (Agenda Item 8)

This meeting in Honolulu is likely the penultimate meeting of WG 17, and although good progress has been made on fulfilling the various terms of reference of this Working Group, it is clear that there remains a clear need in the future for broad coordination of carbon cycle studies among PICES nations.

There are a number of new international ocean programs moving ahead: CLIVAR, IMBER and SOLAS, that are still in the process of discussing just how they will coordinate issues of common interest, such as CO₂ measurements. A possible coordinator of these activities is IOCCP (supported by Dr. Maria Hood at IOC) but this office presently has a quite restricted focus. One strategy that has been articulated involved setting up regional groups that have a clear interest in the science. Obviously this is an area in which PICES could play a role.

The Working Group members discussed this idea in some detail. In particular, it was felt that it would be desirable to set up a Section within PICES so as to ensure long-term continuation of this important activity. Possible tasks of such a

Section were discussed, and the following themes emerged:

- Coordinate and encourage ongoing and planned national and international syntheses of carbon cycle research studies in the North Pacific;
- Review the present level of knowledge on the processes controlling the carbon cycle in the North Pacific, and identify the gaps and problems;
- Identify available and suitable data sets on the oceanic CO₂ system, and work to enable effective mechanisms of data and information exchange;
- Regularly review the existing methodology of CO₂ measurements including the preparation of standards and reference materials, and advise on intercalibration and quality control procedures;
- Organize symposia, workshops, or PICES annual meeting sessions on carbon cycle and climate studies in the North Pacific.

In particular, it was recognized that it would be extremely important for such a Section to coordinate effectively on a more global level with the emerging international programs such

as CLIVAR, IMBER and SOLAS as well as with IOCCP. (A subsequent meeting of *International Ocean Carbon Stakeholders* in December 2004 re-iterated a need for similar activities on a global scale.)

Member reports (Agenda Item 9)

The meeting then concluded with a number of brief member reports on their recent activities in studying the carbon cycle and proposed future activities. The US activities were articulated by Drs. Richard A. Feely and Christopher L. Sabine, and Dr. Shuichi Watanabe provided an overview of activities of JAMSTEC in this area.

Action items for 2005

- Complete the proposed “Guide to best practices for oceanic CO₂ measurements and data reporting”;
- Complete the Technical Report on the *p*(CO₂) inter-comparison experiment;
- Prepare a proposal to POC and PICES articulating the need to create a Section to coordinate North Pacific carbon cycle studies.

WG 17 Endnote 1

Participation List

Members

Andrei G. Andreev (Russia)
Robin M. Brown (Canada)
Andrew G. Dickson (U.S.A., Co-Chairman)
Richard A. Feely (U.S.A.)
Hernan E. Garcia (U.S.A.)
Alexander Kozyr (U.S.A.)
Christopher L. Sabine (U.S.A.)
Toru Suzuki (Japan)
Shuichi Watanabe (Japan)
Yutaka Watanabe (Japan)

Observers

Alexander Bychkov (PICES)
Fei Chai (U.S.A.)
James Christian (Canada)
Curtis Deutsch (U.S.A.)
Maria Hood (IOC/IOCCP)
Hisayuki Inoue (Japan)
Kitack Lee (Korea)
Sachiko Oguma (Japan)

WG 17 Endnote 2

WG 17 Meeting Agenda

1. Welcome and introductions
2. Discussion of agenda
3. Report on IOCCP/NIES/PICES Workshop on “Ocean surface $p\text{CO}_2$ database and data integration”
4. Report on NOAA/GCP/PICES Workshop on “Understanding North Pacific carbon-cycle change: Data synthesis and modeling”
5. Report on PICES XIII Topic Session on “The impacts of climate change on the carbon cycle in the North Pacific”
6. Distribution and discussion of draft “Guide to best practices for oceanic CO_2 measurements and data reporting”
7. Proposal and discussion of plans for inter-session activities in 2004/2005
8. Planning for the future of carbon cycle studies within PICES
9. Members reports and plans for future national activities
10. Summary and review of action items

REPORT OF WORKING GROUP 18 ON MARINE AQUACULTURE



The meeting of the Working Group 18 (WG 18) on *Mariculture in the 21st century – The intersection between ecology, socio-economics and production* was held from 08:30 – 17:00 hours on October 16, 2004. The Co-Chairmen, Ik-Kyo Chung and Carolyn S. Friedman, called the meeting to order and welcomed the participants (*WG 18 Endnote 1*). Welcoming remarks were also made by Drs. Ian Perry (Science Board Chairman) and John E. Stein (MEQ Chairman).

Dr. Perry reminded participants that WG 18 was established at PICES XII (2003) in Seoul (Korea), under the direction of the Fishery Science (FIS) and Marine Environmental Quality (MEQ) Committees. He pointed out that the focus of this group should be on the environmental and ecosystem function, sustainability of production (*e.g.*, carrying capacity of ecosystems), and socioeconomics, rather than on the technology of aquaculture or specific aspects of nutrition of culture species. He also suggested that WG 18 should try and involve other PICES groups to aid in its task.

Dr. Stein emphasized that WG 18 is jointly sponsored by MEQ and FIS – a first time in PICES, and this reflects the broad interest that exists for the topic of mariculture. He noted that MEQ has had several aquaculture sessions at PICES Annual Meetings, and now through the Working Group, would have a focus for more in-depth activities on the scientific issues associated with aquaculture in the PICES region. He strongly recommended that WG 18 should strive to include socioeconomic aspects of mariculture in the North Pacific Region. He also reminded Working Group members that they are also responsible for adding information (reports or presentations) to the MEQ web page on the PICES website. Working Group 18 members should encourage broader involvement from each member country, and think about

publishing their results either in the PICES Scientific Report Series or peer-reviewed journals.

The proposed agenda was reviewed and adopted unanimously (*WG 18 Endnote 2*).

National reports on current status and trends in aquaculture (Agenda Item 3)

The terms of reference (*WG 18 Endnote 3*) were reviewed, followed by individual country reports on current status and trends in aquaculture. Summaries of these reports as well as comments and questions from the participants are appended as *WG 18 Endnote 4*.

Discussion and suggestions of WG 18 focus for 2005 and beyond (Agenda Items 4-6)

1. Carrying capacity (K):
To understand how many organisms may be cultured in a body of water, we need to have a complete understanding of the ecosystem, and learn how ecosystems change over time, thus, allowing alterations to stocking so as not to exceed K.
 - a. As technology is changing, we need to be able to incorporate technological impacts of K evaluation
 - b. Evaluation of impacts of culture activity on the carrying capacity
 - i. Senescence of shellfish grounds due to fecal production
2. Interactions between native and exotic species (local and broader geographic implications):
 - a. Evaluate potential of being invasive and competitiveness with native species
 - b. Consideration of goal of aquaculture: terminal market *vs.* enhancement/release
 - i. Land-based *vs.* water-based farms
3. Disease transfers and management
4. Genetics

5. Ecosystem balance: Assess direct and indirect effects of cultured and wild species on one another – an ecosystem approach
6. Socioeconomics:
 - a. Local impacts
 - b. Supply-demand-price
 - i. Overproduction
 - ii. Reduced availability (*e.g.*, due to natural vs. anthropogenic influences)
 - c. Incorporate lessons learned from agriculture (socioeconomic and otherwise)
 - d. How to evaluate values of different coastal activities: scenery, tourism, wild fish-shellfish-plants, aquaculture, and fishing
 - i. Integrated coastal zone management.

Other activities for the coming year(s) include:

- To coalesce all presentations from the WG 18 meeting at PICES XIII into a single Power Point presentation for the PICES website;
- To prepare a publication in the PICES Scientific Report series based on the submitted reports on current status and trends in aquaculture in PICES member countries;
- To consider what can be done to attract more scientists from the western Pacific to attend the WG 18 meeting at PICES XIV (October 2005, Vladivostok, Russia);
- To review potential for an inter-sessional meeting of the Working Group prior to the next two PICES Annual Meetings;
- To discuss participation of WG 18 members in the 3rd international symposium on restoration and stock enhancement to be held in 2006, in Seattle, U.S.A. (should PICES be requested to provide travel support for one scientist to attend?);
- To consider more collaboration with ongoing studies or groups such as APEC, ICES, NPAFC, University of Washington's

School of Marine Affairs, PICES WG 19 on *Ecosystem-base management science*, etc.

Proposed Topic Session at PICES XIV

Four session topic proposals were discussed:

1. Aquaculture, carrying capacity and ecosystem-based management;
2. Aquaculture, carrying capacity and the human dimension;
3. Aquaculture, carrying capacity, ecosystem-based management and socioeconomics;
4. Current and emerging issues of marine and estuarine aquaculture in the Pacific Region: Carrying capacity, ecosystem function and socioeconomics.

Following consideration of all the proposals, the Working Group recommends that a ½-day Topic Session on “Current and emerging issues of marine and estuarine aquaculture in the Pacific Region: Carrying capacity, ecosystem function and socioeconomics” be convened at PICES XIV (jointly with the Working Group on *Ecosystem-based management science*). This session will bring experts together to identify criteria for suitable indicators and the utilities of predictive models relevant to the impacts of mariculture, to assess the sensitivities of indicators, and to highlight gaps in current knowledge (*WG 18 Endnote 5*). Recommended convenors are Carolyn Friedman (U.S.A.), Glen Jamieson (Canada) and Sergey Pozdnyakov (Russia). Dr. Jian-Guang Fang has been asked to consider if he or one of his colleagues from China would be prepared to serve as a co-convenor.

The Working Group plans to convene a 1-day or ½-day Working Group meeting at PICES XIV. To promote cooperation with mariculture experts from Asia, in addition to this meeting, the Working Group recommends holding a separate meeting in Japan or Korea, immediately prior to PICES XIV.

WG 18 Endnote 1

Participation List

Members

Ik-Kyo Chung (Korea, Co-Chairman)
Jian-Guang Fang (China)
Carolyn S. Friedman (U.S.A., Co-Chairman)
Toyomitsu Horii (Japan)
John A. Moores (Canada)
Michael B. Rust (U.S.A.)

Observers

Yukimasa Ishida (FIS Chairman)
Victor Nazarov (Russia)
R. Ian Perry (Science Board Chairman)
John E. Stein (MEQ Chairman)
Ling Tong (China)

WG 18 Endnote 2

WG 18 Meeting Agenda

1. Welcome and introductions
2. Adoption of agenda
3. National reports on current status and trends in aquaculture
4. Summary of presentations and discussion of next steps
5. Consideration of publications and workshops on the current status and trends
6. Relations with other international programs and organizations
7. Other business
8. Adoption of report and recommendations to the Science Board

WG 18 Endnote 3

Terms of Reference for WG 18 on

Mariculture in the 21st century – The intersection between ecology, socio-economics and production

1. To review and report on the current status and projected trends in aquaculture in marine and estuarine regions of PICES that substantively contribute to world aquaculture.
2. To develop an overview of current and emerging issues, with respect to environmental and ecosystem function, sustainability of production (*e.g.*, carrying capacity of ecosystems), and socio-economics.
3. To convene a workshop on “Scientific issues for sustainable aquaculture in the PICES region”. A product from the workshop would be recommendations for a PICES Action Plan on scientific issues of mariculture.

WG 18 Endnote 4

National reports on “Current status and trends in aquaculture”

United States (Carolyn S. Friedman and Michael B. Rust)

The United States has a small marine aquaculture industry and thus has more consumers than producers.

Production

More shellfish than finfish production occurs along the west coast of the United States. The number of shellfish farms is on the rise, but increases in salmon production since 1996 are due to increased farm efficiency in lieu of a growing number of farms. Large rises in some new shellfish species are emerging - geoduck and abalone. A small offshore marine finfish culture is developing: Moi in Hawaii and discussion of offshore culture in California (CA) and Washington (WA). Also small land-based marine fish production is observed in Hawaii. In the US, an average 3-4% increase has been observed annually relative to about 12% increase in marine aquaculture globally, and is mostly due to improved technology in the US in lieu of farm expansions. No growth in the capture fishery sector has been observed, so increases in marine products are from aquaculture. Socioeconomic drivers are prominent along the western US - perceived and real competition with wild fisheries and the perception that farming is bad for the environment (a lot of misinformation), and some of this bad reputation is falling into the shellfish arena. There is a growing consumption market for marine products, and the upcoming demographic change projected as baby boomers' age, and more seafood consumption is expected in the next few years. In addition, people are becoming more health-conscious, leading to an increase in per capita fish consumption that results in the net import of seafood noted for the US.

NOAA-NMFS: Uses a science-based risk assessment of aquaculture (common approach to evaluate many issues that is being adopted by the US and EU):

1. Hazard (bad outcome)

- a. Define hazards
2. Risk: Level of risk or probability of the hazard or benefit occurring
 - a. Determine risks
3. Benefit: Gain from taking the risk
 - a. Define benefits
4. Mitigation strategies: Adjustments to reduce risk or severity of the hazard
 - a. Develop mitigation strategies to reduce hazard or risk to acceptable level if not already accepted

This method moves from a qualitative to quantitative assessment of any given activity, including marine aquaculture.

Environmental and ecosystem function

Carrying capacity: We need to consider impacts on the environment and ecosystem. An important component is the carrying capacity (K); as K is approached we may overreach capacity resulting in environmental and ecological impacts.

Native and exotic species: When culturing an exotic or introduced species, we must consider its capacity to become invasive, carry disease and compete with native flora and fauna. When culturing a native species, many concerns also need to be considered, including the genetic diversity of the captive relative to wild populations, and other genetic issues (domestication selection, inbreeding, outbreeding, *etc*), competition and disease.

Genetic issues: Include inbreeding, outbreeding, Ne, selection/domestication which can be controlled to a large extent by breeding programs designed to minimize these hazard and balance Ne with selection/domestication.

Disease: It is important to understand diseases of both wild and cultured animals, and to apply established methods to avoid disease introduction. Such methods will reduce the risk

of moving infected stocks, or reduce selection of sites where disease agents are prevalent in wild stocks but will not entirely preclude the potential for disease outbreaks. Parasites and diseases are natural components of the ecosystem and function to modulate population dynamics; in crowded culture systems disease expression is often enhanced relative to its expression in wild conspecifics.

Public awareness and stewardship: In the United States, non-governmental Organizations (or NGOs) and public education are key to public acceptance of cultured aquatic and marine products. The US desires safe, high quality seafood at a low price that is produced by an environmentally-safe method.

Comments/questions

1. PICES is evaluating the status of the North Pacific ecosystems, and information from this work may be applicable to WG 18's goals.

Canada (John Moores and Susan Bower)

Canadian issues are similar to that of the US. A lot of different aquaculture occurs on the west and east coasts, and inland waters with many companies established in multiple regions.

Production

Western Canada has ~27,000 km of coastline, and a lot of this shoreline is protected and may be used for aquaculture, with most concentrated around population centers but still away from cities in more pristine areas. Due to the pristine state of these sites, conflict with preservationists is an issue. Also often salmon farms and shellfish companies may compete for the same sites. Baynes Sound and Cortes Island are shellfish production oriented, and Broughton Sound contains more salmon culture operations. Production is estimated at 90,000 mt (90 Kmt) annually with Atlantic salmon at 73 Kmt, Chinook at ~10 Kmt and oysters at 7.2 Kmt. Expected production: now is 3900 ha and there is a plan to expand 5 times with new species

2. We need to think about the carrying capacity of the entire ecosystem that we are assessing for aquaculture. Some work is being done along Prince Edward Island, (Canada) regarding mussel culture and the ability to influence phytoplankton levels, but we need data on ecosystem impacts.
3. We need to assess how to integrate science and social aspects including risk aversion (*e.g.*, any risk is too much).
4. Perhaps comparing impacts of aquaculture to other accepted marine resource utilization, such as fishing or ecotourism, will allow the public to make decisions based on relative impacts.
5. We should consider studies by charitable foundations (*e.g.*, PEW) and the impact of such funded studies on public perceptions.
6. Aquaculture practices and scales vary between sites, regions and countries: The development of Best Management Practices (BMPs) may aid in minimizing impacts.
7. Some felt that the amount of fear over aquaculture was disproportion to its scale.

under development. Canadian aquaculture has been increasing ~10% annually, but recently has reached a plateau due to regulations and other impacts. Culture sites are subject to Canadian Environmental Assessment Act approval, and both Federal and Provincial governing of aquaculture. Canada is looking to implement an Integrated Management Approach: All stakeholders have a right to a voice (Oceans Act).

Environmental and ecosystem function

Carrying capacity: Insufficient information exists leading to a precautionary approach. There is a need to establish standards (Canada is developing codes of practice to minimize risk and build on existing knowledge; it is also hard to identify any impacts solely due to aquaculture) and to look at alternate techniques.

Native and exotic species: Introduced species include Atlantic salmon, Pacific oysters, and

Manila clams. Concern exists about displacement of native species, escapement, genetics and disease as well as displacement of other industries such as fisheries. Canada is looking to develop sablefish, Pacific halibut, geoduck, abalone and algae farms. A key question entails: When is a species domesticated? As there are likely to be large differences in cultured and wild congeners due to selection within a farm, it may be important to identify criteria for domestication.

Sustainability of production: Industry priorities: Fish health, breeding programs, alternate feeds, species interactions. The government is interested in environmental interactions and may not share same interests as scientists.

Genetics: Broodstock development, sources of seed are of key concern in the genetic management of farms.

Diseases: IHN, *Kudoa*, sea lice, mikrocytosis occur in Canada. Most are naturally occurring (see DFO web site). British Columbia has a Health Management Plan (only use of certified fish is allowed, which will reduce but not preclude the risk of disease).

Feed supply: A limit exists to the amount of forage fish available and there is concern over the culture of carnivores that rely on wild fish for protein. Feed is estimated to represent ~33% of culture costs; thus Canada is looking for alternative protein sources. There is interest in minimizing nutrient loading (P in freshwater and N in seawater) and trying to minimize associated impacts.

Socioeconomics: Annual revenue from mariculture is estimated at \$300 M, with 576 licensed sites, 2000 direct on-farm jobs and, if related jobs are included, from 6000 or up to 14000 jobs are associated with marine aquaculture. This industry also serves as the economic and ceremonial base for rural and First

Nation communities (hard to quantify this latter benefit of aquaculture).

Restoration of stocks: Not considered true aquaculture as seeks to maintain characteristics of wild stocks. There is a feeling that if we put aquaculture and restoration together (*e.g.*, restoration aquaculture) it may lead to problems. Many programs exist to enhance stocks (Salmon Enhancement Program). Programs to preserve endangered stocks also exist: abalone in British Columbia and salmon in Bay of Fundy on the east coast.

Public awareness: This aspect is considered very important. In general, throughout Canada, a positive response to aquaculture exists. However, there is also controversy over aquaculture, especially along the west coast of the country. We need to increase knowledge base and communicate effectively.

Comments/questions

1. Currently in the US, state hatcheries need NEPA approval.
2. There are challenges due to differing mandates of Canadian governing bodies: federal and provincial.
3. Where aquaculture occurs, it is conducted at high densities with site-specific problems. This is still a new industry and needs to move up the learning curve. There is a need to look at political concerns and put these into perspective, perhaps by including lessons learned from other countries.
4. Using an ecosystem approach needs improvements; it is hard to evaluate impacts if ecosystem characterization is lacking.
5. It is time to look at compromises between production and environmental assessments.
6. Dr. Ishida wanted to know what issues exist for the three main species cultured along the eastern Pacific: Salmon, oysters and clams. This was discussed later in the meeting.

Korea (Ik-Kyo Chung)

Production

Production fluctuates in Korea, in part, in conjunction with economics.

Total aquaculture: Shellfish and seaweed cultures are decreasing but fish culture is increasing; seaweed culture is the largest component of the industry and its contribution fluctuates annually. Marine aquaculture based on value is rising, with fish in the lead over shellfish and seaweed, both of which are declining. Shellfish: oysters represent 80% of production; seaweed: *Undaria* and *Porphyra* are the most frequently cultured (90% combined). Although shellfish aquaculture is declining, more people are engaged in this culture industry, while fish culture is stable regarding the number of farms and sizes of culture sites. Most species are cultured in the south: eastern regions focus on fish and western regions focus on shellfish and seaweed.

Fish products: Live raw fish predominate, and recently Korea has been trying to expand markets to include fresh types of processed fish. Seaweed prices reflect the amount of production, and the industry needs to pay attention to this.

Luxury versus subsistence: Luxury items are the first stage of any operation and may become subsistence as the industry grows. Fish and abalone are highly valued and take priority. Most production is consumed locally in Korea.

Environmental and ecosystem function

Carrying capacity: Estimation of carrying capacity is necessary to maintain sustainable production and to protect the environment from impacts of culture activities. Research is ongoing and uses the ecosystem model EUTROPII based on physical and eutrophication processes in the coastal bays. This model is used to incorporate the size of production to calculate the amount of species X that can be produced in that area; production-oriented, not whole bay ecosystem.

Genetics: The number of exotic species cultured is small and these species are in the early stages of introduction. Korea is doing genetic assessments (and has information) on several native cultured species as compared with wild conspecifics.

Wild and native species: No competition issues between wild and cultured organisms have been identified in Korea.

Disease: This issue is considered important, and laboratories are working on diagnostic methods, but this research is in its early stages.

Sustainability of production: Culture to enhance production in an environmentally sound and economically successful manner. Strict regulations for use of the coastal environment is leading to research on recirculating systems, integrated polyculture, and off shore systems.

Socioeconomics: Fishery household income has declined, while cost of marine products is on the rise, but price of some cultured species has declined (*i.e.*, oysters, bastard and laver, often due to over production as occurred in 2002).

Restoration aquaculture: This has been practiced for 25 years. 12 National Fisheries Hatchery laboratories are involved, and 375 M individuals have been released. Korea has produced artificial reefs and released seed/spat. Now higher numbers of individuals and more species are being released. Salmon: 260 M smolts over 35 yrs and returns of 1-1.5% in the 1990s. Now due to the success of increases from released smolts, salmon season has been expanded and related income has risen:

- about 56 species are under mass production;
- 50 species are in the pilot scale production;
- 30 species are in the initial stages of development;
- researchers are considering genetic and disease issues.

Methods: Conflicts exist regarding how to evaluate the use of artificial reefs: Some seem to work, some do not. Researchers are thinking

about genetic effects and methods to reduce genetics impacts and rates of releasing animals.

Public awareness: Ministry of Marine Affairs and Fisheries has the following three basic objectives: (1) promoting the vitality of our territorial waters; (2) development of a knowledge-based marine industry; and (3) sustainable development of marine

Japan (Toyomitsu Horii)

Production

A 33% decline in capture fisheries has been documented between 1991 and 2001, in both volume and value, while aquaculture has been stable in volume:

- yellowtail production and price has remained stable for 20 years;
- red sea bream increased in volume but reduced in price due to imports;
- the volume of flounder has increased but is stable now, and price is decreasing;
- the volume of ocellate puffer is on the rise but price is flat or has decreased slightly; this species is on the rise as culture methods improve;
- scallop production increased to a stable level since 1990, and currently price is reduced due to oversupply;
- stable price and volume produced are noted for oysters; tango are stable also;
- the sea mustard industry has had a stable price despite reduced volume produced; laver is also stable.

Most products are consumed locally but some are exported. Volumes and prices generally are stable and some luxury species (*e.g.* puffer) are on the rise.

Environmental and ecosystem function

Current and emerging issues: These include environmental degradation, damage to fish due to pollution (*i.e.*, red tides), and disease. Not much concern is expressed over genetics as local species are cultured.

resources. To attain its vision and objectives efficiently, Ocean Korea 21 (OK21) has 7 specific goals consisting of 100 special projects. As part of the policy initiatives for sustainable development, which is a new paradigm of the 21st century, a comprehensive program for marine environment conservation has been set up for implementation. There are plans to make some practices compulsory.

Sustainability of production: In 1999, the law was established to ensure sustainable aquaculture production. Specific disease lists were developed for the three primary cultured organisms, including shrimp, and two fish species.

Socioeconomics: Declines in some fish species have resulted in socioeconomic impacts.

Restoration aquaculture/stock enhancement:

- salmon releases have resulted in increases in the number fished;
- red sea bream has a stable release/catch program;
- the number of flounder seed released have resulted in a stable catch;
- increases in abalone seed not been able to reverse a trend of decreased catch (over-fishing and environmental change are thought to contribute to this trend);
- the scallop catch and release programs appear balanced;
- remarkable results have been noted for salmon and scallop programs, and Japanese researchers are evaluating the results of stock enhancement programs for other species.

Concerns: Disease is the top concern over genetics or carrying capacity.

Comments

1. Has the optimal size of planting been determined for each species? Dr. Horii indicated that a balance between size and

cost is the method of determining this value for each species.

2. The goal of the enhancement programs was asked, and Dr. Horii responded that some

programs are designed to replenish stocks (e.g., aid in returning to self-sustaining populations), while others are perpetual release programs.

China (Jian-Guang Fang)

Production

Since the 1970s, mariculture has been on the rise and has made substantial contributions to seafood production. Most production is based on shellfish (80% of production); seaweed is next in volume. Fish cultured include: Japanese sea bass, yellow croaker, red drum, sea bream and flat fish. Shrimp cultured include: *L. vannamei* and *L. chinensis*, and the culture industry is on the rise after decimation due to disease. Crabs are also cultured.

The most important species include: oysters, clams, scallops, razor clams, mussels and abalone in descending order. Abalone: *H. disucs hannai* in the north and *H. diversicolor* in the south. China is the largest producer globally and is still expanding production. The vast areas and densities in production are leading to environmental concerns.

Cage culture makes up 50% of total production of fish. Varying farm methods are used from extensive to intensive.

Environmental and ecosystem function

Carrying capacity: In order to assess carrying capacity (K), primary production and POM is measured to estimate filter feeding rates, zooplankton consumption, and to project the amount aquaculture that can be sustained in a given area. Based on the models used some species were cultured in densities that exceeded K by 20-100%. As an example, in Sungo Bay, algae and smaller sized scallops exceeded K, while medium-sized scallops were balanced with primary production and larger scallops were below their K. Now Chinese researchers are

trying to reduce production densities via polyculture (i.e., fish and *Laminaria*, and also integrate seaweed with shellfish on long lines, integrated or adjacent block methods, as well as sea cucumber and mussels co-culture). Polyculture has increased yields: e.g. polycultured *Laminaria* increased in yield 45% over that species in monoculture.

Impacts on the environment: In Sungo Bay, kelp, oyster and scallops are the main species cultured and are reared in high densities. High harvest levels reduce large volumes of N and P in the bay. When combined with the filtering capability of filter feeders, reduced nutrient loads have been observed (bivalves may filter 38% of Sungo Bay water per day). In addition, chlorophyll *a* levels have declined.

The impact of seaweeds on other species depends on nutrients available in the bay. Impacts on benthos have been noted for those in suspension culture: 2 times more feces produced for each bivalve harvested (i.e., 2 MT feces for 1 MT harvest) and, by calculations, could result in 10 cm of fecal sediments; but currents carry away a large amount of fecal material. From 1993 to 2004, changes in the benthic community with reduced biodiversity from over 200 to 30 species have been documented. Suspended culture has also reduced sea grasses. Re-suspension of sediments result in bivalve losses and lead to algae blooms, reduced light penetration and reduced sea grasses and benthic algae.

Researchers have established models to examine these impacts and to evaluate impacts on culture, and the environment and human health. There is a need to establish management practices.

Russia (Victor Nazarov)

Production

Current status: Northern Russia has a small population and no aquaculture (Koriak region has only 1 farm); Kamchatka: release Pacific salmon from 10 farms (pink, chum, less coho, and even less chinook); Magadan: 4-5 anadromous ponds; next district: more mariculture but less than 20 farms for releases (>1 billion pink and chum released); the next region to the south has 5 farms for salmon release (200,000+ smolts released); the next district has mariculture development programs to produce 1000 farms for scallops, mussels and sea cucumbers; the southernmost region has 3 kinds of aquaculture: freshwater, anadromous and

sturgeon (>50 tonnes), Pacific salmon releasing ponds for chum (<50 million fingerlings); the southernmost area is just beginning the practice of aquaculture (in 2000, began mariculture development for scallop, seaweed, mussels, sea cucumber and oysters). Most farms here are quite small because of small demand. Products are for domestic consumption.

Problems of disease, sustainability are not known as Russia only has a small industry, and does not expect industry expansion in coming years.

Most farms are governmentally owned and only a few, located in one territory, are private.

WG 18 Endnote 5

Proposal for a ½-day MEQ/FIS Topic Session at PICES XIV on “Current and emerging issues of marine and estuarine aquaculture in the Pacific Region: Carrying capacity, ecosystem function, and socioeconomics”

It is well recognized that for successful and long-term utilization of waters for aquaculture and other uses, we must consider the allocation of resources and trophic structure of the system. Ecosystem-based management of resources requires ways to monitor current conditions and predict future states, particularly in response to known human activities that impact the marine environment. Mariculture is an important expanding industry in all PICES countries, and this session will consider mariculture as a case study on how the ecosystem impacts of a particular human activity can be managed. Indicators and predictive models are being used

to evaluate and hypothesize the responses of an ecosystem to environmental impact and resulting management actions. This session will bring experts together to identify criteria for suitable indicators and the utilities of predictive models relevant to the impacts of mariculture, to assess the sensitivities of indicators, and to highlight gaps in current knowledge.

Recommended co-conveners: Jian-Guang Fang (China), Carolyn Friedman (U.S.A.), Glen Jamieson (Canada) and Sergey Pozdnyakov (Russia).

REPORT OF STUDY GROUP ON ECOSYSTEM-BASED MANAGEMENT AND ITS APPLICATION TO THE NORTH PACIFIC

☪

☪

The MEQ/FIS Study Group on *Ecosystem-based management and its application to the North Pacific* (SGEBM) met on October 14, 2004. Participants introduced themselves and the missing representation from China and Japan was noted. Some of these representatives would be coming later in the week but not in time to participate in the meeting. The Russian member could not attend but several Russian scientists attended the meeting as observers (*SGEBM Endnote 1*). The SGEBM Co-Chairmen, Drs. Glen Jamieson and Chang-Ik Zhang, went over the agenda for the meeting, and it was approved as presented (*SGEBM Endnote 2*).

Meeting summary

The terms of reference for the Study Group (*SGEBM Endnote 3*) were reviewed, followed by presentations of national submissions to the SGEBM report. Dr. Jamieson summarized the submissions of China and Japan. Dr. Oleg Katugin presented the Russian contribution. It was noted that the SGEBM report should be amended to indicate Study Group members who were responsible for preparing the national contributions so that questions could be directed to those individuals.

In reviewing the summaries of each country's approach to ecosystem-based management (EBM), it is immediately obvious that EBM challenges are different between China, Japan and Korea vs. Russia, Canada and the United States. The greater coastal populations in the former three countries, coupled with their much longer history of full exploitation of most harvestable renewable resources, meant that EBM is, initially at least, focused on 1) minimizing existing impacts, 2) rebuilding depleted stocks to more acceptable levels, and 3) in near-shore areas in particular, minimizing widespread impacts in the marine environment from land runoff from both industrial and urban

developments. In contrast, in the latter three countries, human coastal populations and development were generally much less, with fishing impacts and offshore oil and gas development and transport identified as the major impacts. In many instances, relatively unimpacted, pristine habitat and biological communities still existed, and so the challenges there were often how to maintain them while permitting appropriate new economic activity to occur.

There was much discussion around three issues:

- 1) What would be an appropriate standard format to document environmental impacts and initiatives to minimize them?
- 2) How could the PICES region be subdivided into what the Study Group termed eco-regions? and
- 3) What indicators would be most appropriate to evaluate progress in achieving EBM?

While it is recognized that many human activities impact the marine environment (*e.g.*, fishing, mariculture, oil and gas exploration and development, pollution from land-based activities, disruption of freshwater discharges by urbanisation, *etc.*), the most comprehensive databases (*e.g.*, target species landings, bycatch and discard characteristics, habitat disruption, *etc.*) as to how these impacts are affecting marine ecosystems are related to fishing activities. Hence, much initial reporting of ecosystem impacts has been focused on documenting and addressing fishery impacts. Alternate reporting formats may need to be assessed or developed, that capture the ecosystem effects resulting from other human activities, and that describe how these ecosystem effects are being monitored. Ecosystem parameters already, or potentially, being monitored, may be capturing environmental change, without linking this change back to the specific human activity, or activities, that in fact

might be causing the change (*e.g.*, increasing sea water temperature may be the result of many causes, some of which relate to human activities). In some cases, additional research may need to be undertaken to determine linkages. It was thus suggested that a standardized reporting framework that describes human activity impacts be progressively applied to all fisheries in PICES member countries, and that the adopted reporting framework be robust enough to address an increasing number of environmental and other requirements imposed by legislation, certification schemes, and consumer and community demands.

It was generally agreed that while achievement of EBM was a common objective, only through monitoring could the level of progress be actually measured. For cost-effectiveness, existing monitored parameters should be first assessed as to their utility there, but it was recognised that new parameters, many associated with non-commercial species, will also have to be monitored. Different national approaches to achieving such monitoring were briefly discussed, mostly in the context of initiatives to develop a process to determine an optimal mix of parameters to monitor.

The Study Group accepted Canada's definition of "eco-regions" as "*a part of a larger marine area (eco-province) characterized by continental shelf-scale regions that reflect regional variations in salinity, marine flora and fauna, and productivity*". Biological communities between each region are somewhat

different, but within a region, they are generally similar, at least on the large scale. There would obviously be differences between habitats (*e.g.*, estuarine, rocky, soft substrate, *etc.*) within an eco-region, but overall, the same mix of species could be expected to occur. EBM approaches within an eco-region should thus strive to achieve the same broad conceptual objectives of trying to preserve the natural species mix, proportions across trophic levels, water quality, and so on. Since some eco-regions transgress national boundaries, this might mean that different countries would be trying to address the same ecological objectives in their own waters within the same eco-region. The Study Group thus indicated that it would be of value to have a collective evaluation of where different eco-region boundaries are located.

It was concluded that SGEBM completed its terms of reference and prepared a report which describes current efforts and programs on EBM in PICES member countries. In finalizing the report, the following recommendations were made:

- Publish the final SGEBM report in the PICES Scientific Report Series in 2005;
- Establish a Working Group on *Ecosystem-based management and its application to the North Pacific* under the direction of the FIS and MEQ Committees, with a 3-year duration and the terms of reference as listed in *SGEBM Endnote 4*;
- Convene a 1-day MEQ/FIS Topic Session at PICES XIV on "Ecosystem indicators and models" (*SGEBM Endnote 5*).

SGEBM Endnote 1

Participation List

Members

Christopher Harvey (U.S.A.)
Glen Jamieson (Canada, Co-Chairman)
Jae Bong Lee (Korea)
Patricia Livingston (U.S.A.)
Inja Yeon (Korea)
Chang Ik Zhang (Korea, Co-Chairman)

Observers

Elena P. Dulepova (Russia)
Oleg Katugin (Russia)
Suam Kim (Korea, CCCC-IP Co-Chairman)
Olga Lukyanova (Russia)
John E. Stein (U.S.A., MEQ Chairman)
Hao Wei (China)
Oleg Zolotov (Russia)

SGEBM Endnote 2

SGEBM Meeting Agenda

1. Welcome and introductions
2. Approval of agenda
3. Discussion of SGEBM terms of reference
4. Presentation of national EBM reports
5. Discussion and identification of emerging scientific issues related to the implementation of ecosystem-based management
6. Discussion and development of recommendations for a Working Group to focus on one or more issues identified
7. Finalization of report and recommendations to Science Board

SGEBM Endnote 3

Terms of Reference for the Study Group on *Ecosystem-based management and its application to the North Pacific*

1. To review and describe existing and anticipated ecosystem-based management initiatives in PICES member nations and the scientific bases for them;
2. To identify emerging scientific issues related to the implementation of ecosystem-based management;
3. To develop recommendations for a Working Group to focus on one or more issues identified in (2) above;
4. To report the results to Science Board at PICES XIII.

SGEBM Endnote 4

Proposed Terms of Reference (with additional information) and membership for the Working Group on *Ecosystem-based management and its application to the North Pacific*

1. Describe and implement a standard reporting format for ecosystem-based (EBM) initiatives (including more than fishery management) in each PICES country, plus a listing of the ecosystem-based management objectives of each country.

Review and describe in detail existing and anticipated ecosystem-based management objectives and initiatives in PICES member countries and elsewhere globally, and the scientific bases for them (this will be in more detail than is summarized in this report of the Study Group). Common elements, gaps and critical issues will be identified, particularly for areas such as monitoring, in which concerted international (*e.g.*, PICES) efforts might help in the achievement of progress. A standard reporting format, such as the Australian outline, would be developed for summarising the approach each country has adopted for all human impacts affecting the marine environment, including fishing.
2. Describe relevant national marine ecosystem monitoring approaches, and plans and types of models for predicting human and environmental influences on ecosystems. Identify key information gaps and research and implementation challenges.

The most important emerging scientific issues related to EBM appear to be the identification of sensitive ecosystem indicators and development of predictive models that can tell managers how ecosystem state might change in response to human or climate forcing. A major challenge in the achievement of EBM is determining what are the most relevant and cost-effective ecosystem parameters to measure in the monitoring of whether EBM is actually being effectively achieved. The details of such

parameters can be expected to be ecosystem-specific, but evaluation is required of whether there are underlying basic parameters that need to be monitored in all systems. Within PICES member countries, efforts would be described that explore science evaluation of potential components of ecosystem monitoring (measurements, indicators). Another key aspect of EBM to be examined would be national efforts to develop predictive models that incorporate human and climate effects and important ecosystem processes (such as predator-prey dynamics). The Working Group could then comment on key gaps in the ecosystem monitoring system of the North Pacific and recommend development of additional models for decision-making.

3. Evaluate the indicators from the 2004 Symposium on “Quantitative Ecosystem Indicators for Fisheries Management” for usefulness and application to the North Pacific.
4. Review existing definitions of “eco-regions” and identify criteria that could be used for defining ecological boundaries relevant to PICES.

The FAO Technical Guidelines for Responsible Fisheries recognize that for ecosystems to be a functional management unit, they need to be geographically-based with ecologically meaningful boundaries. Eco-regions are defined by jurisdictions differently, but are used here with Canada’s definition: *“a part of a larger marine area (eco-province) characterized by continental shelf-scale regions that reflect regional variations in salinity, marine flora and fauna, and productivity.”* Such ecosystem features often cross national boundaries. The product envisaged here is the listing of criteria for identifying ecological boundaries. Ecologically relevant boundaries are needed to

allow scientific evaluation of how EBM objective achievement can be assessed, and to determine what potential components in an ecosystem monitoring and prediction program are most appropriate for the ecosystem being considered. It is important to have a standardized set of terms and vocabulary for defining spatial scales of interest.

5. Hold an inter-sessional workshop in Year 2 or 3 of the WG’s mandate, that addresses the status and progress of EBM science efforts in the PICES region, with the deliverable being either a special journal issue or a review article.
6. Recommend to PICES further issues and activities that address the achievement of EBM in the Pacific.

The following scientists are suggested as members of the Working Group based on their experience, qualifications and active participation to date (key participants are italicised; recommended Co-Chairman is marked by *):

Canada:

*Glen Jamieson**, Robert O’Boyle, Ian Perry,

Japan:

Tokio Wada

People’s Republic of China:

Xian-Shi Jin, Hao Wei

Republic of Korea:

Jae-Bong Lee, Inja Yeon, *Chang-Ik Zhang**

Russia:

Vladimir Radchenko

U.S.A:

Christopher Harvey, *Patricia Livingston**

SGEBM Endnote 5

Proposal for a 1-day MEQ/FIS Topic Session at PICES XIV on “Ecosystem indicators and models”

Ecosystem-based management (EBM) of resources will require ways to monitor current conditions and predict future states. Ecosystem indicators are single variables that reflect the status of broad suites of management activities or environmental conditions, and their assessment is key to monitoring the achievement of EBM. Predictive ecosystem models can be used to hypothesize the responses of an ecosystem to management actions, to assess the sensitivities of indicators, and to highlight gaps

in current knowledge. This session will bring experts together to identify criteria for suitable indicators and the utilities of predictive models, and to present candidates of indicators and models that are actively in use in PICES areas.

Recommended co-convenors: Glen Jamieson (Canada), Tokio Wada (Japan), Xian-Shi Jin (People’s Republic of China), Chang-Ik Zhang (Republic of Korea), Vladimir Radchenko (Russia) and Patricia Livingston (U.S.A.).

REPORT OF THE IMPLEMENTATION PANEL ON THE CCCC PROGRAM

3

8

The Executive Committee of the Climate Change and Carrying Capacity Program Implementation Panel (CCCC-IP/EC) met from 17:30-20:00 hours on October 17, 2004. The meeting was chaired by Drs. Harold P. Batchelder and Suam Kim. The Chairmen welcomed the attendees, and after brief introductions of those present (*CCCC-IP Endnote 1*), it was noted that MONITOR had been elevated from a CCCC Task Team to a Technical Committee, as recommended by the CCCC-IP/EC at PICES XII, and now should report directly to Science Board. Also, it was noted that this was the last meeting for the BASS and REX Task Teams, and the inaugural meeting for the new *Climate Forcing and Marine Ecosystems* (CFAME) Task Team. The agenda was reviewed and adopted with slight modifications (*CCCC-IP Endnote 2*).

Review of procedures for Best Presentation Awards and Closing Ceremony

Dr. Batchelder reported on the results of the discussion of this item at the first Science Board session. The procedure of nomination/selection for the CCCC Best Presentation Award by a young scientist will be identical to that used at PICES XII. PICES Secretariat implemented procedures for PICES XIII registration that provided more complete information on which talks were eligible for this award. Drs. Batchelder and William T. Peterson agreed to serve as judges to determine the Best CCCC presentation from the eligible papers in the CCCC Topic Session on “The impacts of large-scale climate change on North Pacific marine ecosystems”, and the CCCC/MODEL Topic Session on “Modeling approaches that integrate multiple spatial and trophic levels between shelf and open oceans”, and from the CCCC/REX Workshop on “The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim”. Dr. Sukyung Kang was

nominated and agreed to serve as a judge representing CCCC on the Best Poster Award committee for PICES XIII.

Mr. Hyun-Cheol Kim (Korea Ocean Research and Development Institute) won the CCCC Best Presentation Award for his paper entitled “Relation between phytoplankton blooming and wind stress in the central Japan/East Sea” (co-authored by S. Yoo and I.S. Oh) presented in the CCCC/REX Workshop.

Business from PICES XII (Agenda Item 3)

There were no items on-going from last year’s meeting that required discussion.

Documentation of scientific sessions (Agenda Item 4)

CCCC-IP/EC discussed responsibilities for documenting CCCC-sponsored Topic Sessions and workshops at PICES XIII. It was agreed that convenors of the CCCC/REX Workshop (Dr. W. Peterson), the CCCC Workshop on “Linking open ocean and coastal ecosystems II” (Dr. Kerim Y. Aydin), and the CCCC/MODEL Topic Session (Drs. Francisco E. Werner and Shin-ichi Ito) would provide session summaries by the end of Wednesday, October 20, to Dr. Batchelder. Drs. Batchelder and Kim will prepare a summary of the CCCC Topic Session on “The impacts of large-scale climate change on North Pacific marine ecosystems” after it concludes on Thursday, October 21. All summaries are included elsewhere in this Annual Report.

Progress reports of Task Team activities (Agenda Item 5)

CCCC-IP/EC received brief reports of CCCC Task Team activities from BASS, REX and MODEL Co-Chairmen, and a more lengthy

report and discussion of CFAME activities from the proposed Co-Chairmen of this Task Team, Drs. Kerim Y. Aydin and Akihiko Yatsu. On October 20, all Task Teams provided final reports that included a summary on progress since PICES XII and recommendations and planned activities for MODEL and CFAME for 2005, and even some for 2006. These reports appear elsewhere in this Annual Report. It was also noted that the Advisory Panel on *Iron Fertilization Experiment in the Subarctic Pacific* (IFEP-AP), had been formerly under BASS, which has now completed its work and has been dissolved, and so the Panel would need a new home. CCCC-IP/EC suggests to Science Board that the Biological Oceanography Committee should be the new home for IFEP-AP.

Changes in CCCC-IP/EC and Task Team membership (Agenda Items 6 and 7)

CCCC-IP/EC endorsed:

- MODEL's request to extend Dr. Werner's term as Co-Chairman for one additional year, with Dr. Thomas C. Wainwright (U.S.A.) to serve as Co-Chairman-elect after PICES XIV. It was noted that this might result in both Dr. Werner and Dr. Shin-ichi Ito's terms ending in 2005 (at PICES XIV), and the Executive Committee might want to consider extending Dr. Ito's term to end in 2006 (at PICES XV). Dr. Ito agreed to consider this extension in his term;
- MODEL's proposal on the following changes in Task Team membership:
 - Drs. Toshio Katsukawa and Hiroaki Saito (Japan) to be replaced by Dr. Goh Onizuka;
 - Dr. Hao Wei (People's Republic of China) to join the Task Team as a member;
 - Drs. Peter S. Ross (Canada), Jae-Hak Lee (Republic of Korea) and Linda Jones (U.S.A.) to formally rotate off the Task Team as they have not participated in recent meetings;
 - Additional members from Canada, People's Republic of China, Republic of Korea and Russia are needed.
- CFAME's request to have Drs. Kerim Aydin (U.S.A) and Akihiko Yatsu (Japan) as initial

Co-Chairmen. It was suggested by CCCC-IP/EC that Dr. Aydin's term be for three years and Dr. Yatsu's term be for two years to avoid simultaneous rotation of both Co-Chairmen in future years;

- CFAME's recommendation that the initial Task Team members be: Drs. Jacquelynne R. King and Gordon A. McFarlane (Canada), Sanae Chiba, Masahide Kaeriyama, Akihiko Yatsu and Yoshiro Watanabe (Japan), Hyung-Ku Kang and Sukyung Kang (Republic of Korea) and Vera Agostini, Kerim Y. Aydin, Brenda L. Norcross and James E. Overland from the United States. No specific suggestions for the People's Republic of China and Russia were made because those countries did not participate (except Dr. Vladimir I. Radchenko) in the CFAME meeting. At the Science Board meeting later in the week, Dr. Radchenko suggested Dr. Elena P. Dulepova as a Russian member to CFAME.

Suggested changes in membership will be forwarded to Science Board and Council for further actions.

The CCCC Co-Chairmen thanked Drs. Peterson and Watanabe for their service as REX Co-Chairmen, and Drs. Yatsu and McFarlane for their service as BASS Co-Chairmen.

Proposals for new subsidiary bodies (Agenda Item 8)

The Executive Committee did not receive any proposals for new subsidiary bodies.

Topic Session and Workshop proposals for PICES XIV (Agenda Item 9)

The following Topic Sessions and Workshops are proposed to be convened:

- a ½-day CCCC/MODEL Topic Session on "Modeling climate and fishing impacts on fish recruitment", possibly joint with FIS (*MODEL Endnote 4*);
- a 1-day CCCC/CFAME Topic Session on "Comparative response of differing life history strategists to climate shifts" (*CFAME Endnote 6*); selected papers from

the session are expected to be published in an international scientific journal;

- a 1-day CCCC/FIS Topic Session on “Evidence of distributional shifts in demersal fish in relation to short and long term changes in oceanographic conditions” (*FIS Endnote 3*);
- a CCCC Poster Session on “GLOBEC, and GLOBEC-like studies in the North Pacific: Observing pattern and inferring process” (*CCCC Endnote 3*);
- a 1-day CCCC/CFAME Workshop on “East-west comparison of community structure, productivity and biodiversity under climate change scenarios” (*CFAME Endnote 7*);
- a ½-day joint IFEP-MODEL Workshop on “Modeling and iron biogeochemistry: How far apart are we?” (*IFEP-AP Endnote 4*).

Theme proposals for future Annual Meetings (Agenda Item 10)

CCCC-IP/EC suggests several potential themes for the Science Board Symposium at PICES XV (October 2006, Japan). The first choice is, “Key recruitment processes and life history strategies: Bridging the temporal and spatial gap between models and data”. A draft description of the theme has been prepared.

Update on CCCC Synthesis Symposium in April 2006 (Agenda Item 11)

Dr. Batchelder reviewed the current status on the planning of the PICES/GLOBEC Symposium on “Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis”. He noted that the CCCC Topic Session on “The impacts of large-scale climate change on North Pacific marine ecosystems” at PICES XIII was a preliminary step toward having a successful synthesis symposium. Co-convenors for the symposium are Drs. Harold Batchelder and Suam Kim. A Steering Committee for the symposium has been formed, and they had an informal *ad hoc* meeting early during PICES XIII to discuss a timeline and agenda for the meeting. The Steering Committee consists of Drs. Makoto Kashiwai (Japan), Gordon A. McFarlane (Canada), Vladimir I. Radchenko

(Russia), Yasunori Sakurai (Japan), Franklin B. Schwing (U.S.A), Sinjae Yoo (Korea), and Francisco E. Werner (GLOBEC International). All, except Dr. Kashiwai were able to attend the *ad hoc* meeting. Dr. Batchelder received useful feedback from the committee on the structure of the meeting, and will revise the schedule as suggested to provide more time for organized discussion during the meeting. The symposium will occur April 19-21, 2006, in Honolulu, U.S.A. The meeting has three sub-themes: (1) Regime shifts, (2) Ecosystem productivity and structural responses to physical forcing, and (3) Pan-Pacific comparisons. A preliminary announcement of the symposium has been published previously in PICES Press (Vol. 12, No. 2, July 2004), and a separate printed announcement will be distributed in February 2005.

CCCC activities and travel support requests (Agenda Item 12)

The following meetings are proposed to be convened inter-sessionally (between October 2004 and October 2005):

- a 2-day CCCC/CFAME workshop in late winter or early spring 2005, to develop a work plan for future CFAME activities and to focus on time and space scales of fish, euphausiids, and squids to regime shift (*CFAME Endnote 5*); projected workshop size is 15 participants; preliminary results from this workshop will be presented at the CCCC Synthesis Symposium in April 2006;
- a CCCC/MODEL workshop in September or more likely October 2005, in Japan, that will focus on extending NEMURO.FISH to fish stocks in other geographic regions (Europe, Africa, Asia, South America); the pending APN workshop proposal titled “Toward quantitative understanding of natural fluctuations of marine coastal fisheries of sardines and anchovies and their impact on fishing-dependent human communities” was submitted by Dr. Michio Kishi, and if the funding is awarded, it will support the travel of Chinese, Indian and Bangladeshi young scientists to the workshop; funding has also been requested from IAI, IOC and FRA.

CCCC-IP/EC requests support for the following travel:

- 2 scientists to attend the CCCC/CFAME inter-sessional workshop to develop a CFAME workplan, to be held in late winter or early spring of 2005;
- 2 scientists to attend the CCCC/MODEL inter-sessional workshop on extending NEMURO.FISH to fish stocks in other geographic regions, to be held in Japan, in September/October 2005;
- 1 invited speaker for the CCCC/CFAME Topic Session on “Comparative response of differing life history strategists to climate shifts” at PICES XIV;
- 1 invited speaker for the CCCC/MODEL Topic Session on “Modeling climate and fishing impacts on fish recruitment” at PICES XIV;
- 2 scientists to attend the joint IFEP-MODEL Workshop on “Modeling and iron biogeochemistry: How far apart are we?” at PICES XIV;
- 1 invited speaker for the International SEEDS-II Symposium to be held at Ocean Research Institute, University of Tokyo (Japan), in October 2005;
- both CCCC Co-Chairmen to participate in the interim Science Board meeting to be held in Seattle (U.S.A.), in April 2005;
- 1 CCCC scientist to attend the ICES/PICES session on “Fisheries, ecology and life history of small pelagic fish” at the ICES Annual Science Conference, in Aberdeen (Scotland), in September 2005;
- 1 CCCC scientist to participate in the ICES/PICES session on “Comparing and constructing the scientific strategies and output of regional ecosystem projects” at the ICES Annual Science Conference, in Aberdeen (Scotland), in September 2005;
- 1 CCCC scientist to participate in the joint NPAFC-PICES symposium on “State of Pacific salmon and their role in North Pacific marine ecosystems” to be held in Jeju (Republic of Korea), in October 2005.

Funds are also requested (estimated at US\$20,000) to translate users’ manuals and documentation of NEMURO and NEMURO.FISH from English to Chinese,

Korean, Russian and Japanese. This activity is viewed as a capacity building contribution.

PICES Capacity Building (Agenda Item 13)

Due to time limitations this topic was little discussed. In principle, CCCC-IP/EC supports the proposal for a joint PICES-ICES Young Scientists Conference on marine sciences. No further discussion on this topic occurred, except to note that the MODEL Task Team has developed several proposals which have enabled some limited capacity building with Russian and Chinese scientists on NEMURO and NEMURO.FISH, and that more capacity building will occur in the proposed inter-sessional MODEL workshop in Japan, in October 2005.

Discussion of PICES Strategic Plan (Agenda Item 14)

Little time was spent on this issue in the CCCC-IP/EC meeting. Dr. Batchelder asked that the two CCCC Task Teams, MODEL and CFAME, consider how their future work and activity plans address the specific goals provided in the PICES Strategic Plan. MODEL was able to do this specifically (see the MODEL report elsewhere in this Annual Report). CFAME, which was just organized this year, and relating the CFAME activities to the PICES Strategic Plan will occur more fully during the requested 2005 inter-sessional workshop.

Discussion of future PICES Programs (Agenda Item 15)

No specific discussion on this topic occurred, other than to note that PICES would like to establish a second major science program that integrates activities and interests of all of the PICES member nations. This new program could be based on remaining unresolved scientific questions from CCCC (*e.g.*, climate-oriented), or might be completely unrelated (HABs, ecosystem-based management, *etc.*). Science Board has asked that the committees and scientific programs of PICES provide input on what future PICES science programs might include.

Relations with other organizations and programs/projects (Agenda Item 16)

CCCC-IP/EC identified linkages with ICES, GLOBEC, NPRB and the EVOS Gulf Ecosystem Monitoring (GEM) initiative as high priorities for the coming year. Also, there are several regional coastal observing programs in the Northeast Pacific (PaCOS, PNW-IOOS, AOOS), as well as numerous programs in the Northwest Pacific (CREAMS, NEAR-GOOS, others), that CCCC-IP should maintain close relations with. The continued development of closer links with GOOS and the Sloan Foundation's Census of Marine Life initiative are also viewed as promising areas to support. Finally, CCCC-IP must interact closely with NPAFC to address salmon issues of interest to the CCCC Program in the North Pacific. Because of the interests in maintaining close ties with ICES and NPAFC, in particular, it is recommended above, that CCCC scientists attend the ICES Annual Science Conference (September 2005) to participate in the joint ICES/PICES sessions, and also attend the joint NPAFC-PICES symposium on "State of Pacific salmon and their role in North Pacific marine ecosystems" in October 2005.

Dr. Ken Drinkwater, Chairman of the ICES Cod and Climate Change Program, attended the CCCC-IP/EC meeting this year. He invited the CCCC Program to participate in a broadly based theme organized around climate and marine

ecosystems at the ICES Annual Science Conference in 2006. Moreover, he suggested that the ICES and PICES meetings in 2006 have identical themes that would apply to both the CCCC and CCC Programs. The goal is to have several invited CCCC scientists attend the ICES Annual Science Conference in September 2006, and several CCC scientists attend the PICES Annual Meeting in 2006. Drs. Drinkwater and Batchelder will continue discussions on this issue. Overall, CCCC-IP/EC endorsed this suggestion.

Recommendations to Science Board (Agenda Item 18)

- CCCC-IP/EC **suggests a theme** of "Key recruitment processes and life history strategies: Bridging the temporal and spatial gap between models and data" for PICES XV.
- CCCC-IP/EC **strongly endorses** BIO Committee's recommendation that PICES support travel of one additional participant to each meeting of the new SCOR Working Group on "Global comparisons of zooplankton populations"; projected to be three meetings (one in each of 2005, 2006, 2007).
- CCCC-IP/EC **recommends the approval** of changes in CCCC-IP/EC membership requested under Agenda Items 6 & 7 above.
- CCCC-IP/EC **recommends the approval** of the travel requests detailed above.

CCCC Endnote 1

Participation List

Members

Kerim Aydin (proposed CFAME Co-Chairman)
Harold P. Batchelder (CCCC-IP Co-Chairman)
William R. Crawford (Canada)
Shin-ichi Ito (MODEL Co-Chairman)
Suam Kim (CCCC-IP Co-Chairman)
William T. Peterson (REX Co-Chairman)
Sei-ichi Saitoh (MONITOR Vice-Chairman)
Yoshiro Watanabe (REX Co-Chairman)
Francisco E. Werner (MODEL Co-Chairman)
Akihiko Yatsu (BASS Co-Chairman)
Sinjae Yoo (Korea)

Observers

Ken Drinkwater (ICES CCC Chairman)
Stewart (Skip) M. McKinnell (Deputy Executive Secretary)
R. Ian Perry (Science Board Chairman)

CCCC Endnote 2

CCCC-IP/EC Meeting Agenda

1. Welcome and opening remarks
2. Adoption of agenda
3. Business from last year's meeting
4. Review of responsibilities for documenting CCCC scientific sessions W2, W3, S9 and S10; best poster/oral awards
5. Brief progress reports of Task Teams (MODEL, REX, BASS, CFAME) activities from past year and plans for next two years; more complete reports submitted in writing
6. Review of current CCCC-IP membership
7. Replacements for Task Team Chairmen
8. Proposals for new CCCC subsidiary bodies
9. Topic Session and Workshop proposals for PICES XIV
10. Themes for future PICES Annual Meetings
11. Discussion of CCCC integration and the NEXT report and recommendations
12. Review of planned CCCC activities and travel support requests
13. Discussion of North Pacific Ecosystem Status Report
14. Discussion of report from Study Group on *PICES Capacity Building*
15. Discussion of report from Study Group on *PICES Strategic Issues*
16. Relations with other international programs
17. PICES website revisions
18. Request for scientific advice from the United States
19. CCCC report and recommendations to Science Board
20. Other business

CCCC Endnote 3

Proposal for a CCCC Poster Session on "GLOBEC and GLOBEC-like studies in the North Pacific: Observing pattern and inferring process"

Numerous GLOBEC and GLOBEC-like studies linking atmospheric forcing, ocean climate and physical variability, and ecosystem structure and pattern have occurred in the past decade. This POSTER session provides a forum for a review of the observational evidence linking climate to ecosystem pattern, and inferring the mechanisms or processes that link climate forcing to ocean physics and ecosystem pattern and dynamics. Presentations related to dynamics and processes

on multiple temporal (event to seasonal to interannual and longer) and multiple spatial (local to mesoscale to regional to basin-wide) scales are encouraged. Inferring mechanism (process) from spatial and/or temporal patterns is emphasized in this session, but contributions on related topics are encouraged as well.

Convenors: Harold P. Batchelder (U.S.A.) and Suam Kim (Korea)

REPORT OF BASS TASK TEAM

The Basin Scale Studies (BASS) Task Team met from 8:30 - 9:45 hours on October 17, 2004, to review the accomplishments since its establishment, and activities for the new Task Team, CFAME (Climate Forcing and Marine Ecosystems), created to replace the BASS and REX Task Teams during the synthesis phase of the CCCC Program. The Co-Chairmen, Drs. Kerim Y. Aydin and Akihiko Yatsu, welcomed participants (*BASS Endnote 1*) and outlined the objectives of the meeting. The agenda was approved as presented (*BASS Endnote 2*).

Activities and accomplishments in 2004 (Agenda Item 2)

Publication from BASS Workshop at PICES XII

A 1-day BASS Workshop on "Linkages between open and coastal systems" was convened on October 15, 2003, in Seoul, Korea, during the PICES Twelfth Annual Meeting. A total of 11 selected papers from the workshop were accepted for a special issue of *Deep-Sea Research II* (Elsevier) to be published in the spring of 2005.

CCCC Workshop at PICES XIII

Following the successful completion of the BASS/MODEL workshop series on data synthesis and trophic modeling of the subarctic Pacific basin ecosystems, the MODEL/REX, workshop series to develop NEMURO and NEMURO.FISH, and the 2003 BASS Workshop on "Linkages between open and coastal systems", the BASS Task Team proposed convening a workshop to explore specific food web modeling approaches for linking climate with coastal and oceanic biological production, as a recommended continuation of these Pacific-wide collaborative research efforts.

A 2-day CCCC Workshop on "Linking open ocean and coastal systems II" was held October 15-16, 2004, at PICES XIII. This workshop aimed to develop approaches for synthesis of the

CCCC Program on the basis of reviewing ongoing Task Team activities on modeling of lower trophic levels (NEMURO), forage species (NEMURO.FISH) and upper trophic levels (ECOSIM) for multiple regions of the North Pacific. The summary of the workshop is included elsewhere in this Annual Report.

Report of IFEP Advisory Panel

Dr. Hiroaki Saito presented a brief report on past and future activities of the Advisory Panel on *Iron fertilization experiment in the subarctic Pacific Ocean* (IFEP-AP). Differences in biogeochemical responses between two *in situ* iron enrichment experiments carried out in the western subarctic gyre of the North Pacific, SEEDS-I (2001) and SEEDS-II (2004), were discussed.

The IFEP-AP meeting was held later during PICES XIII (from 17:00-19:30 hours on October 19 and 19:00-21:00 hours on October 20, 2004), and the report of this meeting is included elsewhere in this Annual Report.

Review accomplishments of the BASS Task Team since its inception (Agenda Item 3)

Activities and accomplishments of the BASS Task Team since its inception in 1995 were summarized and appended as *BASS Endnote 3*.

Recommendation for CFAME Co-Chairmen (Agenda Item 4)

The Task Team recommends that the current BASS Co-Chairmen, Drs. Kerim Aydin (U.S.A.) and Akihiko Yatsu (Japan), become Co-Chairmen of the newly established CFAME Task Team. The nomination is to be discussed by the Executive Committee of the Climate Change and Carrying Capacity Program Implementation Panel (CCCC-IP/EC), and should be finally approved by Science Board.

Other business (Agenda item 5)

Proposal for CFAME Workshop/Symposium

The following ideas were suggested for a CFAME Workshop or Symposium in 2005 and 2006:

- Using recommendations of the Study Group on *Fisheries and ecosystem responses to recent regime shifts* (FERRRS), and WG 16 on *Climate change, shifts in fish production, and fisheries management* to develop a CFAME work plan (final reports of FERRRS and WG 16 will be published in the PICES Scientific Report Series in early and late 2005, respectively);
- Euphausiid studies in relation to WG 14 on *Effective sampling of micronekton* (final

report of WG 14 will be published in the PICES Scientific Report Series in early 2005).

Status of NPAFC/PICES Symposium on salmon

A joint NPAFC/PICES Symposium on “The status of Pacific salmon and their role in North Pacific marine ecosystems” will be held in conjunction with the 2005 NPAFC Annual Meeting. A Steering Committee has been formed and will discuss the symposium objectives and key questions to be addressed soon after the completion of this year’s PICES and NPAFC Annual Meetings. It was agreed that BASS would present the proposal for the symposium at the upcoming CCCC-IP Executive Committee meeting.

BASS Endnote 1

Participation List

Members

Kerim Aydin (U.S.A., Co-Chairman)
Masahide Kaeriyama (Japan)
Gordon A. McFarlane (Canada)
Rolf Ream (U.S.A.; for Thomas R. Loughlin)
Patricia A. Wheeler (U.S.A.)
Akihiko Yatsu (Japan, Co-Chairman)

Observers

Richard J. Beamish (Canada)
Hiroaki Saito (Japan)

BASS Endnote 2

BASS Meeting Agenda

1. Welcome and introduction
2. Review accomplishments in 2004
 - a) Publication from BASS Workshop on “Linking open ocean and coastal systems” at PICES XII
 - b) CCCC Workshop on “Linking open ocean and coastal systems II” at PICES XIII
 - c) Report of IFEP Advisory Panel
3. Review accomplishments of the BASS Task Team since its inception
4. Recommendation for CFAME Co-Chairmen
5. Other business
 - a) CFAME Workshop/Symposium in 2005 and 2006
 - b) NPAFC/PICES Symposium on “The status of Pacific salmon and their role in North Pacific marine ecosystems”

BASS Task Team Final Report

Background

The Basin Scale Studies (BASS) Task Team was established in 1995, following the first meeting of the Executive Committee of the Climate Change and Carrying Capacity Program Implementation Panel (CCCC-IP/EC). The Task Team was created to facilitate the exchange of scientific data and encourage scientific research in the eastern and western basins of the subarctic Pacific Ocean.

In general, the oceanography and ecology of the eastern and western basins of the subarctic Pacific are poorly understood relative to the coastal areas. It is known that the central subarctic Pacific is productive, as indicated by the large abundance of Pacific salmon, squid and other important fishes. Recent studies also suggest that the oceanography of the gyres is closely linked to the decadal scale changes in climate. It is important, therefore, that there is a coordinated effort to focus on the priority research issues and to exchange scientific information on a timely basis.

At the PICES Sixth Annual Meeting (October 1997, Pusan, Korea), the BASS Task Team sponsored a symposium on "Ecosystem dynamics of the eastern and western subarctic gyres". The purpose was to bring together available information on the two gyres in a comparative framework. Topics included: 1) ocean responses to climate forcing, 2) nutrients and primary production, 3) structure of the lower trophic levels, the mesozooplankton communities, and the epipelagic nekton, 4) the role of mid-water fishes, and 5) the importance of these areas to marine birds and mammals. Papers presented at the symposium were published in 1999, in a *Progress in Oceanography* special issue entitled "Ecosystem Dynamics in the Eastern and Western gyres of the Subarctic Pacific" (Guest Editors: R.J. Beamish, S. Kim, M. Terazaki and W.S. Wooster).

A 2-day follow-up workshop on "The development of a conceptual model of the subarctic Pacific basin ecosystems" was convened in conjunction with the PICES Ninth Annual Meeting (October 20-21, 2000, Hakodate, Japan),

to identify potential models which might have utility for examining gyre systems. Trophodynamic linkages that were likely to be common, as well as those that were model-specific, were identified, and shortfalls were highlighted. Discussions included identifying data groups and potential data sources, incorporating climate and oceanographic change in models, and linking gyre models to coastal area models. Extended abstracts of papers given at the workshop are published in *PICES Scientific Report* No. 17 (2001).

The workshop participants recognized that as the CCCC Program enters its synthesis phase, modeling would play an increasingly prominent role in examining the dynamics of the gyres, and recommended that the BASS and MODEL Task Teams examine the feasibility of using the ECOPATH/ECOCIM modeling approach as a means to organize our understanding of the ecosystem of the subarctic gyres. Specific objectives were: (a) synthesize all trophic level data in a common format; (b) examine trophic relations in both the eastern and western subarctic gyres using ECOPATH/ECOSIM; and (c) examine methods of incorporating the PICES NEMURO lower trophic level models into the analysis.

Three joint BASS/MODEL workshops followed: a 2-day workshop on "Quantification of a food web model for the subarctic Pacific gyre systems" (March 5-6, 2001, in conjunction with the PICES/CoML/IRC workshop on "Honolulu, U.S.A."); a 1-day workshop "Ecosystem models for the subarctic Pacific gyres" (October 5, 2001, in conjunction with the PICES Tenth Annual Meeting in Victoria, Canada); and a 2-day workshop on "Perturbation analysis on subarctic Pacific gyre ecosystem models using ECOPATH/ECOSIM" (April 21-22, 2002, in conjunction with the PICES co-sponsored symposium on "North Pacific transitional areas" in La Paz, Mexico). At these workshops, ECOPATH/ECOSIM baseline models were developed, linked to the NEMURO model, and a number of hypotheses were tested.

The purpose of this approach was to provide a “picture” of the two subarctic Pacific gyres, and to facilitate our understanding of how these systems respond to natural and anthropogenic change. It was hoped that it will form the basis of future work which will attempt to link the subarctic system to coastal system. The results of these workshops have been presented in several issues of *PICES Press* and in *PICES Scientific Reports* No. 20 (2002) and No. 25 (2003). The latter report summarized our current understanding of the dynamics of these systems, and also data availability and gaps in upper trophic level biological data for understanding the function and variation in the subarctic gyres’ food webs.

Following a direction suggested by the participants of the BASS/MODEL workshops, a 1-day BASS Workshop (with the involvement of the MODEL and REX Task Teams) on “Linkages between open and coastal systems” was convened at the PICES Twelfth Annual Meeting (October 15, 2003, Seoul, Korea). A total of 15 talks and 5 posters covering all trophic levels from both gyres and coastal areas were presented. Invited speakers from North America and Asia provided current information on physics, plankton, fish, birds and mammals, and speculated on mechanisms for energy transfer between areas. Selected papers from the workshop constitute a special issue of *Deep-Sea Research II* (Guest Editors: G.A. McFarlane and S.M. McKinnell) to be published in the spring of 2005.

This subject was further explored at a 2-day CCCC Workshop on “Linking open ocean and coastal systems II” held October 15-16, 2004, in conjunction with the PICES Thirteenth Annual Meeting in Honolulu, U.S.A. This workshop aimed to develop approaches for synthesis of the CCCC Program on the basis of reviewing ongoing Task Team activities on modeling of lower trophic levels (NEMURO), forage species (NEMURO.FISH) and upper trophic levels (ECOSIM) for multiple regions of the North Pacific. A total of 9 talks and 3 posters were presented. The summary of the workshop is included in the 2004 PICES Annual Report. Recommendations of the workshop will be useful for future activities of the CFAME (Climate Forcing and Marine Ecosystems) Task Team.

Objectives of BASS

In 1996, the BASS Task Team developed a 5-year work plan with 5 objectives:

1. retrospective comparison of lower trophic level dynamics in the eastern and western subarctic Pacific gyres: a link between climate change and higher trophic levels
2. zooplankton standardization
3. time-series measurements of primary productivity and zooplankton stocks
4. inventory of higher trophic level species
5. acquire and collate the work or science plans of all agencies carrying out research in the eastern and western subarctic Pacific gyres.

Substantial progress has been made towards objectives 1, 4 and 5. Linkages between NEMURO lower trophic model outputs and a higher trophic mass balance model (ECOPATH) have been established. This represents progress to linking climate change to the subarctic Pacific gyre systems. Included in this exercise is the compilation of an inventory of higher trophic level species. This also required the collation of scientific work and data of all agencies carrying out research in the gyres.

The results of this BASS/MODEL collaboration were published in *PICES Scientific Report* Nos. 17 (2001), 20 (2002) and 25 (2003). These are the major products of the successful east-west comparison of ecosystem structure and responses to turbulences such as climate variations, primary production variations and removals of key elements (fishery) using ECOPATH and ECOSIM. One conclusion of this exercise is that improved understanding of factors that control species abundance will require directed research by PICES member nations.

Future work

Among the five objectives of BASS, considerable progress was made in comparisons of structure and dynamics between two gyres on the basis of inventory of higher trophic level species. However, zooplankton standardization and time-series measurements of primary productivity and zooplankton stocks remain insufficient. These tasks will be taken over by the new CFAME Task Team in collaboration with MONITOR.

Advisory Panel on Iron fertilization experiment

Considering the questions and potential significance relating to the role of iron on productivity processes in the subarctic North Pacific, an Advisory Panel on *Iron fertilization experiment in the subarctic Pacific Ocean* (IFEP-AP) was formed in 1999, under the BASS Task Team. The objective of this Panel is to design, coordinate and oversee *in situ* iron enrichment experiments in the subarctic North Pacific, in order to examine the details of the responses of the lower trophic levels to the addition of iron. The Panel plans to identify similarities and differences in the biogeochemical responses of the planktonic ecosystems in the eastern and western subarctic Pacific gyres obtained from various *in situ* experiments (*e.g.*, differences in species composition, export flux rates, etc.), and to develop new experimental strategies and hypotheses to explain these differences. There are strong linkages of IFEP-AP activities with the emerging IGBP SOLAS (Surface Ocean Lower Atmosphere Study) Program.

During 2001-2004, three *in situ* iron enrichment experiments were conducted in both gyres under the Subarctic Pacific Iron Experiment for Ecosystem Dynamic Study (SEEDS) and the Subarctic Ecosystem Response to Iron Enrichment Study (SERIES): SEEDS-I (Japan/Canada, summer of 2001) and SEEDS-II (Japan/U.S.A., summer of 2004) in the western subarctic Pacific, and SERIES-I (Canada/Japan, summer of 2002) in the eastern subarctic Pacific.

The Panel convened several workshops and meetings to design/plan the experiments, and to evaluate and synthesize the data: a workshop on “Designing the iron fertilization experiment in the Subarctic Pacific (October 19-20, 2000, in Tsukuba, Japan); a workshop on “*In situ* iron enrichment experiments in the eastern and western subarctic Pacific” (February 11-13, 2004, in Victoria, Canada); and a joint Canadian SOLAS/PICES-IFEP session on “Response of the upper ocean to meso-scale iron enrichment” (February 17-18, during the ASLO/TOS 2004 Ocean Research Conference held in Honolulu, U.S.A.).

The proceedings of the two IFEP-AP workshops will be published as a *PICES Scientific Report* in 2004 or early 2005. A synthesis paper on SEEDS-I was published in *Science* (Tsuda *et al.* “A meso-scale iron enrichment in the western subarctic Pacific induced a large centric diatom bloom”, Vol. 300: 958-961, 2003), and a synthesis paper on SERIES was published in *Nature* (Boyd *et al.* “Evolution, decline and fate of an iron-induced subarctic phytoplankton bloom”, Vol. 428: 549-553, 2004). Selected papers resulted from the SEEDS-I experiment will be published as a special issue of *Progress in Oceanography*, and selected papers from the SERIES experiment will be published as a special issue of *Deep-Sea Research II*. Both volumes will appear in 2005. It is expected that a second volume of *Deep-Sea Research II* on SERIES would be proposed for 2006.

Historical List of BASS Task Team members

Canada

Richard J. Beamish (1996-98;
Co-Chairman 1996-98)
David L. Mackas (1996-2000)
Gordon A. McFarlane (1999-2004;
Co-Chairman 1999-2003)

Japan

Masahide Kaeriyama (2001-04)
Makoto Kashiwai (1996-2000)
Hidehiro Kato (2000-2004)
Kazuya Nagasawa (1996-1998)
Makoto Terazaki (1996-2000;
Co-Chairman 1996-1998)
Akihiko Yatsu (1999-2004;
Co-Chairman 2003-04)

Korea

Suam Kim (1996-2000)
Jang-Uk Lee (1999-2004)

Russia

Alexander Boltnev (1996-2000)
Andrei S. Krovnin (1999-2004;
Co-Chairman 1999-2002)
Vadim F. Savinykh (2001-04)

U.S.A.

Kerim Y. Aydin (2002-04;
Co-Chairman 2003-04)
Michael L. Dahlberg (1996-1999)
Bruce W. Frost (1996-2000)
Thomas R. Loughlin (2000-04)
Bruce A. Taft (1996-2000)
Patricia A. Wheeler (1996-2004)

List of Presenters and Convenors

BASS Symposium on “Ecosystem dynamics of the eastern and western subarctic gyres”

(October 24, 1997, Pusan, Korea)

Canada

Richard J. Beamish (convenor)
Paul J. Harrison
David L. Mackas

Makoto Terazaki (convenor)

Korea

Suam Kim (convenor)

Japan

Michio J. Kishi
Moriyuki Kotori (poster)
Shosiro Minobe
Yoshihiko Sekine
Akira Taniguchi

U.S.A.

Richard D. Brodeur
Gretchen Ann Harrington (poster)
James E. Overland (poster)
Alan M. Springer
Warren S. Wooster (convenor)

List of Participants

BASS Workshop on “The development of a conceptual model of the subarctic Pacific basin ecosystems” (October 20-21, 2000, Hakodate, Japan)

Canada

Richard J. Beamish (convenor)
James Irvine
Jacquelynne R. King
Steven J.D Martell
Gordon A. McFarlane (convenor)

China

Ling Tong

Japan

Yukimasa Ishida
Masahide Kaeriyama
Takashige Sugimoto
Akihiko Yatsu (convenor)

Russia

Andrei S. Krovnin (convenor)
Victor Tsiger

U.S.A.

Kerim Y. Aydin
Albert J. Hermann
Dale B. Haidvogel
Jeffrey J. Polovina

List of Participants

BASS/MODEL Workshop on “Quantification of a food web model for the subarctic Pacific gyre systems” (March 5-6, 2001, Honolulu, U.S.A.)

Canada

Richard J. Beamish
Jacquelynne R. King
Gordon A. McFarlane (convenor)
Daniel M. Ware

Hiroyuki Sakano
Lan Smith
Akihiko Yatsu (convenor)

China

Qi-Sheng Tang

Russia

Andrei S. Krovnin (convenor)

Japan

Makoto Kashiwai
Michio J. Kishi

U.S.A.

Kerim Y. Aydin
Bernard A. Megrey (convenor)
Jeffrey J. Polovina

List of Participants

BASS/MODEL Workshop on “Ecosystem models for the subarctic Pacific gyres” (October 5, 2001, Victoria, Canada)

Canada

Jacquelynne R. King
Gordon A. McFarlane (convenor)
R. Ian Perry
Marc Trudel

Akihiko Yatsu
Hiroshi Yoshinari

Japan

Makoto Kashiwai
Toshio Katsukawa
Michio J. Kishi (convenor)
Takahiro Iida
Kohei Mizobata
Sei-ichi Saitoh
Hiroaki Saito
S. Lan Smith

Russia

Natalia Klovatch
Andrei S. Krovnin (convenor)
Alexei Orlov

U.S.A.

Kerim Y. Aydin
Patricia Livingston
Thomas R. Loughlin
Bernard A. Megrey (convenor)
Thomas C. Wainright
Francisco E. Werner

List of Participants

BASS/MODEL Workshop on “Perturbation analysis on subarctic Pacific gyre ecosystem models using ECOPATH/ECOSIM” (April 21-22, 2002, La Paz, Mexico)

Canada

Gordon A. McFarlane (convenor)
Jacquelynn R. King
R. Ian Perry

Japan

Takashige Sugimoto
Michio J. Kishi
Ichiro Yasuda
Sachihiko Itoh

Mexico

Salvador E. Lluch-Cota

U.S.A.

Kerim Y. Aydin
Bernard A. Megrey (convenor)
Francisco E. Werner
Jeffrey J. Polovina

List of Presenters and Convenors

CCCC Workshop on “Linkages between open and coastal systems” (October 15, 2003, Seoul, Korea)

Canada

Richard J. Beamish
Jacquelynn R. King
David L. Mackas
Gordon A. McFarlane (convenor)
Frank A. Whitney

Japan

Atsushi Kaneda (poster)
Sachi Ohki
Takashige Sugimoto
Kazuaki Tadokoro
Tomowo Watanabe
Orio Yamamura
Akihiko Yatsu (convenor)

Korea

Hyo Choi
Kyung-Hoon Shin (poster)

Russia

Vladimir A. Belyaev (convenor)
Larissa A. Gayko (poster)
Svetlana V. Naydenko

U.S.A.

Keith L. Boslev (poster)
George L. Hunt, Jr
Carol Ladd
Rolf Ream

List of Presenters and Convenors

CCCC Workshop on “Linking open ocean and coastal systems II” (October 15-16, 2004, Honolulu, U.S.A.)

Canada

Gordon A. McFarlane (convenor)
Jacob Schweigert

Japan

Shin-ichi Ito (convenor, poster)
Kosei Komatsu
Motomitsu Takahashi
Akihiko Yatsu (convenor)

Korea

Jin-Yeong Kim (convenor, poster)

Russia

Yury I. Zuenko (poster)

U.S.A.

Kerim Y. Aydin (convenor)
Vera N. Agostini
Alec D. MacCall

REPORT OF CFAME TASK TEAM

3

8

The first meeting of the CFAME (Climate Forcing and Marine Ecosystems) Task Team was held from 10:30-12:30 hours on October 17, 2004. The acting Co-Chairmen, Drs. Kerim Y. Aydin and Akihiko Yatsu, called the meeting to order and welcomed participants (*CFAME Endnote 1*). For this meeting, as members had not been appointed yet, attendance was open to all, with input from BASS and REX Task Teams. The proposed agenda was reviewed and adopted (*CFAME Endnote 2*).

Nomination of Co-Chairmen (Agenda Item 1)

BASS nominated Drs. Kerim Y. Aydin (U.S.A.) and Akihiko Yatsu (Japan) as potential Co-Chairmen. REX did not offer nominations. There were no objections to the nominations.

Terms of reference (Agenda Item 2)

A substantial discussion of the proposed terms of reference (*CFAME Endnote 3*) was conducted, focusing on CFAME's role in CCCC synthesis and in looking towards post-CCCC Programs. Both BASS and REX felt that as written, the terms of reference are overly general and provide limited guidance on CFAME activities.

Discussion of membership (Agenda Item 3)

All membership nominations will be made through member countries. There was general agreement that CFAME would be best served by drawing from REX and BASS expertise, but with the addition of members from outside the former Task Teams.

Activities of CFAME in relation to the PICES Strategic Plan (Agenda Item 4)

It was suggested that the addition of a PRIMARY GUIDING HYPOTHESIS for CCCC synthesis would provide more extensive guidance. The wording of the hypothesis was

extensively discussed, and the consensus hypothesis is included in this report (*CFAME Endnote 4*). While the workshop on "Linking open ocean and coastal ecosystems II" at PICES XIII provided initial guidance for scientific work within CFAME (the summary of the workshop is included elsewhere in this Annual Report), it was felt that a more extensive planning meeting with core participants would be necessary (*CFAME Endnote 5*). It is expected that this interim workshop will be held at a to-be-determined location in winter or early spring of 2005, and will lead to the recommendation of a series of workshops through 2006.

Interactions with MODEL (Agenda Item 5)

MODEL members were unable to attend the CFAME meeting due to their own Task Team meeting running concurrently. A suggestion was raised for a CFAME/MODEL collaborative workshop on "Scaling bottom-up modeling to population-level production and recruitment controls through the linking of multiple models", but the decision was postponed pending further discussions with MODEL.

Session topics for PICES XIV and potential science themes for PICES XV (Agenda Item 6)

The following two Topic Sessions and one Workshop are proposed to be convened at PICES XIV:

- a 1-day CCCC/CFAME Topic Session on "Comparative response of differing life history strategists to climate shifts" (*CFAME Endnote 6*); selected papers from this session to be published in an international scientific journal;
- a 1-day FIS/CFAME Topic Session on "Evidence of distributional shifts in demersal fish in relation to short and long term changes in oceanographic conditions" (*FIS Endnote 3*), FIS will take the lead on this session;

- a 1-day CCCC/CFAME workshop (leading to a PICES XV Science Board Symposium) on “East-west comparison of community structure, productivity and biodiversity under climate change scenarios” (*CFAME Endnote 7*). This workshop is contingent on identifying co-conveners.

Additionally, CFAME encouraged the development of sessions or workshops on the role of euphausiids in ecosystems, possibly to be pursued by other committees.

PICES Capacity Building (Agenda Item 7)

CFAME noted that a project on “Euphausiids capacity building and awareness” would be an important endeavor to move forward.

CFAME also encouraged the broader use of models developed within PICES (NEMURO and ECOPATH/ECOSIM) to facilitate hypothesis exploration and test climate change scenario. Possible interaction with ESSAS on this issue was mentioned.

Travel requests (Agenda Item 8)

CFAME requests support for the following travel:

- 2 invited external scientists for the CCCC/CFAME interim workshop (*CFAME Endnote 5*), to provide multiple examples of

synthesizing life-history data into climate change scenarios for diverse species types;

- 1 invited speaker for the CCCC/CFAME Topic Session on “Comparative response of differing life history strategists to climate shifts” at PICES XIV (*CFAME Endnote 6*);
- 1 invited speaker for the CCCC/CFAME workshop on “East-west comparison of community structure, productivity and biodiversity under climate change scenarios” at PICES XIV (*CFAME Endnote 7*).

CFAME web page (Agenda Item 9)

It was agreed that the CFAME Co-Chairmen would coordinate the provision of materials once membership of the Task Team is finalized.

Topics for the next major integration program (Agenda Item 10)

Potential topics were discussed extensively as part of developing synthesis Terms of Reference (Agenda Items 2 and 4) and were tabled to be taken up at the proposed interim workshop.

Other business

Coordination

- CFAME encouraged joint cruises for the study of higher trophic levels;
- CFAME endorsed the development of longer-term east/west exchange of research through postdoctoral support.

CFAME Endnote 1

Participation List

Christine Abraham (U.S.A.)
 Vera Agostini (U.S.A.)
 Kenji Asano (Japan)
 Kerim Y. Aydin (U.S.A.)
 Harold P. Batchelder (U.S.A.)
 Richard J. Beamish (Canada)
 Richard D. Brodeur (U.S.A.)
 John Field (U.S.A.)
 Douglas E. Hay (Canada)
 Russ Hopcroft (U.S.A.)
 Masahide Kaeriyama (Japan)
 Hyung-Ku Kang (Korea)

Sukyung Kang (Korea)
 Jin-Yeong Kim (Korea)
 Suam Kim (Korea)
 Tatsu Kishida (Japan)
 Jae-Bong Lee (Korea)
 Andrew Leising (U.S.A.)
 Alec MacCall (U.S.A.)
 Gordon A. McFarlane (Canada)
 Brenda L. Norcross (U.S.A.)
 James E Overland (U.S.A.)
 William T. Peterson (U.S.A.)
 Vladimir I. Radchenko (Russia)

Rolf R. Ream (U.S.A.)
Yoshiro Watanabe (Japan)
Yutaka Watanuki (Japan)

Patricia A. Wheeler (U.S.A.)
Akihiko Yatsu (Japan)

CFAME Endnote 2

CFAME Task Team Meeting Agenda

1. Introductions/nomination of Co-Chairmen
2. Discussion of Terms of Reference
3. Membership, with emphasis on geographic and scientific balance
4. Activities of CFAME in relation to the PICES Strategic Plan, and the development of an Action Plan
5. Interactions with the MODEL Task Team
6. Session topics for PICES XIV and potential science themes for PICES XV
7. PICES Capacity Building
8. Travel requests for 2005
9. Discussion and preparation of related materials to be included on the CFAME web page
10. Topics for next major integration program

CFAME Endnote 3

CFAME Draft Terms of Reference

Objective:

- To synthesize regional and basin-wide studies and provide a forum for the integration of CCCC-related hypotheses and data.

Terms of Reference:

1. The CFAME Task Team is responsible for the promotion, coordination, integration and synthesis of research activities related to the CCCC Program among member nations. This goal could be accomplished by convening meetings, periodic scientific symposia or workshops, or by distributing information designed to foster cooperation and integration among existing or developing programs;
2. The CFAME Task Team should provide the scientific body for hypothesis testing of

model experiments, by providing a forum for interaction between data-gathering and distribution programs (MONITOR) and theoretical experimentation and development (MODEL and NEXT) as related to climate change impacts on marine ecosystems;

3. Particular emphasis is placed on testing ecosystem-level hypotheses, through review and examination in a collaborative environment, of (i) comparisons between regional and/or basin ecosystems, (ii) linkages in time, space, or seasonality between climate and ecosystems, and (iii) responses of regional ecosystems to basin-scale forcing;
4. The CFAME Task Team should encourage establishment of component activities as needed to facilitate synthesis of the CCCC Program.

CFAME Endnote 4

Primary CFAME guiding hypothesis for CCCC synthesis

PRODUCING A CCCC SYNTHESIS – a “two-year” project: “What is carrying capacity, and how is it affected by climate in the North Pacific?”

THE WRAP-UP of CCCC may be to report the synthesis which underlies accepting the following hypothesis (H₀):

H₀: CARRYING CAPACITY for an ecosystem is embedded in species with varying life history strategies, moderated by climate REGIMES.

SUB-HYPOTHESES TO EXAMINE

- H(a) This is primarily true for FORAGE SPECIES but not large predators;
- H(b) The succession is
(Hi) a relatively predictable
(Hii) in a repeating sequence
(Hiii) with some Pacific-wide synchrony.
There are periods of relative stability and of extremely rapid change;
- H(c) The magnitude and control of production (top-down vs. bottom-up) varies throughout this sequence;
- H(d) Succession patterns are linked to ecosystem type as defined by biophysical processes (*e.g.*, upwelling vs. broad shelf);
- H(e) Succession patterns are linked to interannual (regime-scale) climate drivers;

H(f) Stewardship: Fishing, habitat change and broader climate shifts affect the pattern of succession, and expectations are better managed by considering climate and regimes (*e.g.*, the consideration of autocorrelation structure over time).

We can create a synthesis, and produce recommendations for CCCC successor Programs, by describing and disseminating our current state of knowledge: historical data with extensive gaps covered by models, either mathematical or conceptual. However, linkages between modeling regions and across time scales are yet to be performed.

The scale to which these models has developed is sufficient, or may be sufficient within two years, to describe many climate/fish interactions, both direct and surprising, as well as document our key, specific uncertainties, provided these linkages between currently-existing models can be created.

CFAME Endnote 5

Proposal for a 2-day CCCC/CFAME inter-sessional workshop to develop a CFAME work plan and hypothesis set for CCCC synthesis

The synthesis of CCCC knowledge of climate change and carrying capacity may focus on developing a work plan based on the proposed CFAME guiding hypothesis (*CFAME Endnote 4*). To facilitate this synthesis, CFAME recommends an interim workshop for a core group of CFAME participants, in order to develop FERRRS/WG 16 recommendations into a concrete program for progress and the development of a CFAME work plan.

The scientific focus of this workshop will be **the time scales of response mechanisms to specific climate shifts**. It will approach the question: “Is there a sufficiently general conceptual model which may relate each life history strategist to patterns in lower trophic-level production?” It is hoped that tractable hypotheses may be outlined, for example the “flow hypothesis” for Pacific sardine, as discussed in the PICES XIII CCCC workshop on “Linking open ocean and coastal

ecosystems II”. Two invited scientists will aid in providing current hypotheses.

The development of the work plan will center on the comparison of the response of multiple life-history strategists in relation to climate. The preliminary list for discussion is: euphausiids, pollock, squid, sardines, pink salmon, saury, capelin, and anchovy.

It is expected that preliminary results from the work initiated at this workshop will be submitted as one or more CFAME presentations at the 2006 CCCC Synthesis Symposium.

Duration and size: 2-day workshop to be held at a TBD location in winter or early spring of 2005, for approximately 15 attendees.

Recommended convenors: Kerim Y. Aydin (U.S.A.) and Akihiko Yatsu (Japan).

CFAME Endnote 6

Proposal for a 1-day CCCC/CFAME Topic Session at PICES XIV on “Comparative response of differing life history strategists to climate shifts”

In recent years we have come to accept that regime shifts are real and produce species and ecosystem-level responses, however not all species and ecosystems are equal. In particular, there is the need to move beyond correlative indices between climate variables and species indicators, and consider the temporal and spatial scale of the mechanisms, especially as they may differ between different life history strategists within an ecosystem. In this session, we invite contributions which examine the scale of response of species to climate, especially from an east/west comparative perspective. We

especially encourage papers investigating the underlying mechanisms of responses, with an emphasis on targeting critical life history stages and differences in sensitivity to climate for different life history strategists (for example, between equilibrium and opportunistic strategists). It is intended that selected papers (oral and poster) will be published in an international scientific journal.

Recommended conveners: Gordon A. McFarlane (Canada) and Hyung-Ku Kang (Korea).

CFAME Endnote 7

Proposal for a 1-day CCCC/CFAME workshop at PICES XIV or XV on “East-west comparison of community structure, productivity and biodiversity under climate change scenarios”

In the waters of the North Pacific Ocean, total primary, secondary and fisheries production appears to be much greater in the west compared to the east. The eastern side of the North Pacific is characterized by narrow continental shelves and, in general, a gradual transition from sub-tropical waters off the coast of southern California to the sub-arctic waters of the Gulf of Alaska. The California Current is particularly productive due to coastal upwelling and Ekman pumping which enhances new production. In contrast, the western Pacific is characterized by broad continental shelves but a rapid transition from sub-tropical to sub-arctic waters. Rates of new production are probably lower there. The situation in the North Atlantic is roughly, but not exactly, similar. As a consequence, the temporal and spatial patterns of plankton and fish

distribution and production, and fish migration differ between each side of the North Pacific. These differences need to be considered when comparing community structure and biodiversity, especially in the context of climate change. It is probable that the short- and long-term effects of climate change will produce different responses on each side of the Pacific that could differ in both spatial scale and duration. This workshop will solicit and invite contributions that examine and compare different aspects of new production, community structure and biodiversity, within and among species, communities and ecosystems, relative to climate change. The number and duration of talks will be restricted to ensure adequate time for discussion.

REPORT OF MODEL TASK TEAM



The meeting of the MODEL Task Team was held from 08:30-12:00 hours on October 17, 2004. The Co-Chairmen, Drs. Shin-ichi Ito and Francisco E. Werner called the meeting to order and welcomed the participants (*MODEL Endnote 1*). The proposed agenda was reviewed and adopted (*MODEL Endnote 2*). During the meeting, participants:

- summarized the achievements and accomplishments of MODEL over the past year;
- reviewed the results and products of an APN/PICES workshop held the same week in Honolulu, immediately prior to the PICES Thirteenth Annual Meeting;
- discussed the PICES Strategic Plan and PICES Capacity Building;
- reviewed discussion of future strategies of the CFAME Task Team resulting from the CCCC workshop on “Linking open ocean and coastal ecosystems II”;
- reviewed the current status and future perspectives of the 3-D NEMURO model;
- discussed future perspectives and funding related to activities of MODEL;
- planned activities of MODEL for 2005 and beyond;
- discussed the membership of MODEL and selection of a new MODEL Co-Chairman.

MODEL accomplishments in 2004 (Agenda Item 2)

A successful workshop on “Summary and synthesis of contributions from NEMURO and NEMURO.FISH” (sponsored by Fisheries Research Agency of Japan, FRA) was held December 4-6, 2003, at the National Research Institute for Fisheries Science, Yokohama, Japan. The main results of the workshop were:

- successful modeling (validated by field data) of lower trophic ecosystems at several sites in the North Pacific;
- successful modeling of fish growth of Pacific herring and saury;

- extension of NEMURO to a 3-D basin-wide and global model;
- agreement to publish scientific contributions of NEMURO and NEMURO.FISH as a special issue of *Ecological Modelling*.

A workshop on “Development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific” (co-sponsored by FRA and PICES) was held August 20-23, 2004, at the Alaska Fisheries Science Center, Seattle, U.S.A. The main results of the workshop were:

- decision of clear editorial policy for the *Ecological Modelling* special issue on NEMURO and NEMURO.FISH;
- definition of objectives and preparatory arrangements for an APN/PICES workshop.

A 4-day APN/PICES workshop on “Climate interactions and marine ecosystems” (co-sponsored by the Asia Pacific Network and PICES) was convened from October 10-13, 2004, at the Ala Moana Hotel, Honolulu, U.S.A. The main results of the workshop are noted in a later section. A report of the workshop will be published in PICES Press in January 2005.

A ½-day CCCC/MODEL Topic Session on “Modeling approaches that integrate multiple spatial scales and trophic levels between shelf and open ocean” was convened at PICES XIII. The summary of the session is included elsewhere in this Annual Report.

APN/PICES workshop on “Climate interaction and marine ecosystems” (Agenda Item 3)

Drs. Francisco E. Werner and Bernard A. Megrey were principal investigators and co-convenors of the workshop. The project, which started in June 2004, is one-year in duration, and the workshop was held to review progress to date and define future activities. Fourteen

participants from all PICES member countries were in attendance. The objectives of the project are to study geographic and temporal variations of marine ecosystems (through fish, using Pacific herring as a target) in the North Pacific as determined by climate (bottom-up) forcing, with possible consideration of future climate change scenarios. Among the main results were:

- the workshop attendees were informed of the developments of the NEMURO and NEMURO.FISH models;
- methods for estimating parameters quantitatively were discussed as relevant to applications to new sites;
- new sites were selected for study to complete the east-west basin-scale comparison;
- new fish species were targeted including sardines, anchovies and mackerel, among others.

The APN funding and project run through June 2005, and over the coming months communication will continue through a portal to be established by Dr. Megrey at the Alaska Fisheries Science Center. The portal will also be used to post all model codes and available data for access by all workshop participants.

Discussion of PICES Strategic Plan and PICES Capacity Building (Agenda Item 4)

Dr. Ito briefly reviewed the PICES Strategic Plan and PICES Capacity Building. The main results of the follow-up discussion on possible MODEL contributions were:

- agreement to hold a training session of NEMURO and NEMURO.FISH as a part of a workshop which was proposed to a new APN program (PI: Dr. Michio Kishi);
- preparation of users' manuals and documentation of NEMURO and NEMURO.FISH, and request funding for translation costs of the above documentation from English to Chinese, Japanese, Korean and Russian languages, as a capacity building component of PICES.

CFAME future strategy (Agenda Item 5)

Dr. Ito briefly reviewed the results of the discussions of CFAME's future strategies presented at the CCCC workshop on "Linking open ocean and coastal ecosystems II". During the coming year, as CFAME continues to develop its future strategies, MODEL members agreed to keep close collaboration with CFAME.

Plans for 2005 and beyond (Agenda Item 6)

MODEL adopted the following three objectives as targets to apply NEMURO and NEMURO.FISH (*MODEL Endnote 3*).

- Geographic variation in fish growth (*Goal 1 of PICES Strategic Plan*);
- Understanding regime shifts (*Goal 2 of PICES Strategic Plan*);
- Global climate change effects on energy pathways and fish production (*Goal 2 of PICES Strategic Plan*).

The following plans were outlined to meet these objectives:

PICES XIV

- Convene a ½-day CCCC/MODEL Topic Session on "Modeling climate and fishing impacts on fish recruitment" (*MODEL Endnote 4*).

Inter-sessional meetings

- Convene a workshop in October 2005, in Japan (hosted by FRA), to build up a multi-species model using NEMURO.FISH; Dr. Kishi submitted a proposal to APN for US\$10,500, for an International workshop on "Toward quantitative understanding of natural fluctuations of marine coastal fisheries of sardines and anchovies and their impact on fishing-dependent human communities", and if funded, the proposal will support participation of Chinese, Indian, and Bangladeshi young scientists for the workshop; co-funding has also been requested from FRA, IAI, IOC and PICES (*Goals 5 and 6 of PICES Strategic Plan*).

Publications

- Submit papers on NEMURO and NEMURO.FISH models and their applications for review and publication as a special issue of *Ecological Modeling* (Goal 8 of PICES Strategic Plan);
- Prepare users' manuals and documentation of NEMURO and NEMURO.FISH for publication on the PICES website (Goal 8 of PICES Strategic Plan).

On-going and proposed projects

Two existing MODEL-related funded efforts are underway:

- APN: "Climate interaction and marine ecosystems" (PIs: Drs. Francisco E. Werner and Bernard A. Megrey);
- FRA: "Development of model on coupled response of lower and higher trophic level ecosystems for climate variability in the North Pacific" (PI: Dr. Shin-ichi Ito).

Three MODEL-related projects proposed for funding were reported:

- APN: "Toward quantitative understanding of natural fluctuations of marine coastal fisheries of sardines and anchovies and their impact on fishing-dependent human communities" (PI: Dr. Michio Kishi);
- FRA: "Regional comparison of growth of sardine and anchovies through bottom-up process and modeling approach toward it" (PI: Dr. Shin-ichi Ito);
- NOAA/NMFS: "Software framework for integrating marine ecosystem models" (PI: Dr. Thomas C. Wainwright).

Requests for travel (Agenda Item 7)

MODEL requests support for the following travel:

- 1 invited speaker for the CCCC/MODEL Topic Session on "Modeling climate and fishing impacts on fish recruitment" at PICES XIV (October 2005, Vladivostok, Russia);
- 2 scientists to attend the CCCC/MODEL inter-session workshop, to build up a multi-species model using NEMURO.FISH (October 2005, Japan).

Current status and future perspectives of 3-D NEMURO model (Agenda Item 8)

Dr. Yasuhiro Yamanaka reviewed the current status of the 3-D NEMURO model. Available output is limited to a coarse resolution model (1 degree in both longitude and latitude). However, fine resolution model (less than 1/10 degree) hydrodynamic integrations (without biology) have already been completed, although issues dealing with the large size and transfer of the output still need to be resolved. The 3-D NEMURO model with fine resolution integration will be available within two years. Before starting the integration of the model, spatial parameter sensitivities are needed to modify the parameters of the 3-D NEMURO model.

Membership of MODEL Task Team (Agenda Item 9)

Chairmanship and membership of MODEL were discussed. It was recommended that:

- Dr. Werner's term as Co-Chairman be extended until October 2005, with Dr. Wainwright serving as Co-Chairman-elect after PICES XIV;
- Drs. Hiroaki Saito and Toshio Katsukawa of Japan be replaced by Dr. Goh Onizuka;
- Dr. Hao Wei (People's Republic of China) join MODEL as a member;
- Drs. Peter S. Ross (Canada), Jae-Hak Lee (Republic of Korea), and Linda Jones (U.S.A.) formally rotate off MODEL as they have not participated in recent meetings;
- Additional members from Canada, People's Republic of China, Republic of Korea and Russia be recruited.

Recommendations to CCCC-IP/EC (Agenda Item 10)

1. Convene a CCCC/MODEL workshop in October 2005, in Japan (hosted by FRA), to build up a multi-species model extending NEMURO.FISH; support participation of two scientists in the workshop;
2. Convene a ½-day CCCC/MODEL Topic Session at PICES XIV (joint with FIS and possibly CFAME) on "Modeling climate

- and fishing impacts on fish recruitment”; support one invited speaker for the session;
3. Publish users’ manuals and documentation of NEMURO and NEMURO.FISH on the PICES website, and provide funding for translation costs of the above documentation

- from English to Chinese, Japanese, Korean and Russian languages, as a capacity building contribution.
4. Approve changes in MODEL chairmanship and membership requested under Agenda Item 9.

MODEL Endnote 1

Participation List

Members

Shin-ichi Ito (Japan, Co-Chairman)
 Michio J. Kishi (Japan)
 Bernard A. Megrey (U.S.A.)
 Hiroaki Saito (Japan)
 Jake Schweigert (Canada)
 Thomas C. Wainright (U.S.A.)
 Francisco E. Werner (U.S.A., Co-Chairman)
 Sinjae Yoo (Korea)
 Yury I. Zuenko (Russia)

Observers

Mao-Cheng Cui (China)
 Irina Ishmukova (Russia)
 Hee-Dong Jeong (Korea)
 Jin Yeong Kim (Korea)
 Alexander Leonov (Russia)
 Yasuhiro Yamanaka (Japan)

MODEL Endnote 2

MODEL Task Team Meeting Agenda

1. Welcome and introduction of new members
2. Review of MODEL accomplishments after PICES XII
3. Review of 2004 APN/PICES workshop
4. Discussion of PICES Strategic Plan and PICES Capacity Building
5. Future strategies of CFAME Task Team and MODEL’s role in these plans
6. Planning for 2005 and beyond
 - a. PICES XIV (October 2005)
 - b. APN project
- c. FRA (Japanese Fisheries Research Agency) project
- d. Joint workshop between APN, IAI, IOC, FRA (October 2005)
- e. CCCC/GLOBEC Synthesis Symposium (April 2006)
- f. PICES XV (October 2006)
7. Requests for travel to future meetings
8. Other new business
9. Rotation of membership
10. Recommendations to CCCC-IP/EC

MODEL Endnote 3

MODEL adopted hypotheses to apply NEMURO and NEMURO.FISH

Hypothesis 1: Geographic variation in fish growth. Differences in environmental conditions, and resulting differences in lower trophic conditions, can account for the differences in herring growth rates among selected sites in the North Pacific ecosystem. There exist long-term data sets on herring size-at-age from locations in the North Pacific.

These data sets show that herring growth rates over the past decades have varied consistently among the different locations. Understanding how much environmental conditions account for differences in herring growth is important for predicting climate change effects and for effective management of these types of fisheries in the future.

Hypothesis 2: Understanding regime shifts. Synchronous changes in herring growth rates across locations may be accounted for by basin-wide decadal-scale changes in environmental conditions. Preliminary examination of herring growth rates at several locations has shown sudden shifts in growth rates occurring in the same years across all locations. Where possible, we will combine long-term datasets on herring growth, with regional and local long-term climate and weather records, and use a common NPZ model coupled to the fish growth model to examine consequences of environmental regime changes. Understanding how regime shifts in climatic regimes cascade up the food-web is a good opportunity for using past conditions to infer future effects of climate change.

Hypothesis 3: Global climate change effects on energy pathways and fish production. Climate change may result in energy being diverted from the pelagic pathway and shunted through the

microbial pathway, resulting in less food for pelagic fish and consequently slower fish growth rates. We will use the common coupled NPZ and fish model, the long-term datasets, and defined climate change scenarios to predict how climate change would affect energy cycling, shift the dominance among different phytoplankton and zooplankton groups, and affect fish growth and production in the North Pacific ecosystem. Model simulations will be performed under present-day (baseline) environmental conditions, and for a suite of realistic climate change (IPCC; Intergovernmental Panel on Climate Change, <http://www.ipcc.ch>) scenarios. Comparing these linkages and pathways under baseline and climate change scenarios for a variety of locations that have different environmental conditions (*e.g.*, shallow coastal ocean versus the deep open ocean) will aid in the interpretation and generalization of our results.

MODEL Endnote 4

Proposal for a 1/2-day CCCC/MODEL Topic Session at PICES XIV on “Modeling climate and fishing impacts on fish recruitment”

To model the state of fish populations, both individual growth and the population number are necessary. Recently the PICES MODEL Task Team has generalized ecosystem models for the North Pacific and applied the prototype model of lower trophic levels (NEMURO) for the growth of individual fish, at present Pacific saury and herring. However, the same developments were not implemented at the fish population level. Clearly, the abundance depends strongly on reproductive success and fish survival during

early life stages, and these are, in turn, affected by the environment. This session will review existing models and related scientific knowledge on fish recruitment under varying environmental conditions, and create a foundation for their incorporation in the ecosystem model for the North Pacific and its regions.

Recommended convenors: Yury I. Zuenko (Russia, MODEL) and representatives (potentially) from both FIS and CFAME.

REPORT OF MONITOR TASK TEAM

☞

☛

The MONITOR Task Team met from 08:30-12:30 hours on October 17, 2004, to review accomplishments of the preceding year and the status of various national and regional monitoring programs, and to discuss future activities of MONITOR as a Technical Committee. The Co-Chairmen, Drs. Phillip R. Mundy and Sei-ichi Saitoh called the meeting to order and welcomed the participants (*MONITOR Endnote 1*). The proposed agenda was reviewed and adopted (*MONITOR Endnote 2*).

Reports on ongoing monitoring efforts and new developments in monitoring activities (Agenda Item 3)

Reports were received from Task Team members and guests (*MONITOR Endnote 3*). Power Point presentations will be posted on the MONITOR page on the PICES website when permission is given by authors.

North Pacific Ecosystem Status Report stewardship for MONITOR (Agenda Item 4)

Dr. Skip McKinnell reviewed the approach taken for the development of the North Pacific Ecosystem Status Report (pre-publication is now available on the PICES website). There was consensus among the participants regarding the value of the report and the role of the new MONITOR Technical Committee in having the report periodically updated. A publication interval of 3 – 5 years was suggested for the production of the printed report, with interim updates being made electronically on the PICES website or as shorter reports in the PICES Scientific Report Series.

Technical Committee status for MONITOR (Agenda Item 5)

At the second interim meeting, Science Board approved the proposed structural changes to the

CCCC Program, including moving the MONITOR Task Team outside the CCCC Program to become a Technical Committee directly under Science Board, with terms of reference as presented in *SB-IM Endnote 4*.

The Technical Committee status for MONITOR was discussed, and the Task Team members and guests unanimously supported the action. It was noted that the change to a Technical Committee gives MONITOR:

- a broader view and responsibilities;
- a longer (“on-going”) time frame;
- membership on Science Board; and
- a possibility to convene its own scientific sessions at Annual Meetings.

The following important implications for the membership of MONITOR were also indicated:

- Contracting Parties need to review and confirm their national membership; and
- MONITOR is to consider the transition of Task Team Co-Chairmen to Chairman and Vice-Chairman of the Technical Committee.

Drs. Mundy and Saitoh have agreed to serve as Chairman and Vice-Chairman for the Committee, respectively. These nominations will be submitted to Science Board and then Governing Council for approval.

The draft terms of reference were reviewed and forwarded to Science Board as final (*MONITOR Endnote 4*).

On behalf of the Continuous Plankton Recorder (CPR) Advisory Panel, Dr. Charles B. Miller has requested that the CPR Panel be placed under the new Technical Committee when that is established. The Task Team unanimously endorsed his proposal that the CPR-AP would remain as constituted, reporting to the MONITOR Technical Committee.

Scientific and methodological issues, and inter-comparisons of methodologies (Agenda Item 6)

Dr. Saitoh briefed the Task Team on past discussions of scientific, logistic and methodological issues, and inter-comparisons of methodologies (sampling and data processing) for primary productivity. Monitoring of primary productivity is important to the understanding of not only bottom-up control but also biogeochemical processes in marine ecosystems. At the present time, there are many methods to measure primary productivity such as C¹³, C¹⁴, isotopes, satellite observations and others. For the purposes of quantitative analysis, inter-comparison of methodologies is one of the most important issues. It was proposed that the inter-comparison of methods for primary productivity be discussed at an inter-sessional MONITOR workshop in 2005 or 2006.

Discussion of MONITOR's role in GOOS and consideration of recommendations on PICES' role in GOOS coordination (Agenda Item 7)

The GOOS Regional Policy is now available at <http://ioc.unesco.org/goos/key3.htm#reg>. The main building blocks are the GOOS Regional Alliances (GRA). Recent consolidation of these Alliances and the GRA Networking Development (GRAND) project were presented by Dr. Vyacheslav Lobanov.

Regional coastal observing systems are emerging around the Pacific Rim in PICES member nations. There was consensus among the participants that PICES should be playing a facilitating role in GOOS implementation. Coordination among AOOS and other U.S. regional observing systems and the western Pacific entities such as NEAR-GOOS, is viewed as a logical activity for the new MONITOR Technical Committee. There are several approaches that might be taken in this regard:

- continue to follow the route of ICES coordination now underway (MONITOR has established a closer link with the ICES Steering Group on GOOS in the last two years);
- create a Sub-arctic Pacific GOOS;

- push for a Pacific GOOS; or
- as a start, commit some of MONITOR's activities to GOOS (*e.g.*, develop PICES-sponsored GOOS pilot projects as is being done in the EuroGOOS area).

Perhaps a North Pacific GOOS Advisory Panel could be established under MONITOR to review these approaches and make recommendations to Science Board.

Nomination of workshops and meetings to be held under the auspices of PICES (Agenda Item 8)

- A MONITOR workshop on "North Pacific Ecosystem Status" was recommended to be convened at PICES XIV. This workshop would stress new developments in the monitoring of ecosystem status, and be directed at filling gaps in the current NPESR (*MONITOR Endnote 5*). The report of the workshop published by PICES would serve as addenda to the NPESR. Holding this meeting inter-sessionally would provide more time for discussions and allow time for preparation of the report for PICES XIV.
- A workshop on linking the regional observing systems of the Global Ocean Observing System (GOOS) in Asia and North America was proposed by Dr. Jeffrey Napp. The meeting would discuss approaches to establishing a broader regional alliance under GOOS. Comments from a number of members indicated that this workshop might be held in 2006, in conjunction with PICES XV.
- An inter-sessional workshop was suggested on the development of sensors, sensor platforms and data communications that stresses issues common to multiple technologies and disciplines. A number of members commented that this purpose might be well served by a workshop in conjunction with PICES XIV, where more people may be able to attend.
- An inter-sessional workshop on "Inter-comparison of methods of primary productivity" was proposed to be held in 2005 or 2006 (see Agenda Item 6 for details).

MONITOR Endnote 1

Participation List

Members

Vyacheslav B. Lobanov (Russia)
Phillip R. Mundy (U.S.A., Co-Chairman)
Jeffrey M. Napp (U.S.A.)
Thomas C. Royer (U.S.A.)
Sei-ichi Saitoh (Japan, Co-Chairman)
William J. Sydeman (U.S.A.)

Observers

Jack Barth (NANOOS)
Harold P. Batchelder (CCCC-IP Co-Chairman)
Sonia D. Batten (UK/Canada)
Robin M. Brown (Canada)
William Fox (PaCOS)
John Gould (Argo)
Loh-Lee Low (NPAFC)
Thomas Malone (GOOS)
Molly McCammon (AOOS)
Charles B. Miller (U.S.A.)
James E Overland (U.S.A.)
Clarence Pautzke (NPRB)
Ian Perry (Science Board Chairman)
Peter Rand (U.S.A.)

MONITOR Endnote 2

MONITOR Task Team Meeting Agenda

1. Welcome and introductions
2. Approval of agenda
3. Reports on ongoing international and national monitoring efforts and new developments in monitoring activities
4. North Pacific Ecosystem Status Report
5. Discussion of Technical Committee status for MONITOR, and comments on draft terms of reference
6. Scientific and methodological issues, and inter-comparisons of methodologies (sampling and data processing)
7. Discussion of MONITOR role in GOOS and consideration of recommendations on PICES role in GOOS coordination
8. Nomination of workshops and meetings to be held under the auspices of PICES

MONITOR Endnote 3

List of presentations at the MONITOR Task Team meeting

North Pacific Anadromous Fish Commission
(Dr. Loh-Lee Low)
EcoTrust Wild Salmon Center State of the
Salmon Project (Dr. Peter Rand)
Pacific Continuous Plankton Recorder Program
(Dr. Sonia Batten)
Moore Foundation/Sloan Foundation /Census of
Marine Life Pacific Ocean Shelf Tracking
Project (Dr. Batten for Dr. David Welch)
North East Asian Regional Global Ocean
Observing System (NEAR-GOOS) and
GOOS Regional Alliances Networking

Development (GRAND) Program (Dr.
Vyacheslav Lobanov)
International Argo Project (Dr. John Gould)
Neptune Fiber Optic Project and other efforts in
Canada (Mr. Robin Brown for Dr. David
Mackas)
Long-term fisheries and oceanography database
CD-ROM Press of HUFO-DAT (Dr. Sei-
ichi Saitoh)
Ocean Monitoring by Japanese Governmental
Organizations (Dr. Saitoh for Dr. Kiyotaka
Hidaka)

Monitoring developments in Russia (Dr. Vyacheslav Lobanov)
 Integrated and Sustained Ocean Observing System (IOOS) (Dr. Thomas Malone)
 Pacific Coast Ocean Observing System, (PaCOOS) (Dr. William Fox)
 Alaska Ocean Observing System (Ms. Molly McCammon)
 Regional observing systems on the west coast of the contiguous U.S.: Pacific Northwest

(NANOOS), Central and Northern California (CenCOOS), Southern California, (SoCOOS) (Dr. Jack Barth)
 Continuous Plankton Recorder (CPR) and Other Ship of Opportunity Programs (Dr. Phillip Mundy)
 North Pacific Research Board (NPRB) Programs (Dr. Clarence Pautzke)
 NMFS/AFSC/PMEL efforts (Dr. Jeffrey Napp)

MONITOR Endnote 4

Terms of Reference of the MONITOR Technical Committee

1. Identify principal monitoring needs of PICES region;
2. Develop approaches to meet these needs, including training and capacity building;
3. Serve as a forum for coordination and development of the PICES components of the Global Ocean Observing System (GOOS);
4. Serve as the senior editorial board of the North Pacific Ecosystem Status Report (NPESR). In this regard, the committee would establish rules, procedures, and schedule for production of the report in consultation with the Secretariat and other appropriate PICES entities;
5. Recommend interim meetings to address monitoring needs, PICES-GOOS activities, and development of NPESR;
6. Provide annual reports to Science Board and the PICES Secretariat on monitoring activities in relation to PICES;
7. Interact with the Technical Committee on Data Exchange (TCODE) and the MODEL Task Team of the PICES Climate Change and Carrying Capacity (CCCC) Program on matters of mutual concern.

MONITOR Endnote 4

Proposal for a MONITOR Workshop on “North Pacific Ecosystem Status”

In 2004, PICES published the first status report on the marine ecosystems of the North Pacific (PICES. 2004. Marine ecosystems of the North Pacific. PICES Special Publication 1, 280 p). It reviewed climatic, oceanographic, and fisheries conditions for all major regions in the North Pacific, with a focus on 1999-2003, and identified some of the critical factors causing changes in these ecosystems. Much was learned about the process of assessing the status of marine ecosystems, but much was also left out of the report. For example, benthic organisms, near-shore regions and contaminants were only sparsely discussed, and there were few attempts to provide synthetic or summary indices of the ecosystem state that might be comparable among regions. In 2004, PICES also produced a report on Fisheries and Ecosystem Responses to Recent Regime Shifts, which included updated

information that was not in the Ecosystem Status Report. The new MONITOR Technical Committee has accepted the responsibility of updating this Ecosystem Status Report and the production of the next version. The purpose of this workshop is to examine the process used to develop and review the first status report (what worked, what did not), to consider other models of ecosystem status reports (*e.g.*, ICES, Global International Waters Assessment, and the recently released Millennium Ecosystem Assessment), and to identify themes and data sources that were poorly, or not at all, included in the first version. Presentations on these topics, on existing monitoring programs that could contribute to the next Ecosystem Status Report, and on new sampling, observation and data processing technologies which might contribute directly to the next report, are invited.

REPORT OF REX TASK TEAM

3

8

The REX Task Team met from 8:30 – 9:45 hours on October 17, 2004. This was the last meeting of the REX Task Team because REX and BASS will become transformed into a new CCCC Task Team, CFAME. The Co-Chairmen, Drs. William T. Peterson and Yoshiro Watanabe, welcomed participants (*REX Endnote 1*) and outlined the objectives of the meeting. The agenda was reviewed and accepted (*REX Endnote 2*).

Accomplishments of REX in 2004 (Agenda Item 1)

Dr. Peterson presented a brief summary of the REX workshop on “The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim”. 45 people attended this year’s workshop. Since a detailed summary of the workshop had been already presented at the CCCC Workshop on “Linking open ocean and coastal ecosystems II” on the previous day, and since most participants of the Task Team meeting had either attended the REX workshop or the CCCC workshop, the detailed summary was not given again. The report of the workshop is included elsewhere in this Annual Report.

Accomplishments of REX since its inception (Agenda Item 2)

A brief history of REX was prepared by Drs.

REX Endnote 1

Members

Kenji Asano (Japan)
Brenda L. Norcross (U.S.A.)
William T. Peterson (U.S.A., Co-Chairman)
Yoshiro Watanabe (Japan, Co-Chairman)
Yutaka Watanuki (Japan)

Peterson and Douglas E. Hay and is appended as *REX Endnote 3*.

Terms of reference for CFAME (Agenda Item 3)

REX members reviewed the terms of reference for CFAME (*CFAME Endnote 3*) to prepare for a better discussion at the CFAME meeting which followed this REX meeting.

Other business (Agenda Item 4)

Ideas for special sessions that would in turn be presented to the CFAME Task Team for consideration for the next two PICES Annual Meetings were discussed. Dr. Hay’s suggestion to pursue a topic on “An east/west comparison of community structure, productivity and biodiversity under climate change scenarios” was supported (*CFAME Endnote 7*).

Several participants commented on the value of the REX and MODEL collaboration. This was a very productive exercise. The possibility of expanding NEMURO.FISH to include more than size-at-age, and to expand the model to include other fish species such as pink or chum salmon, pollock or sardines, was briefly discussed but no specific recommendations were made.

Participation List

Observers

Christine Abraham (U.S.A.)
Alexander Buslov (Russia)
Elena Dulepova (Russia)
Douglas E. Hay (Canada)
Oleg Katugin (Russia)
Sergey Korostelev (Russia)
Takashi Minami (Japan)
Oleg Zolotov (Russia)

REX Endnote 2

REX Task Team Meeting Agenda

1. Review accomplishments of the REX Task Team in 2004
 - REX workshop on “The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim”
2. Review accomplishments of the REX Task Team since its inception
3. Discuss the terms of reference for CFAME
4. Other business

REX Endnote 3

Genesis, life and death of REX: A summary by William T. Peterson and Douglas E. Hay

The name REX is an acronym for “Regional Experiment”. The REX Task Team was born, as a living component of PICES, on October 17, 1997, a few days prior to the beginning of the PICES Sixth Annual Meeting, starting on October 20, in Pusan, Korea. REX was conceived sometime earlier, as a part of the PICES CCCC (Climate Change and Carrying Capacity) Program which had its beginnings at a workshop held in October 1994, prior the PICES Third Annual Meeting in Nemuro, Japan. REX was designed to be one of several task teams concerned with the harmonization of national GLOBEC programs and PICES interests and activities.

The first Co-Chairmen of REX were Drs. Anne Hollowed (U.S.A.), Vladimir Radchenko (Russia) and Tokio Wada (Japan). This group directed the activities of participants in a 2-day workshop on “Development of cooperative research in coastal regions of the North Pacific” held October 17-18, 1997. The workshop involved over 50 scientists, representing over 40 research institutions from all PICES countries, plus some other nations. The participants were asked to review four key scientific questions presented in the CCCC Implementation Plan:

1. What are the characteristics of climate variability, can inter-decadal patterns be identified, and how and when do they arise?
2. How do primary and secondary producers respond in productivity, and in species and size composition, to climate variability in different ecosystems of the sub-arctic Pacific?
3. How do life history patterns distributions,

vital rates and population dynamics of higher trophic levels respond directly and indirectly to climate variability?

4. How are sub-arctic ecosystems structured? Do higher trophic levels respond to climate variability solely as a consequence of bottom up forcing? Are there significant intra-trophic level and top-down effects on lower level production and on energy transfer efficiencies?

Over the two days, breakout groups explored different aspects of these questions. The meeting concluded with recommendations that the key CCCC questions should be examined for small pelagic species in the North Pacific. This recommendation led to four REX workshops, in Fairbanks (1998), Vladivostok (1999), Hakodate (2000) and Victoria (2001). Also at the PICES Seventh Annual Meeting (October 1998, Fairbanks, U.S.A.), REX convened a scientific session that highlighted research of GLOBEC and GLOBEC-like programs. The results from the 1997 workshop, that initiated REX activities, are summarized in the 1997 PICES Annual Report and reported fully in the PICES Scientific Report No. 9 (1998).

The venues, topics and reports that developed from REX activities are described, sequentially, as follows:

- Fairbanks, U.S.A. (October 16-17, 1998, PICES VII). This REX workshop dealt with “Small pelagic species and climate change”. Though the workshop discussions were quite interesting, the Task Team felt that the topic

was too broad and that REX would be better served by taking a more focused “target species” approach in discussions of climate variability. Thus, the recommendation at was to focus on “...comparative analysis of larval and juvenile vital rates of Pacific herring from different regions of the North Pacific and its adjacent seas, and to facilitate comparative studies of the life history patterns of dominant zooplankton species (especially euphausiids and calanoids (*Neocalanus* and *Calanus*).” Scientific contributions are reported in the PICES Scientific Report No. 11 (1999).

- Vladivostok, Russia (October 8-9, 1999, PICES VIII). This REX workshop focused on “Herring and euphausiid population dynamics” and considered diets of larval and juvenile herring, and long-term changes in abundance of herring and zooplankton in several populations. Sixteen contributions from this workshop were published in the PICES Scientific Report No. 15 (2000).
- Hakodate, Japan (October 20-21, 2000, PICES IX). This REX workshop on “Trends in herring populations and trophodynamics” focused on long-term trends in abundance of herring in relation to environmental signals, and featured reviews of the status of all major herring populations around the Pacific Rim. Ten contributions from this workshop were published in PICES Scientific Report No. 17 (2001).
- An interesting spin-off developed at this meeting, with a joint meeting of the REX and MODEL Task Teams. Each Task Team considered their respective mandates and suggested that some activities might be examined jointly. The specific goal was to have a workshop to explore the application of the developing NEMURO trophodynamic model to explain observed changes in size-at-age in small pelagic species in the North Pacific. Work started on herring and saury populations. This collaboration between the REX and MODEL Task Teams led to a successful MODEL/REX workshop (co-sponsored by the Nakajima Foundation) to “Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes” held January 24-27, 2002, in Nemuro and Yokohama, Japan, with workshop results published in the PICES Scientific Report No. 20 (2002). (Subsequently, this has led to other successful workshops in Yokohama in March and December 2003, with similar objectives, but expanded to include other species. The results from the second MODEL/REX workshop (also co-sponsored by the Nakajima Foundation) to “Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes” (March 3-6, 2003) are published in the PICES Scientific Report No. 27 (2004). Further recent support for this work also has come from other institutions, including the Asian Pacific Network (APN) that sponsored a PICES workshop on “Climate interaction and marine ecosystems” held October 10-13, 2004, in Honolulu, immediately prior to PICES XIII.
- Victoria, Canada (October 5, 2001, PICES X). This REX workshop was on “Temporal variations in size-at-age for fish species in coastal areas around the Pacific Rim”. We focused on long-term trends in size-at-age thinking that this parameter could be more sensitive to physical signals (warming, cooling) or biological signals (zooplankton biomass, species composition or productivity). Although many of the presentations focused on herring populations around the North Pacific, other species (*e.g.*, salmon, sablefish, saury) were discussed as well. It was at the Victoria meeting that a formal collaboration with MODEL was established, and REX scientists began attending inter-sessional MODEL workshops. Thirteen contributions from this workshop were published in the PICES Scientific Report No. 20 (2002).
- Qingdao, China (October 2002, PICES XI). No workshop was held this year because the CCCC Task Teams were participating in the NEXT workshop. Instead, as a contribution

to this NEXT workshop, REX prepared a “white paper” which discussed the ways in which REX activities related to the eight key questions posed by the PICES CCCC Program.

- Seoul, Korea (October 14, 2003, PICES XII). The final REX Topic Session was on “Influence of fishing and invasive species on ecosystem structure around the Pacific Rim.” We had six talks and five posters. The session was an extension of the Science Board Symposium which might explain the fact that the attendance was overwhelming – speakers were treated to standing room only in a room with 60 chairs. The Task Team meeting was attended by 10 people. We had a full agenda and long discussions of topics for the following year’s meetings, collaborations with MODEL Task Team, the PICES North Pacific Ecosystem Status Report, Capacity Building.
- Honolulu, U.S.A. (October 14, 2004, PICES XIII). This meeting marked the official end of REX. We convened our last workshop, “The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim” which included 10 talks and 4 posters. Attendance was very good with at least 80 scientists in attendance. The REX business meeting had the usual attendance of 10-15 people.

To recap the many workshops which REX convened, each was well attended and discussions were always lively. Apart from learning about zooplankton, and small pelagic and general fish ecology from some of the world’s experts in our earlier workshops, perhaps the most significant accomplishment was the recognition of the large number of long-term data sets on landings, stock size, and size-at-age of herring and other pelagic fish species including salmon, saury, mackerel, sardine and anchovy that have been collected by scientists from PICES nations. There are exciting opportunities to write joint review papers with fellow scientists and this avenue should be pursued. Participants at REX workshops strongly supported the idea that PICES collate and create a CD ROM of all available Pacific herring data. Using a CD to share this data among all scientists associated with PICES would facilitate interactions and future collaborative research and papers.

Also during the course of these “herring” workshops, it became clear that PICES scientists have conducted a surprisingly large number of zooplankton sampling studies that provide multi-year records of zooplankton seasonal cycles in relation to environmental variables. Thus was born the germ of the idea for the final workshop on “Seasonal cycles of plankton”. The idea for a focus on seasonal cycles also evolved from the Victoria meeting in which it was recognized that modeling of seasonal cycles would be timely.

Historical List of REX Task Team members

Canada

Richard F Addison (1996-2000)
Brent N. Hargreaves (1996-2000)
Michael A Henderson (1996-1999)

China

Qi-Sheng Tang (1996-2004)
Rong Wang (1996-2004)

Japan

Kenji Asano (2001-2004)
Tokimasa Kobayashi (1999-2001;
Co-Chairman 2000-2001)

Yutaka Nagata (1996-2000)
Yasunori Sakurai (1996-2000)
Tokio Wada (1996-1999;
Co-Chairman 1996-1999)
Yoshiro Watanabe (2001-2004;
Co-Chairman 2001-2004)
Yutaka Watanuki (2001-2004)

Korea

Jin-Yeong Kim (1999-2004)
Chang-Ik Zhang (1996-2004)

Russia

Elena P. Dulepova (2002-2004)
Natalia V. Klovach (2002-2004)
Vladimir I. Radchenko (1996-2004;
Co-Chairman 1996-2002)

U.S.A.

Anne B. Hollowed (1996-1998;
Co-Chairman 1997-1998)
George L. Hunt, Jr. (1996-2004)
Brenda L. Norcross (1996-2004)
William T. Peterson (1999-2004;
Co-Chairman 1999-2004)

List of Participants

REX Workshop on “Development of cooperative research in coastal regions of the North Pacific”
(October 17-18, 1997, Pusan, Republic of Korea)

Canada

Richard J. Beamish
Kenneth L. Denman
Brent Hargreaves
Paul J. Harrison
Douglas E. Hay
Paul H. LeBlond
David L. Mackas
Gordon A. McFarlane
R. Ian Perry
David Welch

China

Li-Xian Dong
Shi-Zuo Feng
Da-Ji Huang
Tian-Xiang Meng
Ji-Lan Su
Song Sun
Qi-Sheng Tang
Rong Wang
Zeng-Mao Wu
Xou-Xian Yuan
Zhi-Nan Zhang

Japan

Kenji Asano
Yoshinari Endo
Kimio Hanawa
Yoshiaki Hiyama
Koji Iida
Tsutomu Ikeda (convenor)
Yutaka Isoda
Shin-ichi Ito
Makoto Kashiwai
Michio J. Kishi
Kazuya Nagasawa
Kaoru Nakata
Kuniaki Okuda
Naonobu Shiga
Takashige Sugimoto

Akira Taniguchi
Makoto Terazaki
Atsushi Tsuda
Tokio Wada (convenor)
Kazutoshi Watanabe
Orio Yamamura

Korea

Yu-Hwan Ahn
Young-Shil Kang
Hak-Gyoon Kim
Jin-Yeong Kim
Kuh Kim
Suam Kim
Zang-Geun Kim
Jang-Uk Lee
Ki-Back Seong
In-Ja Yoen
Chang-Ik Zhang

Russia

Vadim V. Navrotsky
Vladimir I. Radchenko (convenor)
Anatoly F. Volkov

U.S.A.

Vera Alexander
Richard D. Brodeur
James H. Cowan
Michael L. Dahlberg
Bruce W. Frost
Steven R. Hare
Anne B. Hollowed (convenor)
George L. Hunt, Jr.
Patricia Livingston
Allen Macklin
Michael M. Mullin
Robert S. Otto
Thomas C. Royer
Warren Wooster

List of Presenters
REX Workshop on “Small pelagic species and climate change”
(October 16-17, 1998, Fairbanks, U.S.A.)

Canada

Douglas E Hay (convenor)

China

Qi-Sheng Tang (convenor)

Japan

Makoto Kashiwai
Hiroshi Nishida
Seiji Ohshimo
Yasunori Sakurai

Tokio Wada (convenor)

Korea

Jin-Yeong Kim (convenor)

Russia

Vladimir I. Radchenko (convenor)

U.S.A.

Richard D. Brodeur
Evelyn D. Brown
Larry Jacobson (convenor)

List of Presenters
Workshop on “Herring and euphausiid population dynamics”
(October 8-9, 1999, Vladivostok, Russia)

Canada

Douglas E Hay (convenor)
Gordon A. McFarlane
Jacqueline M. O’Connell

Japan

Michio J. Kishi
Tokimasa Kobayashi
Tokio Wada (convenor)

Korea

Young-Shil Kang

Norway

Stein Kaartvbeedt

Russia

N. G. Chupisheva
Elsa R. Ivshina
Nikolai I. Naumenko
Vladimir I. Radchenko (convenor)

U.S.A.

David M. Checkley, Jr
Scott M. Rumsey
Augustus J. Paul
William T. Peterson (convenor)

List of Presenters
REX Workshop on “Trends in herring populations and trophodynamics”
(October 20-21, 2000, Hakodate, Japan)

Canada

Douglas E Hay (convenor)
Jake Schweigert

Japan

Tokimasa Kobayashi (convenor)

Russia

Elsa R. Ivshina
Nikolia I. Naumenko

Vladimir I. Radchenko (convenor)

U.S.A.

R. J. Foy
Fritz Funk
William T. Peterson (convenor)
Scott Rumsey
Gray L. Thomas

List of Presenters

REX Workshop on “Temporal variations in size-at-age for fish species in coastal areas around the Pacific Rim” (October 5, 2001, Victoria, Canada)

Canada

Douglas E Hay (convenor)
Brain J. Pyper
Jake Schweigert
Ron W. Tanasichuk

Alexander A. Bonk
Ludmila A Chernoiivanova
Nikolay I. Naumenko
Sergey N. Tarasyuk
Olga S. Temnykh

Japan

Chikako Watanabe
Yoshiro Watanabe

U.S.A.

Evelyn D Brown
R. Bruce MacFarlane
William T. Peterson (convenor)

Russia

Pavel A Balykin

List of Participants

First MODEL/REX Workshop on “Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes” (January 24-27, 2002, Nemuro/Yokohama, Japan)

Canada

Douglas E. Hay

Yasuhiro Yamanaka
Naoki Yoshie

Japan

Tomomori Azuaya
Sanae Chiba
Masahiko Fujii
Masakatu Inada
Shin-ichi Ito
Toshio Katsukawa
Makoto Kashiwai
Michio J. Kishi (convenor)
Tokimasa Kobayashi
Daiki Mukai
Takeshi Okunishi
Lan Smith
Kazuaki Tadokoro
Aiki Tomokazu
Atsushi Tsuda

China

Daji Huang

Kroea

Chul-Hoon Hong

Russia

Yury I. Zuenko
Alexander Leonov
Vadim V. Navrotsky

U.S.A.

Robert A. Klumb
Bernard A. Megrey (convenor)
Fancisco E. Werner

List of Participants

Second MODEL/REX Workshop on “Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes” (March 3-6, 2003, Yokohama, Japan)

Canada

Douglas E. Hay

Japan

Maki Aita-Noguchi

Sanae Chiba

Masahiko Fujii

Taketo Hashioka

Shin-ichi Ito

Makoto Kashiwai

Toshio Katsukawa

Michio Kawamiya

Michio J. Kishi (convenor)

Daiki Mukai

Goh Onitsuka

Lan Smith

Maki Suda

Kazuaki Tadokoro

Yongjun Tian

Yasuhiro Yamanaka

Naoki Yoshie

Sachie Yoshimoto

Kroea

Sin-Jae Yoo

U.S.A.

Bernard A. Megrey (convenor)

Kenneth A. Rose

Fancisco E. Werner

Fei Chai

List of Presenters

REX Topic Session on “Influence of fishing and invasive species on ecosystem structure around the Pacific Rim” (October 14, 2003, Seoul, Korea)

Canada

Douglas E Hay

Japan

Tadanori Fujino

Russia

Larsia S Afechuk (poster)

Pavel A Balykin (poster)

Evgeny Drobjazin (poster)

Larissa A Gayko (poster)

Sergey G. Korostelev (poster)

Anatoliy Ya. Velikanov

U.S.A.

Jeffery R. Cordell

Elizabeth A. Logerwell

Steven J. Martell

William T. Peterson (convenor)

List of Presenters

REX Workshop on “The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim” (October 14, 2004, Honolulu, U.S.A.)

Japan

Hiromi Kasai

Toru Kobari

Kaoru Nakata (convenor)

Atsushi Yamaguchi

Yasuhiro Yamanaka

Korea

Hyen-Gyeong Jeong (poster)

Hyung-Ku Kang (poster)

Young-Shil Kang

Hyun-Cheol Kim

U.S.A.

Christine L. Abraham

Russell R Hopcroft (poster)

William T. Peterson (convenor)

Thomas C Wainwright

REPORT OF ADVISORY PANEL ON CONTINUOUS PLANKTON RECORDER SURVEY IN THE NORTH PACIFIC

☪

☪

The Advisory Panel on *Continuous Plankton Recorder Survey in the North Pacific* (CPR-AP) met from 17:00-19:00 hours on October 18, 2004. The Panel Chairman, Dr. Charles B. Miller, called the meeting to order and welcomed the participants (*CPR-AP Endnote 1*). The draft agenda for the meeting was reviewed and adopted (*CPR-AP Endnote 2*).

Dr. Miller reported that the MONITOR Technical Committee, at its meeting held October 17, 2004, agreed to accept the CPR Advisory Panel as a sub-committee. This is meant to institutionalize the role of the CPR project as a PICES monitoring activity. The Panel will continue to oversee CPR activities as before.

The Panel received reports on current CPR activities from Drs. Sonia Batten and William J. Sydeman.

Meeting summary

Funding

The CPR project has received continued funding through 2006. For the NW to SE towing lines across the Gulf of Alaska, funding is from the EVOS-Gulf Ecosystem Monitoring (GEM) Program. For the Vancouver to Yokohama great-circle run (including the southern Bering Sea), funding is from the North Pacific Research Board (NPRB), and it is now sufficient to support three runs each year (April, June and October). This success with funding requests is good news, and a tribute to the work already completed.

Changed routes

A significant change has been made in the Gulf of Alaska run. The tanker company that deployed recorders from outside Prince William Sound to Long Beach has ended their participation, necessitating a shift to freighter

traffic from Cook Inlet (Anchorage) to Puget Sound. The CPR Advisory Panel thanks *Polar Tankers* for their cooperation over the first five years of the project, and extends thanks to *Horizon Shipping* and the "Horizon Kodiak" for taking on the project now. Scientifically the change means that (1) a different portion of the Alaskan shelf will now be sampled and (2) the long section down the California Current will now be lost. The old and new lines through the central Gulf of Alaska are broadly overlapping, so considerable comparability will remain there. Sampling along the new route has been completed for six months, March to August of 2004, one more run than had been taken on the tanker route from 2000 to 2003. The sea-chest temperature-salinity recorder previously installed on the tankers has not yet been moved to the ships on the new run.

Sample processing

Reasonably rapid work-up of CPR zooplankton has continued. Dr. Batten and Mr. Douglas Moore are working up 20% of a series consisting of every fourth CPR sample (except on the Alaskan shelf where all samples are processed), which is the total eventually examined by SAHFOS. This is done at the Institute of Ocean Sciences (Fisheries and Oceans Canada) in Sidney, British Columbia, Canada. Results from sample processing are posted on the project website at <http://www.sahfos.org>. All of the processed samples have been counted each year by SAHFOS staff within a year of collection. The remainder of the samples has been archived. Dr. Batten provided a report on current results to PICES, which is attached as *CPR-AP Endnote 3*.

Bird and mammal monitoring

Dr. Sydeman reported that the marine bird and mammal monitoring on the east-west run completed its third year of observation in 2004. A total of 8 transects, with about 160 days at sea

have been logged. All observations have been made by one observer, Michael Henry (PhD candidate at the University of British Columbia).

The relative abundance of Tufted puffins along the route illustrates relative densities between seasons and years (Fig. 1).

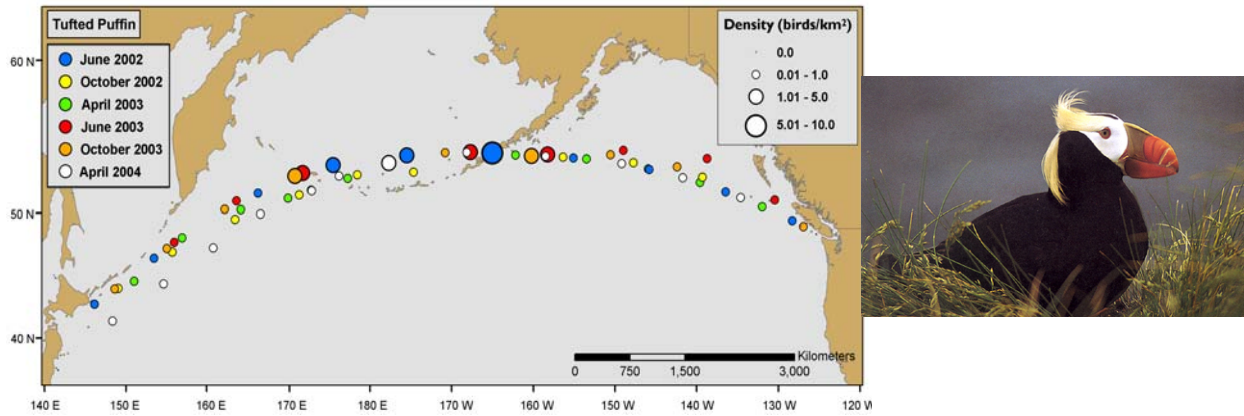


Fig. 1 Tufted puffin distribution and abundance across the North Pacific based on PICES/CPR-MBM surveys from June 2002-April 2004. Densities in June and in the southern Bering Sea were highest, yet puffins were found in all habitats (coastal and oceanic) in all seasons and years. Therefore, puffins may serve as a flagship species for this project. “Gum-ball” plot produced by Christopher Rintoul (PRBO).

D. Hyrenbach, M. Henry, W. Sydeman, K. Morgan and D. Welch have prepared a manuscript on methods for surveying marine birds from vessels of opportunity. S. Batten, D. Hyrenbach, W. Sydeman, P. Yen and D. Welch have prepared a publication characterizing biogeographic zones, or “meso-marine ecosystems”, features that appear in both the bird counts and plankton composition. The transect divides with remarkable consistency into a set of zones occupied by distinct fauna. There are 10 meso-marine ecosystems from Canada to Japan; some of them bounded at obvious features like shelf edge crossings, some less readily explained.

The presence of M. Henry on the east-west transect has made possible the maintenance of a sea-chest-mounted nitrate monitoring system based on automated wet chemistry. This was

deployed on one summer run in 2004. Variation in nitrate across the Pacific was evident as distinct zones of high and low concentration: high nitrate in areas expected to be HNLC ecosystems, low nitrate when crossing coastal currents and continental shelves. PRBO (Point Reyes Bird Observatory) Conservation Science is seeking a postdoctoral fellow to work up satellite observations to overlay with bird data along the east-west transect.

Future prospects

Given that funding is in place for sampling through 2006, and that CPR samples are examined and interpreted in rapid and informative fashion, the future prospects of this project are good. Dr. Batten, upon whom the project heavily depends, reported that she is willing to stay with the work through at least the currently funded period.

CPR-AP Endnote 1

Participation List

Members

Sonia D. Batten (Canada/UK)
Charles B. Miller (U.S.A., Chairman)
Jeffery M. Napp (U.S.A.)

Observers

Michael J. Dagg (U.S.A.)
George L. Hunt (U.S.A.)
K. David Hyrenbach (U.S.A.)
Hyung-Ku Kang (Korea)
Phillip R. Mundy (MONITOR Chairman)
William J. Sydeman (U.S.A.)

CPR-AP Endnote 2

CPR-AP Meeting Agenda

1. Progress report on the Continuous Plankton Recorder program
2. Bird observer report
3. Comments on other plankton monitoring efforts
4. Other business

CPR-AP Endnote 3

Progress report on the PICES CPR project by Dr. Sonia Batten

Over 1900 processed CPR samples are currently in the database, and these contain abundance data for 256 plankton taxa; more samples are to be added for 2004. A sub-section of samples are processed quickly (20-25% of the samples that are ultimately processed) and as each transect is completed the data (species found, abundance and biomass of mesozooplankton), including comparisons with previous transects, are posted on the project web site at http://www.sahfos.org/Pacific_Project. Time series graphs of data for the separate regions sampled by the CPR are available on the website.

Rather than review all of the various results this report will focus on the east-west transect. Recent integrative studies have shown that both plankton and seabird communities sampled by this transect divide into distinct regions. Community composition analyses show changes in plankton communities (from the CPR data) and bird communities (from MBM observations) occurring at the same points along the transect. Figure 2 shows the results of cluster analyses with each sample (or observing period) coloured according to the cluster it belonged to.

Plankton data from 2000 and 2001, and bird data from 2003 also showed the same divisions at the same places, suggesting that these are consistent community patterns, or “meso-marine ecosystems” (MME) as we term them. Comparison with physical data suggested that the MMEs are defined by the topography (such as the transition between the continental shelf and open ocean) and by the currents of the North Pacific (such as the splitting of the North Pacific current into the California and Alaskan currents). A manuscript has been prepared which describes this integrative study and the characteristics of the ecosystems. This result was used to divide the transect into 10 regions that can be examined separately, and more meaningfully, in our data summaries (Fig. 3).

For example, there are now five successive June east-west transects that have been sampled (2000-2004), and Figure 4 shows mean mesozooplankton abundance for each of the ten MMEs, in each year. In 2004, abundances were generally higher in the western Pacific than the east, while in 2002 the reverse was true, probably owing to differences in seasonality. The eastern Pacific was very warm in 2004, and

the spring increase in sub-arctic copepods appears to have been earlier; abundances in

June were quite low, whereas abundances in April were unusually high.

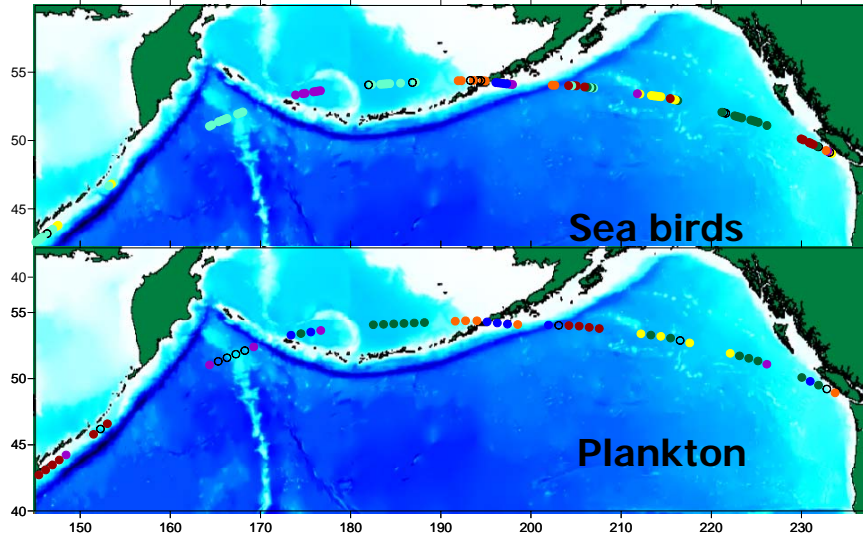


Fig. 2 Separate cluster analyses of the taxonomic data (presence/absence data for plankton, abundance data for birds) along the east-west transect in June 2002. Gaps indicate night. Open circles are samples that did not form a cluster, otherwise colours indicate samples with similar community composition within each trophic group.

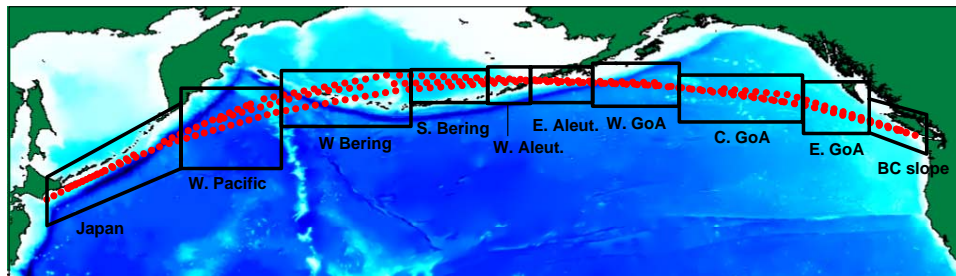


Fig. 3 Meso-marine ecosystems along the CPR-MBM transect.

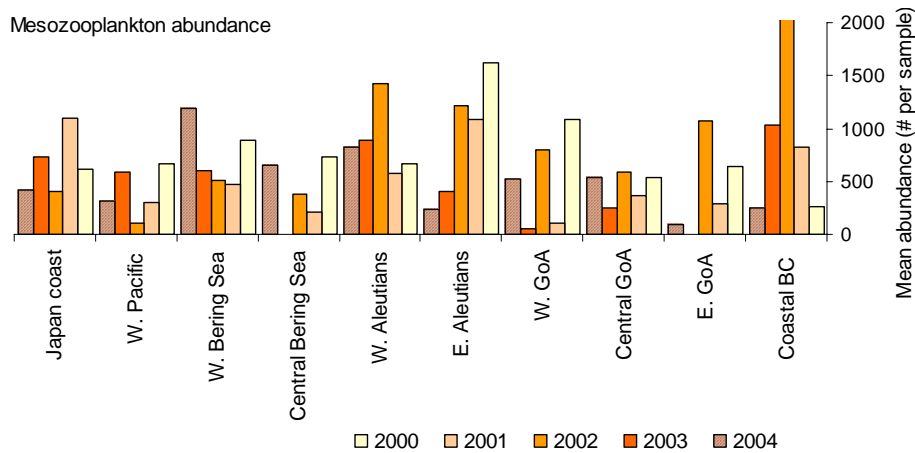


Fig. 4 Mean mesozooplankton abundance in each MME in the June east-west transect of each year.

REPORT OF ADVISORY PANEL ON IRON FERTILIZATION EXPERIMENT IN THE SUBARCTIC PACIFIC OCEAN

3

8

The meeting of the Advisory Panel on *Iron fertilization experiment in the subarctic Pacific Ocean* (IFEP-AP) was held from 17:00-19:30 hours on October 19 and 19:00-21:00 hours on October 20, 2004. The Panel Co-Chairman, Dr. Shigenobu Takeda, called the meeting to order and welcomed the participants (*IFEP-AP Endnote 1*). A new member, Dr. Hiroaki Saito, was introduced to the Advisory Panel. The draft agenda for the meeting was reviewed and adopted (*IFEP-AP Endnote 2*).

Activities in 2004 (Agenda Items 3 and 4)

In order to review the results and outstanding questions from iron enrichment experiments, and to discuss plans for the second longer-term experiment in the western subarctic Pacific (SEEDS-II), the PICES-IFEP workshop on “*In-situ* iron enrichment experiments in the eastern and western subarctic Pacific” was held February 11-13, 2004, in Victoria, Canada (workshop convenors: S. Takeda and C.S. Wong). 26 scientists from Canada, Japan and the United States of America attended the meeting. The workshop started with 4 synthesis talks on SEEDS-I, SERIES and SOFeX, followed by 14 shorter presentations on the physical behavior of the Fe-enriched patch, biological/physiological responses, food-web dynamics, chemistry of iron, carbon cycle, and model prediction. The results of the workshop have been reported in PICES Press (July 2004, Vol. 12, No. 2), and will be published as a PICES Scientific Report in 2004 or early 2005.

A joint Canadian SOLAS/PICES-IFEP session on “Response of the upper ocean to meso-scale iron enrichment” was convened on February 17-18, during the ASLO/TOS 2004 Ocean Research Conference held in Honolulu, Hawaii (session organizers: M. Levasseur, A. Tsuda, W. Miller, W. Cochlan and R. Rivkin). The call for papers was very well received, resulting in a session

composed of 23 oral presentations and 17 posters. As expected, the session was a showcase for the most recent experiment: SERIES. But there was also significant contribution from SEEDS and SOFeX, and some presentations proposed thoughtful inter-comparisons between the various meso-scale experiments. This special session allowed the recognition of the similarities and differences in the responses obtained from various *in situ* experiments. The results of the session have been reported in PICES Press (July 2004, Vol. 12, No. 2).

Progress report of the SEEDS-I data synthesis and publication (Agenda Item 5)

In the summer of 2001, a joint Japan/Canada iron enrichment experiment (Subarctic Pacific Iron Experiment for Ecosystem Dynamic Study – SEEDS-I) was performed in the western subarctic Pacific. A synthesis paper on the experiment was published in *Science* (Tsuda et al. “A meso-scale iron enrichment in the western subarctic Pacific induced a large centric diatom bloom”, Vol. 300: 958-961, 2003). Twelve manuscripts were submitted to a special issue of *Progress in Oceanography*, and 8 papers have been accepted to date. The volume will be published in 2005.

Progress report of the SERIES data synthesis and publication (Agenda Item 6)

In the summer of 2002, a joint Canada/Japan iron enrichment experiment (Subarctic Ecosystem Response to Iron Enrichment Study – SERIES) was carried out in the eastern subarctic Pacific. A synthesis paper on the experiment was published in *Nature* (Boyd et al. “Evolution, decline and fate of an iron-induced subarctic phytoplankton bloom”, Vol. 428: 549-553, 2004). In early April of 2004, a 3-day writing workshop was held at the Institute of

Ocean Sciences, Sidney, Canada, to encourage data discussion, synthesis, paper outlines and writing. The workshop was successful and worthwhile. To date, 8 papers have been submitted to a special issue of *Deep-Sea Research II* (Guest Editors: P.J Harrison, M. Levasseur, P. Boyd, R. Rivkin, A. Tsuda, and W. Miller), and about 8-10 papers are coming in October 2004. There are still 17 proposed papers to be submitted, so a second volume would be proposed for 2005.

Preliminary report of SEEDS-II in 2004 (Agenda Item 7)

The second *in situ* iron enrichment experiment (joint Japan/US effort) was conducted in the western subarctic gyre of the North Pacific (48°10'N, 166°E) from July 20 to August 20, 2004. The experiment consisted of two iron additions: (1) 1600 kg of FeSO₄ x 7H₂O with an inert tracer gas SF₆, over an 8 x 8 km patch with a mixed layer depth of 30 m on Day 0 and (2) 790 kg of FeSO₄ x 7H₂O on Day 6. After the iron release, significant increase in dissolved iron concentration (1.4 nM on Day 1 and 0.6 nM on Day 7) was observed. Chlorophyll-*a* concentration in the surface mixed layer increased from day 4 and reached >2.5 mg m⁻³ on Day 8, but these responses were relatively small compared with large increases observed during previous SEEDS-I experiment (about 20 mg m⁻³). Size structure of phytoplankton was also different from SEEDS-I, and <10 µm size fraction accounted for 70-80% of the Chlorophyll-*a* biomass throughout the observation period. Diatoms did not dominate in the phytoplankton community and decreases in nitrate and silicate concentrations in the surface water were minimum. The observed differences between SEEDS-I and SEEDS-II suggest a need to develop new hypotheses to explain how plankton assemblage responds to iron supply in high-nutrient, low-chlorophyll waters in the subarctic North Pacific.

Expansion of the terms of references (Agenda Item 8)

Due to the unexpected outcomes of the three meso-scale iron enrichment experiments, the

Advisory Panel felt that it is important to expand the existing terms of reference ((*IFEP-AP Endnote 3*) to include the following item:

- To synthesize, compare and contrast the results of SEEDS-I & II and SERIES, and to develop new experimental strategies and hypotheses to explain the different biogeochemical responses to iron enrichment.

IFEP-AP Workplan for 2005 (Agenda Item 9)

The following plans were outlined:

PICES XIV

- Conduct a ½-day IFEP/MODEL workshop on “Modeling and iron biogeochemistry: How far apart are we?” to enhance communication between experimentalists and modelers, and to establish a framework for organizing a 2-3 day workshop that will address problems on structuring iron biochemical models (*IFEP Endnote 4*).

Inter-sessional meeting

- Co-sponsor jointly with the Ocean Research Institute (University of Tokyo), a 2-day international symposium on SEEDS-II experiment, to be held in October 2005, in Tokyo, Japan. The goals of this symposium are: (1) to synthesize results from the second *in situ* iron enrichment experiments in the western subarctic North Pacific (SEEDS-II); and (2) to discuss differences in magnitude, biology and export between SEEDS-I and SEEDS-II.

Publications

- Selected papers from the SERIES iron enrichment experiment to be published as a special *Deep-Sea Research II* issue in 2005.
- A 5-year synthesis report of the Advisory Panel to be prepared for publication in the PICES Scientific Report Series. It will include circumstances of IFEP, summary of SEEDS-I & II and SERIES, terms of reference (initial and new), and future plans to understand why the three iron enrichment experiments in the subarctic North Pacific are different in magnitude, biology and export.

The Advisory Panel recognized the importance and needs for holding a special symposium or session on three successful meso-scale iron enrichment experiments in the subarctic North Pacific (SEEDS-I & II and SERIES). It is, however, not the right time yet to convene such a symposium/session because the sample analyses and data synthesis of SEEDS-II is still underway. The Advisory Panel decided to postpone the special symposium/session to 2006 or later.

Requests for travel (Agenda Item 10)

The IFEP-AP requests support for the following travel:

- 2 scientists to attend the joint IFEP/MODEL workshop “Modeling and iron biogeochemistry: How far apart are we?” at PICES XIV;
- 1 invited speaker for the symposium on SEEDS-II to be held in Tokyo, Japan, in October 2005.

IFEP-AP Endnote 1

Participation List

Members

William P. Cochlan (U.S.A.)
 Hiroaki Saito (Japan)
 Shigenobu Takeda (Japan, Co-Chairman)
 Mark L. Wells (U.S.A.)

Observers

Fei Chai (U.S.A.)
 James Christian (Canada)
 William R. Crawford (Canada)
 Debby Ianson (Canada)
 Jun Nishioka (Japan)
 Angelica Peña (Canada)
 Yasuhiro Yamanaka (Japan)

IFEP-AP Endnote 2

IFEP-AP Meeting Agenda

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Round-table introduction of attendees 2. Adoption of agenda 3. Review of the IFEP activities in 2004 4. Report of the 2004 PICES-IFEP Workshop 5. Progress report of the SEEDS-I data synthesis and publication | <ol style="list-style-type: none"> 6. Progress report of the SERIES data synthesis and publication 7. Preliminary report of SEEDS-II in 2004 8. Future perspective 9. Plans for 2005 10. Requests for travel supports 11. Other new business |
|--|--|

IFEP-AP Endnote 3

Terms of Reference for Advisory Panel on *Iron fertilization experiment in the subarctic Pacific Ocean*

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. To examine the reasoning for a subarctic iron enhancement experiment; 2. To examine the scale, disciplines, and resources (personnel and ships) required ensuring success of the experiment; 3. To design the experiment and its timing, particularly, the suite of chemical measurements and forms of iron, the biological parameters, the tracking of the | <p>spread of iron-induced bloom using SF₆ tracer;</p> <ol style="list-style-type: none"> 4. To synthesize, compare and contrast the results of conducted experiments (SEEDS-I & II and SERIES), and to develop new experimental strategies and hypotheses to explain the different biogeochemical responses to iron enrichment (New). |
|--|---|

IFEP-AP Endnote 4

Proposal for a 1/2-day IFEP/MODEL workshop at PICES XIV on “Modeling and iron biogeochemistry: How far apart are we?”

Synthesis of data from three successful meso-scale iron enrichment experiments in the subarctic North Pacific (SEEDS-I, SEEDS-II and SERIES) is underway. This workshop will enhance communication between experimentalists and modelers. For the most part, iron is not explicitly represented in current ecological models. The goal of this workshop will be to examine the structure of iron biochemical models with respect to what is known about iron biogeochemistry. The purpose will be to establish a framework for organizing a 2-3 day workshop that will address this problem in detail

and compare ecological models that describe how plankton ecosystem respond to meso-scale iron enrichment in the high-nutrient, low-chlorophyll waters of the subarctic Pacific.

Recommended convenors: Fei Chai (U.S.A) and Shigenobu Takeda (Japan). MODEL has been approached to co-sponsor the workshop.

Travel support is requested for two scientists to attend the workshop, one expert on iron biogeochemistry and another on ecological modeling.

REPORT OF ADISORY PANEL ON MARINE BIRDS AND MAMMALS



The fourth meeting of the Advisory Panel on *Marine birds and mammals* (MBM-AP) was held from 15:15 – 18:00 hours on October 14, 2004. The Panel Co-Chairman, Dr. Hidehiro Kato, called the meeting to order and welcomed the participants (*MBM-AP Endnote 1*). The Panel reviewed the terms of reference (*MBM-AP Endnote 2*), and the draft agenda that was adopted (*MBM-AP Endnote 3*). The Panel Co-Chairman, Dr. William J. Sydeman agreed to moderate discussion.

MBM-AP membership (Agenda Item 3)

Dr. Kato introduced Dr. Rolf Ream (U.S.A), a marine mammal expert, who became a new member of the Panel to replace Dr. Thomas Loughlin. MBM-AP members welcomed Dr. Ream and noted that Dr. Loughlin served the Panel well and will be missed.

It was pointed out that work of MBM-AP has been hindered by the lack of national participation. In fact, only Japanese and US members attended all meetings of the Panel. To complete the strategic goals of the Panel the following has been recommended:

- Canada has active marine bird and mammal research programs, yet Dr. Douglas Bertram's position on the Panel (marine birds) has not been replaced, and Dr. Peter Ross (marine mammals) have not attended any MBM-AP meetings since 2001. Canada has to be requested to consider nominating new MBM-AP members;
- Dr. Vyacheslav Shuntov does not travel abroad and is unable to attend meetings outside Russia, and thus Russia has to be requested to consider nominating additional members to the Panel;
- China and Korea have to be requested to nominate experts to the Panel.

Review of MBM-AP workshop at PICES XIII (Agenda Item 4)

The MBM-AP workshop entitled "Combining datasets on distribution and diets of marine birds and mammals II" was held October 14, 2004, and attended by 16 scientists. Five oral presentations were made, including two talks on marine birds and three talks on marine mammals. The summary of the workshop is included elsewhere in this Annual Report.

Presentations and associated discussions revealed the following:

- Diet composition of seabirds and marine mammals varies between the west and east regions of the North Pacific. Myctophids are an important prey for many species in the open ocean, whereas a series of coastal prey are important in marginal seas. Euphausiids and copepods are important for planktivorous seabirds, but diet compositions have changed through time.
- Diet composition has switched dramatically at the decadal level, probably related to regime shifts, El Niños and other climatic factors.
- Marine mammals and seabirds, including, at least, Cassin's Auklet and northern fur seal, and species discussed last year, may be useful as ecosystem indicators of climate fluctuations, though there are some limitations with this approach. For example, understanding the dynamics of prey switching and geographic variability is essential to interpreting spatio-temporal variations in diet composition. MBM-AP, while highlighting this issue, recommends continued efforts to develop dietary and demographic indices of short-term and low-frequency climate-ecosystem fluctuations.

Review of FIS/BIO Topic Session at PICES XIII (Agenda Item 5)

The FIS/BIO Topic Session on “Hot spots and their use by migratory species and top predators in the North Pacific” was scheduled for October 19, 2004. This session was co-organized by MBM-AP, with Drs. Kato and Sydeman serving as co-convenors. The session was well subscribed, with 21 oral presentations and 7 poster presentations. A possible publication of the papers in a special volume of a peer-reviewed journal was discussed and strongly supported by the participants. The summary of the session is included elsewhere in this Annual Report.

Proposals for publications, workshops and topic sessions for PICES XIV and PICES XV (Agenda Item 6)

- Building on the Working Group 11 (Consumption of marine resources by marine birds and mammals in the PICES region) report, and after a thorough review of the presentations and discussions at the MBM-AP workshops on combining dietary datasets of marine birds and mammals in 2003 and 2004, the Panel recommends that the papers presented at the 2003 and 2004 workshops be considered as a special PICES publication. A total of 10 papers are available for publication, preferably in a peer-reviewed journal such as *Progress in Oceanography*. Drs. Sydeman and Kato volunteered to serve as editors. Dr. Sydeman will discuss this opportunity with the PICES Secretariat. This publication represents an important duty that remains incomplete for MBM-AP.
- To promote cooperation with marine bird and mammal experts from Russia, the Panel recommends that a 1-day workshop, entitled “Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea” be convened at PICES XIV (*MBM-AP Endnote 4*). It is hoped that experts on lower trophic levels can be recruited for the workshop to put the top predator data in

context. To provide the greatest potential for participation, MBM-AP requests that the workshop be held on one of the primary meeting days and travel support be provided to at least one keynote speaker.

- The Panel proposes a 1-day Topic Session to be convened jointly by BIO, POC and FIS, in collaboration with MONITOR and TCODE, tentatively entitled “Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations” (*MBM-AP Endnote 5*). This Topic Session will complement the 2004 Topic Session on “Hot spots and their use by migratory species and top predators in the North Pacific”. It is envisioned that the 2005 Topic Session could take advantage of long-term (10+ year) marine bird, mammal, and predatory fish (particularly salmonids) monitoring datasets from around the North Pacific, and would provide novel insight into synchrony in responses of top predators to climate variability in the North Pacific as well as serve to highlight which species and parameters could serve as “rapid-response ecosystem indicators”. The session would also provide initial understandings of top predator responses to secular climate change.

PICES website: MBM-AP contribution (Agenda Item 7)

It is recognized by MBM-AP that attention should be paid to updating the PICES website with new material. Dr. Ream agreed to act as the point person between the Panel and the PICES webmaster, and update the MBM-AP web page.

Cooperation with international organizations (Agenda Item 8)

At last year’s MBM-AP meeting, cooperation with the International Whaling Commission (IWC) was discussed. Dr. Kato is the IWC representative to PICES and the PICES observer to IWC. The Panel thanked Dr. Kato for his significant efforts to date, and recommended that he continue to represent PICES at IWC.

Other business

Future of MBM-AP

The Science Board Chairman, Dr. Ian Perry, provided an overview of the history of MBM-AP and pointed out the need for an evaluation of the Panel's progress to date. Dr. Perry reiterated that MBM-AP was established to provide the upper trophic level perspective to the PICES community, and has been successful in this regard. BIO is the parent committee for the Panel.

MBM-AP members and observers had a lively discussion on the need for continuation of the MBM-AP as a specialist group to support BIO and the PICES community in general. Participants felt that MBM-AP has been a productive group, hosting numerous workshops and Topic Sessions over the past 4 years. MBM-AP has been working to collect and investigate new information of top predator diets and abundance, with which to eventually update the report of WG 11 on *Consumption of marine resources by marine birds and mammals in the PICES region* (PICES Scientific Report No. 14, 2000). To meet this objective, MBM-AP has hosted workshops on combining dietary datasets for the past 2 years.

Information on distribution and abundance of North Pacific predators has been advanced with new studies from member nations, as well as the contribution of MBM-AP to the PICES CPR program, whereby observations of seabirds and marine mammals have been added to the North Pacific CPR survey lines. PIs for this project are Drs. Sydeman and David Hyrenbach. They have been collaborating with CPR PIs, Drs. Sonia Batten and David Welch to provide a more comprehensive analysis on North Pacific marine

ecosystems and how they change in relation to climate. The North Pacific Research Board (NPRB) has funded the MBM portion of the Pacific CPR project, and the Panel gratefully acknowledged this support.

In short, there is need for MBM-AP to continue to develop update estimates of prey consumption for top predators of the North Pacific. Other strategic issues for MBM-AP in the future include:

- development of indicators for climate and ecosystem variability;
- development of an oceanographic understanding of the biogeography of top predators in the North Pacific; and
- enhancing the technology for operational oceanography using top predators as sampling devices.

MBM-AP members and observers voiced unanimous interest and support for continuation of the Panel beyond the initial 5-year term as a subcommittee of BIO. It was indicated that the Panel serves to generate general interest in PICES from the marine bird and mammal research communities, and functions to coordinate multi-disciplinary investigations and symposia within the PICES community. The Panel would develop a strategic plan and vision for the future should that be desired by Science Board and BIO.

North Pacific Ecosystem Status Report

It was recommended that MBM-AP members and observers with expertise in particular regions of the North Pacific Ocean review the draft NPESR and provide comments to the Panel. The MBM-AP Co-Chairmen will then provide comments to the lead authors of NPESR.

MBM-AP Endnote 1

Participation List

Members

Hidehiro Kato (Japan, Co-Chairman)
Rolf Ream (U.S.A.)
William Sydeman (U.S.A., Co-Chairman)
Yutaka Watanuki (Japan)

Observers

Christine Abraham (U.S.A.)
Russ Bradley (U.S.A.)
Yoshihiro Fujise (Japan)
Alexander Kitaysky (U.S.A.)
Tomio Miyashita (Japan)
R. Ian Perry (Science Board Chairman)
Andrew Trites (Canada)

MBM-AP Endnote 2

Terms of reference for Advisory Panel on *Marine birds and mammals*

1. Provide information and scientific expertise to BIO, CCCC Program, and when necessary, to other scientific and technical committees with regard to the biology and ecological roles of marine mammals and seabirds.
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 PICES.

MBM-AP Endnote 3

MBM-AP Meeting Agenda

1. Welcome address
2. Adoption of agenda
3. MBM-AP membership
4. Review of MBM-AP workshop at PICES XIII on “Combining data sets on diets of marine birds and mammals II”
5. Review of FIS/BIO Topic Session at PICES XIII on “Hot spots and their use by migratory species and top predators in the North Pacific”
6. Proposals for publications, workshops and sessions for PICES XIV and PICES XV
7. PICES website: MBM-AP contribution
8. Cooperation with international organizations
9. Other business

MBM-AP Endnote 4

Proposal for a 1-day MBM-AP Workshop at PICES XIV on “Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea”

This workshop will emphasize multi-trophic level understanding of the distribution and foraging ecology of top predators in the Sea of Okhotsk, including marine birds and mammals as well as predatory fishes. One goal is to promote communication with Russian marine

bird and mammal experts that do not often come to PICES meetings. The workshop will have a regional focus (Okhotsk Sea), but it is hoped that experts on lower trophic levels can be recruited to put the top predator data in context. A product would be a better understanding of

potential species and parameters to be used as ecosystem indicators for this critical region of the North Pacific.

Recommended invited speakers: Vyacheslav Shuntov (marine birds), Alexander Boltnev (marine mammals), and A. Pinchuk (lower trophic levels).

Recommended conveners: Alexander Kitaysky (U.S.A.) and Hidehiro Kato (Japan).

Travel support is requested for at least one keynote speaker.

MBM-AP Endnote 5

Proposal for a 1-day Topic Session at PICES XIV on “Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations”

This Topic Session will complement the 2004 Topic Session on “Hot spots and their use by migratory species and top predators in the North Pacific”.

It has been suggested that top predators integrate fluctuations in lower trophic level ecosystem constituents and may therefore serve as reliable, rapid-response indicators to ocean climate change. Previous MBM-AP workshops and topic sessions have revealed synchronous variations in distribution and abundance, life history and demography, and food habits for a variety of predators in the North Pacific. But, how ubiquitous are these patterns, spatially and temporally? What time lags are involved in signals to responses? What species and parameters would be best suited to serve as ecosystem “monitors”? These questions are critical to future efforts to monitor the North Pacific (GOOS, *etc.*), as well as important for many aspects of fishery oceanography. It is

envisioned that this session could take advantage of long-term (10+ year) marine bird, mammal, and predatory fish (particularly salmonids) monitoring datasets from around the North Pacific using information from all possible sources (*e.g.*, ships, rookeries/colonies, and telemetric). The session would provide novel insight into synchrony in responses of top predators to climate variability in the North Pacific as well as serve to highlight which species and parameters could serve as “rapid-response” ecosystem indicators. Publication of the papers in a peer-reviewed journal will be investigated.

Recommended conveners: William J. Sydeman (U.S.A.), Andrew Trites (Canada) and Hidehiro Kato (Japan).

Travel support is requested for two invited speakers (Dr. Ian Boyd (U.K.; British Antarctic Survey) and TBD).

REPORT OF ADVISORY PANEL ON MICRONEKTON SAMPLING INTERCALIBRATION EXPERIMENT

3

8

The meeting/workshop of the Advisory Panel on *Micronekton sampling inter-calibration experiment* (MIE-AP) was held from 09:00-15:30 hours on October 14, 2004, and brought together the Advisory Panel members and the participants on the first MIE cruise conducted off Hawaii (*MIE-AP Endnote 1*). After the opening of the meeting by Dr. Michael P. Seki, MIE-AP Co-Chairman, and short introductions by attendees, a background overview of MIE-AP and review of the project to date ensued. The discussion then focused on the activities, preliminary results, lessons learned from the cruise and next steps (*MIE-AP Endnote 2*).

Meeting/workshop summary

The MIE-AP was established at PICES XI (2002) to evaluate the efficacy of sampling gears and the procedures employed by different investigators to sample micronekton in the North Pacific and other parts of the world's oceans (*MIE-AP Endnote 3*). An initial field effort involved an 8-day (October 6-13, 2004) research cruise in Hawaiian waters just prior to PICES XIII, herein referred to as MIE-I. This cruise served two purposes: (1) to compare the performances of different types of sampling gears in an oligotrophic subtropical gyre area to see how the choice of gear affects our perspective of the micronekton community; and (2) to use the relatively benign weather and sea conditions to evaluate and refine the protocols, logistics and design of the sampling. The workshop reviewed preliminary data and findings from the cruise, and the MIE-AP meeting that followed discussed the goals, objectives and status of the future field program.

MIE-I was conducted aboard the NOAA ship *Oscar Elton Sette* in Central North Pacific waters off the west side of Oahu Island. Participants on the cruise included: Michael P. Seki (Chief Scientist), Richard D. Brodeur,

Daniel Curran, Reka Domokos and Donald Hawn (U.S.A.); Douglas Yelland, Evgeny Pakhomov and Larissa Pakhomova (Canada); Masayuki Abe and Hiroki Yasuma (Japan); and Andrei Suntsov (Russia).

Three gear-types were employed in the comparison: a dual trawl warp 140 m² Stauffer modified Cobb trawl, the single warp 1.8 m Isaacs-Kidd mid-water trawl, and the single warp 2 m variety of Hokkaido University's Rectangular Frame trawl. During all tows, acoustic backscatter was monitored and data recorded with a Simrad EK-60 echosounder equipped with 38 kHz and 120 kHz transducers. For daytime tows, trawls were dropped to the target depth (550 m) and towed horizontally for 1 hour (contamination by animals in the catch on the ascent and descent to depth was assumed to be minimal). For nighttime tows, trawls were dropped to the desired depth as defined by acoustic scattering (*ca.* 120 m), and retrieved obliquely through the water column for a 1-hour duration, and the tow ending with the net at the surface. Since only a fraction of the sound scattering layer (SSL) was observed to migrate to shallow waters at night, a series of tows were also conducted at depth (*ca.* 550 m) during the night, to acquire information of the non-migrants and composition of the SSL with respect to acoustic measurements. The real-time net depths during the tows were monitored with a Northstar NETMIND net mensuration system.

A variety of topics were addressed during discussion, and some of the highlights and recommendations follow.

Lessons learned from MIE-I

- The Panel deemed that it was important to note that MIE-I was accomplished without financial support; all support for the successful execution of the cruise was furnished by the participating agencies.

- The cruise was fortunate to have had specialists for each faunal group among the participating scientific field party. When planning future cruises, having this expertise is strongly recommended and needs to be considered at the planning stages.
- The leads for various aspects of the cruise data (e.g., biological specimen detailed processing – species identification and measurements for faunal groups) were identified. These include fishes (Suntsov), crustaceans (Pakhomov), cephalopods (Seki), and acoustics (Yelland).
- Preliminary analysis from MIE-I indicated that individual gears sampled different, often non-overlapping, size groups of plankton and micronekton. It points out that successful inter-comparison during future cruises requires a closer scrutiny of gear-types and net mesh sizes prior the experiment.
- The Panel agreed that “what one defines as micronekton may not be the same definition as someone else”. MIE-I planning encouraged participants to bring their micronekton sampling gear which resulted in a range of mesh sizes and abilities to sample. On the positive side, the ability of the cumulative gears to sample the full range from mesozooplankton to micronekton enhanced the ability to interpret the data acquired from the multiple acoustic frequencies.
- The Panel suggested the adoption of a “standard” sampling gear (e.g., RMT 1+8 or a 3-m IKMT) and mesh sizes to allow and guide comparisons for future efforts. For higher acoustic frequencies, a towed transducer to access the deeper depths was recommended.

Plans for MIE-II

- Based on the success and preliminary findings of the first cruise, MIE-AP recommended conducting a second experiment within the subarctic North Pacific using a larger variety of micronektonic sampling gears. This cruise is tentatively planned for the summer of 2005 or 2006, depending on ship time availability, in the Bering Sea (or possibly

the Gulf of Alaska or the western North Pacific). This leg will sample a much more productive regime and a faunal community of great interest to many in the PICES member countries. Upon completion, an unprecedented attempt should be made to compare the performance of gears within and between the contrasting environments. This will highlight the MIE-AP effort.

- Dr. Orio Yamamura has requested shiptime aboard the Japan Fisheries Agency research ship *Kaiyo Maru* for conducting MIE-II during the summer of 2005. A decision is expected by the end of the current calendar year on whether the ship time will be awarded.
- The Panel suggested exploring the possibility of joining one of the BASIS cruises to the Bering Sea to accommodate the MIE-II sampling.
- The Panel also recommended pursuing shiptime aboard the NOAA ships *Oscar Dyson* or *Miller Freeman* or Hokkaido University research vessel *Oshoro Maru*. Since most of the sailing schedules for these ships are already set for 2005, any cruise aboard these ships would target the summer of 2006.
- The Advisory Panel discussed using large opening/closing type nets such as the RMT1+8 and the 4 m² MOCNESS, or some other similar gear so that vertically stratified tows can be made during MIE-II.

Publications

- A brief report on MIE-AP activities will be published in the next issue of PICES Press (January 2005).
- A data report containing the detailed processed results from MIE-I will be prepared and a draft completed in time for review at PICES XIV (Vladivostok, Russia). Dr. Seki will take the lead in compiling the information from all contributors. The targeted outlet will be the PICES Scientific Report Series.
- Several formal publications will evolve from MIE-I, but until the detailed processing is completed, a timetable for primary products is very difficult to assemble and will be deferred until better assessment of processing

requirements can be accomplished. This will be revisited at PICES XIV.

Proposals

- Another attempt will be made at obtaining financial support for MIE activities from the North Pacific Research Board through the 2004-05 request for proposals process. Dr. Pakhomov will take the lead in preparing the proposal package seeking support for MIE-II either in the summer of 2005 or 2006, depending on platform availability.

MIE-AP Endnote 1

Participation List

Members

Richard D. Brodeur (U.S.A.)
Kazushi Miyashita (Japan)
Evgeny A. Pakhomov (Canada, Co-Chairman)
Vadim Savinykh (Russia)
Michael P. Seki (U.S.A., Co-Chairman))

Observers

Masayuki Abe (Japan)
Reka Domokos (U.S.A.)
R. Ian Perry (Science Board Chairman)
Andrei Suntsov (Russia)
Hiroki Yasuma (Japan)
Douglas Yelland (Canada)

MIE-AP Endnote 2

Workshop Agenda

1. Welcome and introductions
2. Background and Terms of Reference for the Advisory Panel on *Micronekton sampling gear inter-calibration experiment*
3. Review of cruise activities, sampling, and status of the data and analysis
4. Discussion on the second MIE-AP cruise logistics, including possible platform(s), dates, participants, region of experiment, sampling gears, sampling protocols, sample analysis and disposition
5. Status of financial support status including discussion of scenarios in the absence of funding
6. Summary wrap-up and report write-up

MIE-AP Endnote 3

Terms of Reference for Advisory Panel on *Micronekton sampling inter-calibration experiment*

1. Develop a proposal for a micronekton sampling inter-calibration experiment, arising from the work of PICES WG 14 on *Effective sampling of micronekton*. Advise on appropriate locations as well as identify micronekton sampling gears and other quantifying technologies for inclusion in the inter-calibration experiment.
2. Facilitate the experiment by identifying and securing commitments for resources (personnel and ships) to ensure success of the experiment; provide technical advice in development of sampling protocols and experimental design.
3. Oversee post-survey analysis of samples and data; provide guidance in preparation of results for final report and publication(s).

DOCUMENTING SCIENTIFIC SESSIONS AT PICES XIII

œ

œ

At PICES X (October 2001, Victoria, Canada), Science Board concluded that PICES had not well-documented the science contained in its Annual Meetings, with the exception of papers that were compiled later into PICES Scientific Reports or other publications. To enhance the documentation of PICES scientific sessions and workshops, Science Board recommended that convenors be asked to provide a summary of

their session/workshop, and these summaries be included in the PICES Annual Report.

The following are summaries of sessions and workshops convened at PICES XIII (October 2004, Honolulu, U.S.A.). In the “List of papers”, talks are in the order of presentation and posters are sorted by the presenter’s last name.

Science Board Symposium S1)

Beyond the continental slope - complexity and variability in the open North Pacific Ocean

Co-Convenors: R. Ian Perry (SB), Vladimir I. Radchenko (BIO), Yukimasa Ishida (FIS), John E. Stein (MEQ), Kuh Kim (POC), Igor I. Shevchenko (TCODE), Suam Kim and Harold P. Batchelder (CCCC)

Background

Most of the area of the North Pacific Ocean is in the pelagic realm, beyond the major currents and marginal seas that border the continents. This oceanic region has often been perceived as physically homogeneous and stable with low biological productivity. In reality, it is a spatially and temporally dynamic environment of high complexity. The diversity and structure of open ocean ecosystems are influenced by both the horizontal and vertical structures of the ocean’s physical and biological properties and by their seasonal cycles. Sharp contrasts in oceanic bottom topography caused by seamounts and islands add additional structure and complexity. In spite of its relatively low primary productivity, the region supports complex ecosystems with high biodiversity, and is home to many endangered species. Marine resources are important to the peoples of the North Pacific and are fished by fleets from many Pacific Rim nations. This session sought to improve understanding of the physical, chemical and biological structure and dynamics of North Pacific oceanic waters far beyond the continental shelf, with particular emphasis on the subtropical gyre. The symposium considered how these complex subtropical oceanic ecosystems are structured and

maintained, in light of their generally low productivity. It provided opportunities to compare and contrast these areas with neighbouring regions of higher productivity, to investigate how important small and meso-scale features, such as fronts and eddies, are to the growth, survival and distribution of upper trophic level species, and how sub-tropical waters have been affected by recent global changes.

Summary of presentations

The session consisted of 13 oral presentations plus several posters. Papers dealt with causes and potential predictability of variations in the Pacific Decadal Oscillation, with large-scale environmental monitoring of physical conditions and circulation in the North Pacific, with regime-like changes in lower and upper trophic levels of the sub-tropical North Pacific, and with classification of marine pelagic environments in the open North Pacific Ocean. Variability, on both large and small temporal and spatial scales, was a dominant theme of these sub-tropical open ocean ecosystems, which is in marked contrast to the traditional view. Significant changes in physical conditions (warm and fresh to cold and salty) have been observed north of the Hawaiian Islands since 1996. These physical changes

have led to increases in phytoplankton and zooplankton, so that it is now clear that plankton biomass and biogeochemical fluxes in this region are not in steady-state, but have both high and low frequency variability. Different groups of organisms contribute to different frequencies of variability: for example, “daytime-resident” zooplankton (in contrast to night time vertical migrants) drive the decadal trend of increasing zooplankton biomass. The result is that the carrying capacity of these waters had increased from 1997 to 2002, due to increased entrainment of deep nutrients caused by deeper vertical mixing. Much of this increased productivity occurred in the very small size fractions of phytoplankton and zooplankton that have not

been sampled on traditional surveys. At larger spatial scales, the Kuroshio Extension region, and meso-scale eddies in general, are important locations for small pelagic fish recruitment processes, feeding of sea turtles, and sites of enhanced predator-prey interactions. However, these oceanic hotspots are highly dynamic, but the underlying processes that drive these events are poorly understood. It was also noted that mesopelagic micronekton, including fishes and invertebrates such as squids, are extremely important in open ocean environments of the North Pacific, which is in contrast to continental shelf ecosystems, but are also poorly understood.

List of papers

Oral presentations

Niklas Schneider (Invited)

The forcing of the Pacific Decadal Oscillation

Franklin B. Schwing, Roy Mendelssohn and Steven J. Bograd

When did the 1976 regime shift occur?

Howard J. Freeland

Argo as an aid to environmental monitoring and assessment - An example from the Gulf of Alaska

Jinping Zhao, Shujiang Li, Weizheng Qu and Jie Su

Long-term climate change in the Yellow Sea and East China Sea

Robert Bidigare, Y. Chao, R. Lukas, R.M. Letelier, S. Christensen and D.M. Karl

Temporal variations in phytoplankton community structure and physical forcing at Station ALOHA (22.75°N, 158°W)

Michael R. Landry and Cecelia C. Sheridan (Invited)

Zooplankton community complexity and temporal variability in the subtropical North Pacific

Michael P. Seki (Invited)

Processes and patterns at oceanic “hot spots” in the subtropical North Pacific

Akihiko Yatsu, Masatoshi Moku, Hiroshi Nishida, Kaori Takagi, Norio Yamashita and Hiroshi Itoh

Possible ecological interactions between small pelagic and mesopelagic fishes in the Kuroshio-Oyashio Transition Zone and Kuroshio Extension in spring

Denzo Inagake, Kazuyuki Uehara, Harumi Yamada, Koji Uosaki and Miki Ogura (Invited)

Relation between tuna resources and atmosphere-ocean variability in the North Pacific

Oleg N. Katugin and Gennadiy A. Shevtsov

Patterns of distribution and biology of the North Pacific oceanic squid *Beryteuthis anonychus* with implications for the species life cycle

Julie A. Hall

Links between biogeochemistry and ecosystems in marine environments

Edward J. Gregg, Karin M. Bodtker and Andrew W. Trites

Exploring the structure of the oceanic environment: A classification approach

Vadim F. Savinykh

Dynamics of plankton and nekton communities in the Western Subtropical Gyre

Posters

John R. Bower and Taro Ichii

The red flying squid (*Ommastrephes bartramii*): A review of recent research and the fishery in Japan

Alexander I. Glubokov and Serguei B. Popov

Results of Russian echointegration and trawl surveys in the Donut Hole during autumn 2003

Oleg N. Katugin and Evgenyi V. Slobodskoy

Population structure of the North Pacific oceanic squid *Ommastrephes bartramii* as inferred from variability in biological traits and genetic markers

Andrei V. Suntsov

Ichthyoplankton of the equatorial frontal zone east of Galapagos Islands

Andrei V. Suntsov

Species composition and abundance of mesopelagic fish assemblage on the periphery of the North Atlantic subtropical gyre

BIO Topic Session (S2)

Mechanisms that regulate North Pacific ecosystems: Bottom-up, top-down, or something else?

Co-Convenors: Douglas P. DeMaster (U.S.A.), George L. Hunt, Jr. (U.S.A.), Michio J. Kishi (Japan), Jeffrey M. Napp (U.S.A.) and Andrew Trites (Canada)

Background

Within the PICES region, dramatic changes have been observed in the past 50 years in the structure and function of marine ecosystems. In an effort to understand what caused these, often dramatic, changes, various hypotheses have been proposed as controlling mechanisms for entire ecosystems or for particular components of the ecosystems (*e.g.*, fish stocks and apex predators). Each of the hypotheses (*e.g.*, Trophic Cascade, Oscillating Control, Nutritional Stress and Regime Shift) has at its core a fundamental assumption that control is the result of bottom-up, top-down, or a wasp-waist trophic pyramid restriction. Is it really that simple? Are these hypotheses testable? Will they lead us to a predictive capability? The goal of this session was to review, based on observations and model results, the basic assumption (source of control), and to evaluate the strength and weaknesses of the individual hypotheses. The session examined these hypotheses, as applied to ecosystems and important marine populations from the western and eastern North Pacific Ocean, and explored how the different control mechanisms might affect the ability of managers to maintain sustainable fisheries in the region. The possibility of publishing the results in a special issue of a leading international journal will be explored

Summary of presentations

This session was extremely successful. The session had excellent attendance on both days, and there was only 1 cancelled talk (due to family illness). The session was conducted over 1½ days with 17 papers on the first day and 9 on the second day. The program included a good mix of overview/summary papers and specific examples of ecosystem control in the PICES region. A contribution from the U.S. National Marine Fisheries Service made it possible to increase the number of invited speakers from 2 to 5. In addition, one internationally renowned speaker who was in town for another meeting, was offered per diem support so that he could stay a few extra days and speak at the session. The invited speakers, many of whom have not traditionally attended PICES meetings, gave the symposium a very broad global ecosystem perspective.

A common theme in the session presentations was that it is rare to find systems that are regulated by only one mechanism. The term, “situational” control was presented by one speaker to refer to the potential for multiple modes of control. In addition, the general opinion of the presenters who addressed the subject was that prediction of the control and trajectory of ecosystems is very difficult and that we are a long way from predictive capability.

Several major conceptual ideas were presented during the session. Andrew Bakun presented new definitions for wasp-waist systems and the “predator pit” as a way to understand fluctuations of small pelagic fishes in upwelling systems. Philippe Cury urged investigators to regard both “pattern control” and “process control” in their investigations. Kenneth Drinkwater provided a well-documented example of a warming event in the 20th century and how it affected the cod-dominated ecosystem of the northern Atlantic Ocean. The “climate challenge” was presented by Kerim Aydin to demonstrate how auto-correlation can provide population fluctuations similar to those often attributed to climate and bottom-up forcing in marine ecosystems. At the end of the first day, Richard Beamish introduced a new term, “longevity overfishing”, to bring renewed attention to an old problem – lack of consideration of age structure in the fishing of long-lived species. A short, but lively discussion concluded the first day.

The second day began with a series of papers regarding fluctuations in populations of small pelagic fishes. Included in this was a presentation of the Cyclic Advantage Model by Hiroyuki Matsuda, which predicts the dominant fish species within the Kuroshio/Oyashio system. The session also examined control of other components of the marine ecosystem including squid, sea lions and seabirds. Yasunori Sakurai discussed control of squid populations, and showed a short film clip of the first squid egg mass photographed in the wild. The Ocean Climate Hypothesis was presented by Andrew Trites as a conceptual framework to explain both the decline and the potential stabilization of Steller Sea Lion populations. Evidence for physiological stress by breeding female Steller Sea Lions was presented by Alexander Kitaysky. The baleen whale – killer whale trophic cascade hypothesis was refuted by DeMaster *et al.*, and, to conclude the session, George Hunt discussed control mechanisms for seabirds and mammals, and how they might differ at scales from whole ocean basins to that of the foraging area of a single colony.

List of papers

Oral presentations

Mary E. Power (Invited)

Food webs, fluxes, and flow paths: A fluvial perspective

John C. Field, Robert C. Francis and Kerim Y. Aydin

Top-down modeling and bottom-up dynamics: Linking fisheries-based multispecies models with climate hypotheses in the Northern California Current

Jeffrey M. Napp, George L. Hunt Jr., Sue E. Moore and Christine T. Baier

Who is regulating zooplankton production (or How to resolve issues of control)?

Xuelei Zhang, R.X. Li, M.Y. Zhu, Z.L. Wang, L.H. Zhang, Y. Li and Y.J. Hao

Changes of net phytoplankton in Sanggou Bay, Northern China: Evidence for consumer regulation of primary producer

Philippe Cury (Invited)

Who is controlling whom in marine ecosystems: Observed changes, possible mechanisms and trends in top-down, bottom-up and wasp-waist controls

Andrew Bakun

Mechanisms of “wasp-waist” control in marine ecosystems

William Sydeman, John Calambokidis, Derek Lee, Steve Ralston, Dave Johnston, Chet Grosch and Francisco Chavez

Phase relationships and controls of the upwelling-dominated central California Current ecosystem

Vladlena V. Gertseva, Thomas C. Wainwright and Vladimir V. Gertsev

Juvenile salmon survival in coastal waters of the Northeast Pacific Ocean: Top-down or bottom-up control?

Jennifer L. Nielsen and Gregory T. Ruggerone

Top-down and bottom-up linkages among climate, growth, competition, and production of sockeye salmon populations in Bristol Bay, Alaska, 1955-2000

Bernard A. Megrey and Francisco E. Werner (Invited)

Evaluating the role of top-down versus bottom-up ecosystem regulation from a modeling perspective

Anne B. Hollowed and Vera N. Agostini

A review of the role of environmental disturbance and resource partitioning as a source of population regulation in marine ecosystems

Jie Zheng and Gordon H. Kruse

Recruitment variation of eastern Bering Sea crabs: Density-dependent, "climate-control", or "top-down" effects?

Kerim Y. Aydin, Sarah K. Gaichas and Patricia A. Livingston

Wasp-waist control and beer-belly oscillations: An evaluation of population hypotheses in the Bering Sea and Gulf of Alaska

Franz J. Mueter, Michael C. Palmer and Brenda L. Norcross

Bottom-up and top-down controls of walleye pollock on the Eastern Bering Sea shelf

Yongjun Tian, Hideaki Kidokoro and Tatsuro Watanabe

Long-term changes in fisheries production of the Japan Sea with emphasis on the impacts of fishing and climate regime shifts during the last three decades

Kenneth F. Drinkwater

Marine ecosystem responses to the warming of 1920s and 1930s in the northern North Atlantic

Richard J. Beamish and Gordon A. McFarlane

The natural regulation of long lived fishes and the impact of "longevity over fishing"

Hiroyuki Matsuda (Invited)

How to test, use and manage sardine-anchovy-chub mackerel cycles

Akinori Takasuka, Yoshioki Oozeki, Ichiro Aoki, Ryo Kimura, Hiroshi Kubota and Takashi Yamakawa

Differential optimal temperatures for growth of larval anchovy and sardine: A potential mechanism for regime shifts?

Rubén Rodríguez-Sánchez, Daniel Lluch-Belda and Sofía Ortega-García

Possible mechanisms underlying latitudinal abundance changes of Pacific sardine in the California Current system during the last warming regime (1980-1997)

Vera N. Agostini, Andrew Bakun and Robert C. Francis

Larval stage controls on sardine recruitment variability: Predation or food availability?

Yasunori Sakurai, Sachi Miyanaga and Jun Yamamoto (Invited)

Why do ommastrephid squids increase in abundance during warm regimes?

Andrew W. Trites, Arthur J. Miller and Herbert D. G. Maschner

Bottom-up forcing and the decline of Steller sea lions in Alaska: Assessing the ocean climate hypothesis

Alexander Kitaysky and Alan Springer

When, where and why Steller sea lions experience physiological stress - Evidence from stress hormones and diet quality

Douglas P. DeMaster, Paul Wade and Phillip Clapham

The cascading whale predation hypothesis: Testing with existing data

George L. Hunt Jr.

Are the control mechanisms of marine birds and mammals scale-dependent?

Posters

Igor V. Melnikov

Pelagic predatory fishes as consumers of Pacific salmon: Distribution in the Russian exclusive economic zone and adjacent waters, their abundance and some biological features

Hyunju Seo, Kibeik Seong, Suam Kim and Sukyung Kang

Interannual variability in chum salmon (*Oncorhynchus keta*) growth in relation to environmental change during the 1980s-1990s

BIO Topic Session (S3)

Role of gelatinous zooplankton in coastal and oceanic ecosystems

Co-Convenors: Richard D. Brodeur (U.S.A.) and Jun Nishikawa (Japan)

Background

Recent increases in gelatinous zooplankton in a number of ecosystems in the North Pacific and elsewhere have demonstrated the potential

importance of these organisms in energy transfer in coastal and oceanic environments. Gelatinous zooplankton exhibit rapid individual and population growth rates, and have been shown to be major consumers of phytoplankton,

zooplankton and early life stages of marine fishes, competitors with adult fishes, and conduits of energy transfer to the deep ocean. Despite their importance to the ecosystem, there are substantial gaps in our knowledge of the basic life history, ecology and environmental responses even for many of the dominant species. This session brought together information on diverse gelatinous taxa and examined their role in marine ecosystems and their responses to variable environmental conditions.

Summary of presentations

Nine oral presentations were made during this half-day session. The keynote talk by William Hamner provided an overview of the dominant strategies employed by marine organisms to avoid predation, and found many parallels with terrestrial biota. Adopting a cryptic lifestyle of gelatinous form is unique to the marine environment and has been adopted by numerous evolutionary diverse taxa, suggesting a strong selective pressure for this lifestyle. Our knowledge of gelatinous taxa has evolved in synchrony with advances sampling these fragile forms, particularly *in situ* observations. Jennifer Purcell summarized our current understanding of the effects of climate on jellyfish populations. She showed several long-term changes in gelatinous zooplankton that were related to environmental conditions, with temperature being most important, but anthropogenic effects also may be important in some situations. Mary Arai reviewed the dominant predators on jellyfish, and found that other jellyfish and fish were probably the most important predators.

List of papers

Oral presentations

William M. Hamner (Invited)

Gelatinous animals at sea: Convergent evolution and sampling problems

Jennifer E. Purcell

Climate effects on jellyfish populations: A review

Mary Needler Arai

Predation on pelagic coelenterates

Cynthia L. Suchman, Elizabeth Daly, Julie E. Keister, William T. Peterson and Richard D. Brodeur

Predation by the scyphomedusa *Chrysaora fuscescens* in the northern California

She provided evidence that jellyfish are likely underestimated in diets due to their rapid digestion times, but this may be ameliorated by consumption of vast quantities. An attempt to estimate the feeding impact of a dominant medusa in the California Current was made by Cynthia Suchman, based on medusa abundance, food habits, feeding rates, and prey standing stocks. She found substantial consumption of euphausiid eggs and less for copepods and other zooplankton prey. Evgeny Pakhomov pointed out the distribution of antarctic salp (*Salpa thompsoni*) may be shifting southward over the past half a century with some evidences of damaged populations in the high latitudes, and these shift may indicate a large-scale environmental shift in Antarctic ecosystems. Russell Hopcroft studied egg production rates, growth, and production of larvacean community in the Northern Bering Sea, and suggested their ability to both outgrow and out-reproduce copepod populations. Kiyotaka Hidaka investigated biomass and distribution of larvacean communities around the Kuroshio waters in winter-spring, and suggested their importance in terms of production in that area. Michael Dagg presented research on larvacean production and stomach contents of juvenile salmon in the coastal regions of the Gulf of Alaska, and found that larvaceans play an important trophic role to link between small phytoplankton and juvenile pink salmon. Marsh Youngbluth gave a presentation on his research on predatory habits of the siphonophore (*Nanomia cara*) in the Gulf of Maine, and suggested the difference on vertical distributions and food habits between the coastal and deep ocean.

Evgeny A. Pakhomov

Long-term changes in salp distribution in a polar ecosystem: Some like it hot

Russell R. Hopcroft and Cheryl Clarke

Community composition and production of larvaceans in the Northern Bering Sea

Kiyotaka Hidaka and Kaoru Nakata

Appendicularians around Kuroshio in winter-spring

Michael Dagg, H. Liu, R. Sato, J. Armstrong and L. Haldorson

Trophic roles of larvaceans in the coastal regions of the Gulf of Alaska

Marsh Youngbluth, Charles Jacoby, Francesc Pages, Franz Uiblein and Per Flood

A comparison of predatory habits of the physonect siphonophore *Nanomia cara* in coastal basins (Wilkinson and Georges, Gulf of Maine) and deep-water canyons (Oceanographer and Hydrographer)

Posters

Pei-Kai Hsu, Wen-Tseng Lo and Ming-An Lee

Seasonal distribution of siphonophores in relation to the water masses in the East China Sea, north of Taiwan

Atsushi Kaneda and Hidetaka Takeoka

Relationship between short-term increases of gelatinous zooplankton and physical environments in the near shore area of Iyo-Nada,

Young-Shil Kang, Hye-Eun Lee, Soo-Jung Chang and Min-Ho Son

Predation pressure of some fishes on *Aurelia aurita* (Scyphozoa: Semaestomeae)

Young-Shil Kang, Min-Ho Son, Soo-Jung Chang and Hye-Eun Lee

New finding on young *Nemopilema nomurai* (Scyphozoa: Rhizostomeae) in the western coastal area of Korea

Takeshi Kohama, Shinya Nagano, Noboru Okuda, Hitoshi Miyasaka and Hidetaka Takeoka

Estimation of ecological role and trophic level of jellyfish *Aurelia aurita* using stable isotope ratios in the Uwa Sea, Japan

Shinya Magome, Tomohiro Yamashita, Takeshi Kohama and Hidetaka Takeoka

A study on jellyfish patch formation using aerial photography

Shwu-Feng Yu, Wen-Tseng Lo, Wei-Cheng Su and Don-Chung Liu

Winter distribution of siphonophores (Cnidaria) in the waters surrounding Taiwan

Evgeniy N. Ilynskiy and Alexander V. Zavolokin

Abundance and distribution of jellyfishes in epipelagical of the Okhotsk Sea

FIS/BIO Topic Session (S4)

Hot spots and their use by migratory species and top predators in the North Pacific

Co-Convenors: Churchill B. Grimes (U.S.A.), Yukimasa Ishida (Japan), Hidehiro Kato (Japan) and William J. Sydeman (U.S.A.)

Background

This symposium sought to examine and explain patterns of physical and biological spatial variation in open ocean habitats in the PICES region. The topic session was designed to be multi-disciplinary, with presentations ranging from physical oceanography to marine mammals. Specifically, we investigated the hypothesis that “hot spots” of biological activity, can be found in the North Pacific and that top predators aggregated at these specific sites for feeding, migration and reproduction. Furthermore, we hypothesized that tight physical-biological coupling contributes to the

formation of hotspots, and as such, many hotspots like currents, fronts and eddies are dynamic in space and time. Therefore, the spatio-temporal persistence of hotspots, and the oceanographic mechanisms supporting high levels of biological activity, was a pervasive question addressed at the topic session.

Summary of presentations

A total of 21 oral and 5 poster presentations were made. Six presentations were focused on physical oceanography and lower or mid trophic level organisms, with the remainder on upper trophic level organisms. Methods ranged from

shipboard surveys to satellite telemetry and trace element otolith analysis. Most presentations made use of remote sensing to characterize large-scale physical and biological hotspots. There were also at least 3 other presentations made in other topic sessions that specifically addressed hot spots in the marine environment. We found that many hotspots were persistent in time and space, but the mechanisms supporting their formation and persistence were not well understood. Moreover, while many top predators appeared to be found in regions of elevated chlorophyll *a* (as indexed by SeaWiFS or MODIS), the prey fields supporting predator aggregations were generally unknown. Finally, the significance of hot spots to growth and

reproduction and the population dynamics of marine species are not well understood. Therefore, our discussion focused on how to obtain the information needed to complete the picture of hot spot ocean habitat – predator coupling. The discussion of the implications of hotspot identification focused on the analyses of optimal foraging theory, fisheries management and the design of marine protected areas. In summary: the topic session was successful, with many high quality presentations. Nonetheless, many questions concerning the functional significance of open ocean habitat hotspots and the application of this information to fisheries and ocean management remain to be answered.

List of papers

Oral presentations

Franklin B. Schwing, Steven J. Bograd, Cara Wilson, Petra M. Stegmann, Barbara Block and Daniel Costa (Invited)

An oceanographic basis for identifying biological hot spots

Cara Wilson

Chlorophyll hot spots in the oligotrophic North Pacific Subtropical Gyre

Sukyung Kang, Suam Kim, Kevin Telmer, David Welch and Youn-Ho Lee (Invited)

Configuration of migratory history based on analyses of stable isotopes and trace elements in otolith of the North Pacific chum salmon

Robert Suryan, David Hyrenbach, Fumio Sato, Kiyooki Ozaki, Gregory Balogh, Paul Sievert, Daniel Roby and David Anderson

Foraging destinations of short-tailed albatrosses (*Phoebastria albatrus*) in the Northwest Pacific Ocean, Gulf of Alaska, and Bering Sea

Peter Etnoyer, D. Canny, B. Mate and L. Morgan (Invited)

Persistent pelagic habitat in the Northeast Pacific

Daniel Costa, Barbara Block, Steven J. Bograd, Randy Kochevar and TOPP Science Team (Invited)

Tagging of Pacific Pelagics (TOPP): Using electronic tags to discover hot spots in the pelagic realm

Rogelio Gonzalez-Armas, A. Muhlia-Melo, A. Trasiña-Castro, G. Gutierrez De Velasco, A. Valle-Levinson and R. Funes-Rodriguez

Differences in large pelagic fish larvae and zooplankton volumes over and around a seamount in the Gulf of California

Anatoliy Ya. Velikanov

Seasonal frequency of pelagic fish species in some micro-regions of the southwestern Okhotsk Sea

Shingo Kimura and Katsumi Tsukamoto

Landmark for the spawning of Japanese eel

Youn-Ho Lee, Geoyoung Kang, Woongsic Jung, Ki-Baek Seong, Suam Kim and Gisic Min (Invited)

How to discriminate the aggregated stocks of migratory species according to their origins: A simple and quick PCR method utilizing stock-specific single nucleotide polymorphisms

Brian K. Wells, Churchill B. Grimes and Jim Waldvogel

The effects of ENSO events on California chinook salmon (*Oncorhynchus tshawytscha*) as revealed by scale increment analysis

Hiroshi Ohizumi and Hikaru Watanabe (Invited)

Stomach contents of toothed whales in relation to prey distribution in the North Pacific

Scott M. Gende and Mike Sigler

Persistence of prey “hot spots” in southeast Alaska

Ivonne Ortiz and Kerim Y. Aydin

Hot spots for dining - A groundfish’s view

K. David Hyrenbach, William J. Sydeman, Ken H. Morgan and Peggy P.W. Yen

Upper-trophic predator hot spots in the California Current system: A retrospective analysis of marine bird and mammal communities

Robert S. Schick and Molly Lutcavage

Using GIS to locate pelagic hot spots for bluefin tuna

Takashi Kitagawa, Andre Boustany, Chris Perle, Charles Farwell, Tom Williams, Heidi Dewar and Barbara Block

Horizontal and vertical movements of juvenile bluefin tuna (*Thunnus orientalis*) in relation to seasons and oceanography in the eastern Pacific

Douglas C. Reese and Richard D. Brodeur

Identifying biological hot spots within the northern California Current

Mukti Zainuddin, Katsuya Saitoh and Sei-ichi Saitoh

Detection of high productive area of albacore fishing ground and migration route using multi-sensor satellite remote sensing

Yoshihiro Fujise, Koji Matsuoka, Hiroto Murase, Shigetoshi Nishiwaki and Hidehiro Kato

Existence of hot spots of large sized baleen whale concentration in pelagic zone of the western North Pacific; its biological and oceanographical features

Vincent F. Gallucci and Gordon H. Kruse (Invited)

Recent advances in knowledge of cold water sharks in the North Pacific Ocean

Posters

Sachihiko K. Itoh and Shingo Kimura

Transport and migration of larval and juvenile fishes through oceanic fronts

Patrick D. O'Hara, Peggy P. Yen, Chris Rintoul, Ken H. Morgan, K. David Hyrenbach and William J. Sydeman

Pelagic habitat hot spots as revealed by replicate seabird surveys in the NE Pacific

John E. Richert, Salvador J. Jorgensen, Arturo Muhlia Melo and A. Peter Klimley

Seamounts as hot spots of pelagic fish diversity in the Eastern Pacific Ocean

Victor R. Foux and Eugene V. Samko

Transport of fodder plankton in low-frequency waves and eddies: Favorable conditions for fishing grounds formation

Robert Suryan, David Anderson, Daniel Roby, David Hyrenbach, Scott Shaffer, Yann Tremblay, Jill Awkerman, Mark Westbrock, Karen Fischer, Fumio Sato and Kiyooki Ozaki

Wing loading and prevailing winds: Their relative importance to the at-sea distribution of four species of Pacific albatrosses

Galina A. Vlasova

Zone of "hot spots" of the surface temperature for the NW Pacific

Douglas Yelland

Backscatter variability within a Haida Eddy

MEQ Topic Session (S5)

Natural and anthropogenic introductions of marine species

Co-sponsored by the International Council for the Exploration of the Sea (ICES)

Co-Convenors: William P. Cochlan (U.S.A./PICES), Yasuwo Fukuyo (Japan/PICES) and Stephan Gollasch (Germany/ICES)

Background

Species introductions are among the most prevalent of human activities affecting natural ecosystems. In the marine environment, introductions, including most aquaculture initiatives, have resulted in both positive and negative effects. The transport of invasive species, such as phytoplankton, is thought to

stem from range extensions associated with fluctuating oceanographic conditions (*e.g.*, El Niño), severe storm events (*e.g.*, typhoons), and human activities (*e.g.*, ballast water). The impact of transport processes on species distributional changes in North Pacific waters is not fully understood. Relative to the terrestrial environment, the study of introductions, and the potential for new species to become invasive, is

in its infancy in marine systems. Emerging work includes introduction vectors, life history characteristics of invasive species, ocean conditions responsible for invasions, ecosystem resistance to invasion, and potential for eradication or mitigation of introductions once established. This session sought to answer three fundamental questions: 1) What is known about different transport mechanisms? 2) What is the magnitude of ecological and economic effects arising from the transport of species? and 3) What steps can be taken to minimize real or potential effects of existent and future invasive species? The current session is particularly timely given that the IMO Ballast Water Management Convention was signed in February 2004, and is now awaiting ratification.

Summary of presentations

The session consisted of 11 oral presentations and 1 poster, representing authorship from five PICES nations: Canada, Japan, Korea, Russia and the United States, and six non-PICES nations: Australia, Germany, Ireland, Italy, Mexico and New Zealand, as well as ICES. Despite the broad range of invasive topics selected for this session, the attendance was modest. The late cancellation of one oral presentation permitted careful discussion and additional questions for each of the talks: an opportunity well received by those in attendance. The session's presentations were organized around 1) the case histories of invasives, including both pelagic and benthic organisms, 2) descriptive and mathematical analyses of invasive vectors and their relative importance in various marine systems, and 3) management of invasion vectors, followed by discussion of any aspect of the session and consideration of future workshop ideas.

After brief introductory remarks by one of the co-convenors (S. Gollasch), the first invited speaker (Gustaaf Hallegraeff) discussed the role of ship's ballast water in spreading harmful algal bloom (HAB) species in Australian coastal waters, including the presence of culturable *Pseudo-nitzschia* diatoms and *Pfiesteria piscisida* dinoflagellates in ballast waters. His presentation also discussed the special problem

of invasive cysts, methods to determine if these invasive cysts have firmly established themselves in new environments, and the treatments to remove invasive species in ballast waters or destroy their viability. The next two speakers continued with case histories of invasive species, including the seaweed *Undaria pinnatifida* and their molecular identification (Shinya Uwai), and a Russian study of the invasive success of benthic species (polychaetes and phoronids) in the more ecologically stressed and contaminated regions of the Peter the Great Bay (Tatiana Belan).

Majorie Wonham, our next invited speaker, discussed the various hypothesis used to describe the apparent increase in marine biological invasions. Using existent data sets (from six independent marine systems), she demonstrated that often more than one model (linear, exponential and exponential) can describe temporal invasion trends, and outlined the difficulty of interpreting species invasions without consideration of both introduction rates and survival probabilities. Stephan Gollasch (invited ICES speaker) posed the question of whether ballast water was the key vector for aquatic species invasions. His presentation reviewed the relative importance of the various vectors for species introductions in twelve marine regions around the world, and demonstrated that hull fouling, ballast water and aquaculture were the most important vectors in all regions considered. However, his analysis also showed that the relative importance of these vector is regionally specific, and that hull fouling, not ballast waters, was the dominant vector in 60% of the regions considered; a conclusion which suggests that increased international regulation of ballast water introductions will not necessarily eliminate or decrease species invasions in all regions. Dan Minchin continued with the theme of vectors, and showed the importance of small craft, (open boats, yachts and cruisers) in transporting invasive species, and how their relative importance has appeared to increase with the growing number of citizens capable of owning and operating such craft. His analysis also demonstrated the importance of marinas as exchange points for invasives from the primary

vector of shipping to the secondary vector of small craft which further increase their range extension to areas inaccessible by shipping alone.

Yasuwo Fukuyo, in a series of back-to-back presentations, outlined the IMO Ballast Water Management Convention, its history and articles, and most importantly the challenges present in obscure wording (*e.g.*, viability) and the availability of reliable scientific methods to support the performance standards outlined in the convention. A very promising technique (Special Pipe) designed in Japan to terminate ballast water organisms using shear stress and cavitation was described, and its tests of efficacy presented. Jennifer Boehme outlined a verification system to ensure that mid-ocean ballast water exchange procedures are actually conducted based on the optical characteristics of chromophoric dissolved organic matter (CDOM) present in the original ballast water. She showed that statistics could be effectively used to discriminate the variability of CDOM fluorescence in various oceanic and coastal regions, and that such an analysis could offer a verification system independent of port salinity. Scott Godwin described recent efforts to identify and control species introductions associated with hull-fouling - the principle invasive vector in Hawaiian waters, using a risk-management approach based on a relative fouling risk associated with various vessels and the dynamics of their arrival in Hawaiian ports. The

final oral presentation by Stephan Gollasch was an introduction to the history, practices and work products resulting from the ICES efforts on the introductions of marine organisms. He concluded with a number of suggestions including the establishment of a PICES Working Group on *Species invasions* (not limited to HABs), and the reciprocal attendance of PICES and ICES members at their annual meetings and working sessions. He urged PICES member countries to follow the “ICES Code of Practice for the Introduction and Transfer of Organisms” when planning species introductions, and emphasized the need for both regional and global networks to most efficiently deal with biological invasions, given that an invasive species could originate from a non-PICES nation.

The session was concluded by a lively discussion led by Dr. Fukuyo where representatives of all PICES member countries in attendance agreed upon the establishment of a Working Group on *Marine invasive species*. Such a working group will serve as a means to create awareness of the species invasion problem, encourage additional scientific research on the issue, and enhance funding opportunities dealing with marine invasive initiatives in PICES member countries, and eventually may support the timely ratification and implementation of the IMO Ballast Water Management Convention.

List of papers

Oral presentations

Gustaaf M. Hallegraef (Invited)

Range extensions and ship ballast water transport of harmful algal bloom species in the Australian region

Shinya Uwai, Wendy Nelson, Luis E. Aguilar-Rosas, Sung Min Boo and Hiroshi Kawai

Introduced seaweeds - Genetic diversity of introduced and native *Undaria pinnatifida*

Tatyana A. Belan

Anthropogenic invasion of some benthic species in the coastal areas

Marjorie J. Wonham and Elizaveta Pachepsky (Invited)

What do temporal trends in invasion records really mean?

Stephan Gollasch (Invited)

Ballast water - The key vector for aquatic species invasions?

Dan Minchin, Anna Occhipinti, Oliver Floerl and Dario Savini

Small craft as a vector of exotic species

Yasuwo Fukuyo

The Ballast Water Convention and its inherent, but inevitable incompleteness for the prevention of biological invasion

Jennifer Boehme and Mark Wells

Ballast water exchange verification using the optical characteristics of dissolved organic matter

Yasuwo Fukuyo, Takeaki Kikuchi, Katsumi Yoshida and Seiji Kino

Onboard ballast water treatment using the special pipe to terminate aquatic organisms

L. Scott Godwin

Marine invasive species transported by vessel hull fouling: Potential management approaches

Stephan Gollasch

ICES and biological invasions - introduction to the work of ICES Working Group on Introductions and Transfers of Marine Organisms and ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors

Poster

Alexei M. Orlov

Ichthyofaunal exchange between northwestern and northeastern Pacific: Possible directions and mechanisms

MEQ Topic Session (S6)

Marine Protected Areas

Co-Convenors: Glen Jamieson (Canada) and Qui-Lin Zhou (People's Republic of China)

Background

Marine protected areas (MPAs) are increasingly being recognized as both a fishery management tool and means to re-establish reference areas of relatively undisturbed biodiversity and productivity. There are proposals to declare substantial (20-30%) portions of all habitats as fully protected as is possible, and some studies suggest that this action may enhance local fisheries. The goals of this session were: (i) to review the nature and characteristics of existing and proposed MPAs in PICES countries; (ii) to review scientific data as to the utility of MPAs in improving our understanding of marine ecosystems and in fishery enhancement; and (iii) to compare experiences with MPAs in both tropical and temperate waters.

Summary of presentations

The session consisted of 6 oral presentations plus 1 poster. The invited paper dealt with the Australian experience in the development of its MPA network in federal, offshore (>3 nautical miles (about 5 km) waters, based on a marine bioregionalisation (ecoregion) program. Geomorphic and bathymetric mapping were the most useful tools for MPA development, as good biological and oceanographic data are limited. Two papers focused on methods and processes related to the identification of priority

conservation areas, one in the entire Northeast Pacific (from Baja California to the Bering Sea) and the other in northern British Columbia. Priority determination in the former paper reflected both conservation and the threats and opportunities to protecting sites, while the latter considered a complex of conservation objectives (representative, rare and distinctive features) in an analysis that evaluated how best to minimize the total areas suggested for protection to achieve desired objectives. Specific high "conservation utility" areas were consistently identified. Another paper looked at the effectiveness of a specific gear restriction (trawl exclusion zones) as a means of mitigating competition for a pelagic fish (Atka mackerel) between fishers and an endangered mackerel predator (Stellar sea lions). Because of the mobility of both prey and predator, exclusion zone size was found to be very important, arguing that MPA boundary design needs to consider habitat requirements, local abundance and movements of the species involved. This view was supported by a more theoretical study that considered a spatial model that allowed for fish movement due to processes of diffusion, directed movement and density dependent habitat selection. The goal of this latter study was to develop predictive approaches to help allow stakeholders to evaluate costs and benefits of establishing MPAs on fisheries for representative groundfish species. Finally, a

paper summarized the types of MPAs established in Korea, pointing out the challenges involved in protecting areas where human environmental impacts are extensive and have occurred for relatively long time periods. Goals here tended to be on population restoration and conservation of species' reproduction areas, rather than the conservation of relatively pristine areas. Collectively, the papers provided very

interesting insights into the challenges of establishing effective conservation areas and reducing human impacts on marine ecosystems. Presentations showed variable approaches, and showed that consideration of socioeconomic factors is as important as consideration of biological ones in the development of an effective regional MPA network.

List of papers

Oral presentations

Peter Taylor (Invited)

Offshore MPAs: The opportunities and the challenges

Lance E. Morgan, Sara Maxwell, Fan Tsao, Tara Wilkinson and Peter Etnoyer

Identifying priority conservation areas for the Baja California to Bering Sea region

Inja Yeon

Korean Marine Protected Areas

Elizabeth A. Logerwell and Susanne F. McDermott

The utility of trawl exclusion zones for protecting local aggregations of Atka mackerel in the Aleutian Islands, Alaska

Glen S. Jamieson and Jeff Ardron

Marine protected areas in Pacific Canada: an approach for network design

William de la Mare

Methods for evaluating the potential effects of MPAs on adjacent fisheries

Poster

Galina V. Moyseychenko and G.S. Borisenko

Ecologic and fishery studies in marine protected areas

POC/MONITOR Topic Session (S7)

Application of Global Observing Systems to physics, fisheries, and ecosystems

Co-sponsored by Argo

Co-Convenors: Michael G. Foreman (Canada), Vyacheslav B. Lobanov (Russia), Phillip R. Mundy (U.S.A.) and Sei-Ichi Saitoh (Japan)

Background

Problems such as global climate change, carbon cycling, ocean circulation forecasting, and variability in biomass and fish abundance have necessitated a great increase in the variety and quantity of ocean measurements. In response to these growing demands, the last two decades have seen a proliferation of new technologies for remotely sensing the physical and chemical properties of oceans and the biological characteristics of organisms living in them.

Noteworthy examples include the TOPEX/Poseidon/Jason and ERS/Envisat satellites for sea surface heights, SeaWiFS and MODIS for ocean colour, and Argo profiling floats for deep ocean velocities, temperatures and salinities. Technologies such as these have allowed interdisciplinary, near-realtime sampling of the global ocean with unprecedented resolution in time and space. This session highlighted the application of these new technology observing systems to the description and better understanding of

important physical, fishery and ecosystem processes in both the global, and more specifically, the North Pacific Ocean.

Summary of presentations

The session consisted of 19 oral presentations and 9 posters covering a wide range of observing systems and applications. The relatively recent availability of Argo float data was described and sample applications were illustrated in one invited presentation, while two other presentations used these data to track anomalous water features in the Gulf of Alaska. The underlying message was that as more floats are deployed and the oceanographic community becomes more familiar with its uses, Argo data can be expected to become a standard tool, much like the complementary information provided by satellite altimetry, for monitoring and analysing ocean conditions. In a similar vein, three papers focused solely on the application of satellite altimeter data: one to determining seasonal current patterns, a second to improving the accuracy of a regional tidal model, and a third to computing geostrophic currents for larval transport studies. The most frequently described data were sea surface temperatures (SSTs), customarily obtained via AVHRR, and ocean

colour obtained through a variety of sensors such as SeaWiFS, MODIS and GLI. One paper described the validation of algorithms for interpreting these ocean colour measurements while two others applied colour observations to describe phytoplankton distributions and variability in specific regions. In yet another paper, both data types were used to devise an anchovy availability index for the waters off northern Chile. Several numerical models using a variety of techniques to assimilate various types of data (including most of those referred to above) were also described. Two presentations were unique in the observing systems they described. The first summarized the development of, and initial results from, an acoustic tracking array along the North American shelf, while the second used the results from a continuous plankton recorder, in conjunction with sea bird measurements, to characterize meso-marine ecosystems in the North Pacific. Overall, the session was a success. All participants came away with the lasting impression that the development of remote observing systems within the last two decades has greatly facilitated ocean monitoring and greatly enhanced our ability to describe, understand, and forecast numerous physical, fishery, and ecosystem processes.

List of papers

Oral presentations

W. John Gould and Dean Roemmich (Invited)

The Argo Project: New observations of the physical state of the ocean and their potential application to climate, including fisheries and ecosystems impacts

William Crawford, Peter Sutherland and Peter van Hardenberg

Origin and persistence of anomalously cold water in the halocline of the Eastern Gulf of Alaska, 2002 to 2004

Toshiyuki Sakurai, Yukio Kurihara and Tsurane Kuragano

A new daily SST product of JMA (merged satellite and *in-situ* data Global Daily SST)

Dmitry D. Kaplunenko, Vladimir I. Ponomarev, Young J. Ro, Olga O. Trusenkov and Serge T. Trusenkov

Climate variations during the 20th century in the Northwest Pacific region

Masafumi Kamachi, Shiro Ishizaki, Norihisa Usui, Yosuke Fujii and Toshiya Nakano (Invited)

Data assimilation in the Pacific Ocean as an application of an observing system to physical oceanography and climate research

George Shevchenko and Alexander Romanov

Seasonal variations of Okhotsk Sea circulation from Topex/Poseidon satellite altimetry data

Michael Foreman, Josef Cherniawsky and Patrick Cummins

A high-resolution assimilating tidal model for the Bering Sea

Gennady A. Platov and Elena N. Goloubeva

Seasonal variation of the salinity belt structure off the Primorie coast: A numerical study

Donald R. Kobayashi (Invited)

Application of satellite remotely sensed environmental data to pelagic larval transport, growth, and survival

P. Ted Strub, Corinne James and Andrew C. Thomas

Comparison of climatic signals (winds, satellite SSH, SST and surface chlorophyll-a pigment concentrations) in the NE and SE Pacific: 1993-2004

Kosei Sasaoka, Sei-ichi Saitoh, Hiroaki Sasaki, Tsuyoshi Miyamura and Tsutomu Yoshida

Bio-optical properties and in-water algorithm validation for ocean color remote sensing in the sub-arctic North Pacific

Hiroki Takemura and Sei-ichi Saitoh

Temporal and spatial variability of phytoplankton biomass and productivity in the Eastern Kamchatka Current region and along the Kuril Islands

Angelica Peña and William Crawford

Phytoplankton distribution in the Queen Charlotte Basin: Regions of high productivity

David Welch

POST: The development of a permanent continental-scale acoustic tracking array for west coast fisheries research

Claudio Silva, Eleuterio Yáñez, Karen Nieto, María Angela Barbieri and Guillermo Martínez

Spatial anchovy availability index for northern Chile

Sonia Batten, David Hyrenbach, William Sydeman, Ken Morgan, Mike Henry, Peggy Yen and David Welch

Characterising meso-marine ecosystems of the North Pacific

Michelle Li and Paul Myers

Mixed layer depth variability in the Gulf of Alaska from Argo and from ship-based observations

Gleb Panteleev, Dmitri Nechaev and Motoushi Ikeda

Summer circulation in the Bering Sea derived as a variational inverse of climatological data

Mao-Chang Cui and Mo Jun

El Niño Phenomenon in SODA data

Posters

Yury N. Volkov, Igor E. Kochergin, Alexey F. Scherbinin, Pavel A. Fayman, Sergey I. Rybalko and Mikhail V. Mishchenko

Diagnostic simulation of Peter the Great Bay (Japan Sea) currents

Pavel A. Fayman

Diagnostic simulation of the Japan Sea currents

Pavel A. Fayman

Diagnostic simulation of the Okhotsk Sea currents

E. Godínez-Domínguez, C. Franco-Gordo, G. Lucano-Ramírez, S. Ruíz-Ramírez, J. Rojo-Vázquez and J. Freire

Main effects of the 1997-1998 ENSO event in the tropical coastal ecosystem in the Mexican Central Pacific

Nikolai A. Maximenko and Pearn P. Niiler

Improved decade-mean sea level of the North Pacific with mesoscale resolution

Sung-Hyun Nam, Jong-Jin Park, Yun-Bae Kim, Young-Ho Kim, Duk-Jin Kim, Kyung-Ae Park, Jae-Yul Yun, Woo-il M. Moon and Kuh Kim

Observing systems in the East (Japan) Sea: A monitoring buoy with moored instruments, surface and subsurface drifting floats, and satellite measurements

George Novinenko and George Shevchenko

Satellite data based determination of SST spatial structure and the forecast of seasonal changes in the Okhotsk Sea

Jong-Jin Park, Kyung-Ae Park, Kuh Kim and Yong-Hoon Youn

Upper ocean response to typhoons and tropical storms

Roberto M. Venegas, P. Ted Strub, Emilio Beier, Ricardo Letelier and Andrew Thomas

Interannual and seasonal variability of satellite-derived chlorophyll pigment, sea surface height, temperature and wind stress in the northern California Current system

POC Topic Session (S8)

The impacts of climate change on the carbon cycle in the North Pacific

Co-sponsored by the International Ocean Carbon Coordination Project (IOCCP)

Co-Convenors: Kitack Lee (Korea) and Christopher L. Sabine (U.S.A.)

Background

Many recent studies have investigated carbon cycle variability in the central and North Pacific. A significant number of these studies have been related to the effects of El Niño-Southern Oscillation (ENSO) on the upwelling regions of the Equatorial Pacific. Recently, there have been several studies that have indicated significant variability over other regions of the North Pacific and potential linkages to the Pacific Decadal Oscillation (PDO). Most of these studies have covered a relatively short time frame, examined a relatively small portion of the North Pacific, or considered a limited number of parameters. What is often lacking is an overall picture of North Pacific variability that draws together all of these individual lines of evidence, and looks for coherent patterns that may help us understand the regional significance of this variability, and the possible mechanisms controlling the observed spatial and temporal patterns. This session provided a forum for presentation of new insights into such links between climate change and the carbon cycle as are manifest in the North Pacific, and showcased – in part – results from a synthesis and modeling workshop (co-sponsored by WG 17) that took place in June 2004, in Seattle (U.S.A.).

Summary of presentations

The session (held in the afternoon of October 20 and the morning of October 21) comprised 18 oral presentations (including 2 invited talks) together with a number of posters.

David Karl set the stage with his invited talk where he described the current state of our understanding (or lack thereof) of microbial processes in the North Pacific Subtropical Gyre, and pointed out a major challenge to go from our picture of a complex microbial food web to a

quantitative understanding of the regional carbon cycle.

The second invited talk by Nicolas Gruber summarized a number of highlights from a June 2004 NOAA Workshop on *Understanding North Pacific carbon-cycle change: Data synthesis and modeling* (co-sponsored by PICES and GCP). The emphasis of this talk was the need to change our image of the North Pacific carbon cycle from a simple steady-state view to a time-varying picture linked (perhaps?) to climate forcing by periodic phenomena such as the Pacific Decadal Oscillation (PDO), as well as the global warming signal that seems to be manifesting itself in a variety of datasets.

A large number of the presentations at the session and most of the associated posters were also related to this June workshop. There were papers showing clear evidence of the interannual and decadal scale variability – though with differing regional trends – in observations of chemical distributions such as $p(\text{CO}_2)$, total dissolved inorganic carbon, and oxygen concentrations at locations all around the North and Equatorial Pacific, and there were other papers trying to make sense of such observations in the context of models of varying complexity (with regard both to the mixing and ecological parameterizations). It is apparent that there is still a lot to be done with regard to integrating the wide variety of observations into a coherent picture, but a start has now been made in doing so. Some of the difficulties brought to light involve deconvolution of changes due to simple physical forcing, and those that may be concomitant on changes in ocean ecology (which may themselves be a response to changes in physical forcing!). As we seek to attribute causes this will assume an ever-greater significance in the future.

In addition to the papers based on the June Workshop, there were a number of other contributions. Two of these presented the recent Sub-arctic Ecosystem Response Iron Enhancement Study (SERIES), one from a more observational perspective, the second with a simple ecological-based model set in the context of simple representation of the mixing that was believed to occur in the experiment. Another

group of papers presented a variety of interesting observations in North Pacific marginal seas and coastal environments which show that these too show interannual and decadal variability that may, ultimately be linked to climate change. There was also an interesting presentation about a new joint Russian/US project (RUSALCA) aimed at documenting climate-induced changes in the Arctic.

List of papers

Oral presentations

David M. Karl (Invited)

Microbial biogeochemical processes in the North Pacific Subtropical Gyre

C.S. Wong, Shau-King Emmy Wong and Yukihiro Nojiri

Carbon change during SERIES (Sub-arctic Ecosystem Response Iron Enhancement Study)

Debby Ianson, Christoph Voelker and Ken Denman

Modelled carbon fluxes in the NE Pacific SERIES iron fertilization experiment

James Christian

Modelling the impact of climate change on the carbon cycle: Redfield and non-Redfield models

Nicolas Gruber, Christopher L. Sabine, Richard A. Feely, Scott C. Doney, Robert M. Key, Jorge L. Sarmiento, Alexander Kozyr and the workshop participants (Invited)

Interannual to decadal variability in the carbon cycle and biogeochemistry of the North Pacific - Highlights from the NOAA/GCP/PICES synthesis and modeling workshop

Sabine Mecking, Mark J. Warner and John L. Bullister

Age and AOU increases at the North Pacific subtropical-subpolar gyre boundary

Hernan E. Garcia, Tim Boyer, Syd Levitus, Ricardo Locarnini and John Antonov

Oxygen and Apparent Oxygen Utilization content variability in the upper North Pacific Ocean (1955 to 1998)

Curtis Deutsch, Steven Emerson and Luanne Thompson

Attributing the causes of North Pacific oxygen changes

Terry E. Whitedge, Kathleen Crane, Vladimir Smolin, Kevin R. Wood and Mikhail Zhdanov

Initial results of Russian-American Long-term Census of the Arctic (RUSALCA) Expedition: 2004

Keith B. Rodgers, Richard A. Feely, Olivier Aumont, James Orr, Gurvan Madec, Nicolas Metzl, Raghu Murtugudde, Patrick Wetzel, Ernst Maier-Reimer, Corinne Le Quere, Eric Buitenhuis, Fei Chai, Galen McKinley, Yasuhiro Yamanaka, Holger Brix, Nicolas Gruber, Taro Takahashi, Rik Wanninkhof, Hisayuki Y. Inoue and Masao Ishii

Interannual to decadal variability in Equatorial Pacific pCO₂ and surface CO₂ fluxes: An intermodel comparison

Richard A. Feely, C. L. Sabine, R. Wanninkhof, A. Murata, R. Key, C. Winn, M. F. Lamb and D. Greeley

Decadal changes of CO₂ in the North Pacific Ocean

Hisayuki Y. Inoue, Masao Ishii, Takashi Midorikawa, Akihiko Murata and Kazuhiro Nemoto

Variations and distributions of pCO₂^{sw} in the western North Pacific during 1990 to 2003

Fei Chai, Lei Shi, Mingshun Jiang, Tsung-Hung Peng and Yi Chao

Modeling decadal variability of carbon cycle in the Pacific Ocean

Chen-Tung Arthur Chen, Shu-Lun Wang, Wen-Chen Chou and David D. Sheu

Carbonate chemistry of the South China Sea

Andrey G. Andreev, C.-T. A. Chen and Nataliya Sereda

Increases in calcium and total alkalinity in the Bering and Chukchi Seas

Jeong-Hee Shim, Young-Chul Kang, Dong-Seon Kim, Jae-Hak Lee and Chul-Ho Kim

Seasonal change in surface pCO₂ distribution in the East China Sea

Kathryn E. Fagan, Fred T. Mackenzie, Daniel W. Sadler and Justin Dilg

Processes controlling air-sea exchange of carbon dioxide, Kaneohe Bay, Oahu, Hawaii

Geun-Ha Park, Kitack Lee, Kyung-Ryul Kim and Dong-Jin Kang

What controls the uptake of atmospheric CO₂ by the well-ventilated East/Japan Sea?

Posters

Andrey G. Andreev and Viktoria Baturina

Interannual variability of dissolved oxygen and inorganic carbon in the Kuril Basin of the Okhotsk Sea

Masao Ishii, Shu Saito, Takeshi Kawano, Kazuhiko Matsumoto, Kazuhiro Nemoto, Hitomi Kamiya, Takashi Midorikawa and Hisayuki Y. Inoue

Decadal trend of the oceanic CO₂ in the western equatorial Pacific warm pool

Shu Saito, Masao Ishii, Hidekazu Matsueda, Keizo Shutta, Masahiko Fujimura, Ikuo Kaneko and Takashi Midorikawa

Change in total inorganic carbon and dissolved oxygen along the 137°E meridian between 1994 and 2003

Kazuhiro Nemoto, Takashi Midorikawa, Hitomi Kamiya, Masao Ishii, Hidekazu Matsueda and Hisayuki Y. Inoue

Long-term trend and interannual variations of winter oceanic pCO₂ and air-sea CO₂ flux in the western North Pacific

Christopher L. Sabine, Richard A. Feely, Nicolas Gruber, Robert M. Key, Kitack Lee, John L. Bullister, Rik Wanninkhof, C.S. Wong, Douglas W.R. Wallace, Bronte Tilbrook, Frank J. Millero, Tsung-Hung Peng, Alexander Kozyr, Tsueno Ono and Aida F. Rios

The oceanic sink for anthropogenic CO₂

Daniel W. Sadler

CO₂ is HOT: Fifteen years quantifying carbon dioxide in the subtropical Pacific Ocean

Takayuki Tokieda and Masao Ishii

Variability in the degree of saturation for CFCs in the North Pacific Central Mode Water

Nobuo Tsurushima, Yutaka W. Watanabe, Yukihiko Nojiri and Koh Harada

Temporal and spatial variation of dissolved inorganic carbon in the western North Pacific in recent years

CCCC Topic Session (S9)

The impacts of large-scale climate change on North Pacific marine ecosystems

Co-Convenors: Harold P. Batchelder (U.S.A.), William R. Crawford (Canada), Michael J. Dagg (U.S.A.) and Suam Kim (Korea)

Background

Although it is widely known from the fossil record of deep-sea cores that climate changes on the glacial-interglacial scale generate significant impacts on marine ecosystem productivity and structure, it is only in the last ten to fifteen years that marine scientists have begun to document evidence that basin- or large-scale climate changes might be significant forcing for decadal to millennium-scale changes in marine ecosystems. Tidbits of information led to the development of the Global Ocean Ecosystems Dynamics (GLOBEC) projects of many individual nations, and to several regional scale programs examining the influence of climate change. In 1994, PICES initiated the Climate Change and Carrying Capacity (CCCC) Program to provide an organizational framework for examining climate impacts on marine ecosystems in the North Pacific. During the past decade, the North Pacific experienced the strong 1997 El Niño and 1998 La Niña, as well,

perhaps, as a regime shift in the late 1990s. The purpose of this session is to begin a general synthesis of these studies linking climate change to ecosystem productivity and structure in the North Pacific Ocean.

Many national programs examining climate-ecosystem linkages on a regional scale are nearing conclusion, and will benefit from the grander scale, basin-wide synthesis that will be initiated in this session. This session brought together scientists from different regions of the Pacific to share their results, and to encourage collaborations for the broader synthesis that will be the topic of a PICES Symposium planned for April 2006.

Summary of presentations

The session consisted of 25 oral presentations plus nearly 20 posters. The first six presentors summarized GLOBEC or GLOBEC-like studies from each of the PICES member nations.

Harold Batchelder summarized the **U.S.** GLOBEC program that has been occurring in the Northeast Pacific since 1997. He highlighted significant new insights on the importance of meso-scale eddies in effecting cross-shelf transport of water, nutrients and organisms, the role of flow-topography interactions in structuring spatial patterns of productivity and ecosystem structure in coastal ecosystems, and the role of far field forcing and phenomena (large scale wind patterns) on transporting different water masses and their impacts in local regions.

Ian Perry described the **Canadian** GLOBEC program that was conducted from 1996-2001. The lifespan of Canadian GLOBEC academic funding was short, but it led to many ongoing “GLOBEC-like” efforts, including a sustained time-series sampling on the Vancouver Island shelf, studies of zooplankton aggregations near abrupt topographic features, and continued model development for both basin and shelf ecosystems.

Because Russia has had no formal GLOBEC program, Vladimir Radchenko instead reviewed the various **Russian** activities that contributed to GLOBEC International and other IGBP activities (*e.g.*, PAGES, SOLAS). He described the development of several database efforts (global atlas of ocean waves; database of world ocean bioluminescence). Lastly, he highlighted the important contributions of Russian scientists in developing a comprehensive metadatabase of biological data collected by Russian fisheries research institutes.

Yoshioki Oozeki presented progress made in several GLOBEC or GLOBEC-like projects within **Japan**. He briefly introduced the goals and some results from the BIO-COSMOS, VENFISH, FRECS and DEEP projects. Each of these projects had (or will have: DEEP is just beginning) substantial field and modelling components. The projects differ principally in their target species and the key physical forcing involved. For example, BIO-COSMOS focused on Japanese Sardine, VENFISH on Pacific saury and walleye Pollock, FRECS on jack mackerel and Japanese common squid, and DEEP on

interactions between surface pelagic fishes and meso- and bathy-pelagic fishes.

Suam Kim described the activities of **Korea** GLOBEC, which began in 1998. Several major international symposia (in 2000 and 2002) were held to bring scientists together to exchange information about Northwestern Pacific ocean regions and marginal seas, which have subsequently been published. Korea GLOBEC research has focused on ecosystem and biogeochemical processes in the East China and Yellow Seas. Recently, Korea GLOBEC has agreed to support the travel of young Korean scientists to significant international meetings on marine science.

Ling Tong provided an overview of the **Chinese** national GLOBEC program, which has consisted of shelf-sea studies in the Bohai Sea (1997-2000) and the East China Sea (1999-2004). Anchovy spawning and regions of anchovy eggs and young larvae were more controlled by physical features (*e.g.*, fronts) than by trophic (prey distribution) relations. More than 80% of the anchovy eggs were not viable in some surveys.

Thomas Weingartner provided an invited talk on ecosystem structure and function on the Gulf of Alaska (GOA) shelf. It provided an overview of the GOA shelf ecosystem, including seasonal, interannual and interdecadal physical variability and cross-shelf variation in ecosystem structure and production. Mechanisms regulating primary production and energy transfer through the food web to higher trophic levels were described, with evidence of both bottom-up and top-down controls on fish recruitment. Climate change, such as warmer, wetter conditions that might occur in the GOA, could affect the timing and patterns of freshwater runoff and nearshore stratification and have significant ecosystem consequences. Changes in the seasonal pattern or variability of physical forcing that affects mixing and freshwater dispersal might have as large an impact on coastal ecosystems as a change in the mean seasonal state.

Julie Hall provided an overview of the new IGBP Integrated Marine Biogeochemistry and

Ecosystem Research (IMBER) program. She described the four principal themes of IMBER, the implementation of IMBER science, how it relates to and collaborates with other IGBP projects, like GLOBEC, and anticipated outcomes (products) of the IMBER program.

The remaining contributed presentations (both oral and poster) covered a wide range of topics in geographic regions spanning the Pacific, including several basin-wide comparisons of regime shift impacts in the California, Kuroshio and Humboldt current systems. There were several presentations on recent changes in ocean conditions in the California Current System, considerations of why the Bering Sea ecosystem has remained in a warm phase state, and model studies of atmospherically forced wind-driven circulation and their impact on marine ecosystems in the North Pacific since 1990. Many of the talks and posters made connections, some of them indirect, between climate variations and ecosystem or population responses, including studies on zooplankton (abundances, species composition, phenology), many types of fishes, but especially sardines and

salmon (abundances, survival and growth rates), and even coastal kelp forests.

Overall, the session was a resounding success in achieving the goal of communicating the results of recent regional investigations of climate variability and ecosystem impacts to a broader audience of peers conducting similar studies in other regions and perhaps, on different trophic levels of the ecosystem. The goal was to provide a breadth of new information to scientists studying climate-ecosystem interactions in the North Pacific. To that end, the session was successful. It is now up to those scientists to consider what they learned, and to begin the process of multinational, cross-regional scientific collaboration that will lead to basin-scale synthesis and improved understanding of how climate variability impacts marine ecosystems, and how to consider these ecosystem level impacts in managing marine living resources. The broader scale understanding that will be gained by considering multiple regional impacts of large scale forcing will be presented at the CCCC Symposium in April 2006.

List of papers

Oral presentations

Harold P. Batchelder

U.S. GLOBEC: Significant findings of climate variability impacts on marine ecosystems in the Northeast Pacific

Qisheng Tang (delivered by Ling Tong)

The overview of Chinese National GLOBEC Program

Vladimir I. Radchenko

Russia in scientific collaboration in programs related to the GLOBEC International

Yoshioki Oozeki and Hiroaki Saito

Progresses and achievements of GLOBEC research projects in Japan

Im Sang Oh (delivered by Suam Kim)

Korea GLOBEC

David Mackas and Ian Perry

GLOBEC Canada: Results and follow-on activities

Thomas Weingartner (Invited)

Ecosystem structure and function on the Gulf of Alaska shelf

Julie A. Hall

A new international research project: Integrated Marine Biogeochemical and Ecosystem Research (IMBER)

Enrique Curchitser, Dale Haidvogel, Albert Y. Hermann, Elizabeth Dobbins and Thomas Powell

A numerical simulation of large-scale physical events in the North Pacific ocean during the 1997-2003 period

William R. Crawford

The eastern Gulf of Alaska: A 36-year time series along Line-P and implications for biological impact

Adriana Huyer, P. Michael Kosro, Robert L. Smith and Patricia A. Wheeler

Changing ocean conditions in the Northern California Current: 1997-2003

John A. Barth, Brian A. Grantham, Francis Chan, Karina J. Nielsen, David S. Fox, Adriana Huyer, Jane Lubchenco, Bruce A. Menge, Anthony R. Kirincich, Burke Hales and Patricia A. Wheeler

Upwelling-driven inner-shelf hypoxia and its connection to oceanographic changes in the Northeast Pacific

James Overland, Jennifer Boldt, Phyllis Stabeno, Anne Hollowed and George Hunt, Jr.

Is the Bering Sea ecosystem stuck in a warm phase?

William Peterson and Rian Hooff

The climate shift of 1998: Something old or something new?

Sanae Chiba, Hiroya Sugisaki and Toshiro Saino

Decadal scale variation of copepod community structure in the Oyashio based on the Odate Collection

Kazuaki Tadokoro, Hiroya Sugisaki, Hiroaki Saito and Toshiro Saino

Interannual variations in developmental timing of *Neocalanus* copepod populations in the Oyashio waters of western subarctic North Pacific

Jung-Hoon Kang, Woong-Seo Kim, Hae-Jin Jeong and Jae-Hoon Noh

The latitudinal differences of mesozooplankton distribution in the Northeastern Equatorial Pacific under El Niño, La Niña and normal condition

Kenneth O. Coyle

The Optimal Stability Window hypothesis and copepod concentrations on the Gulf of Alaska shelf during spring and summer, 1998 - 2002

Kentaro Morita, Shoko H. Morita and Masaaki Fukuwaka

Population dynamics of Japanese pink salmon: Does climate change explain the recent increasing trend?

Albert J. Hermann, Enrique N. Curchitser, Dale B. Haidvogel and Elizabeth L. Dobbins

A comparison of remote versus local influence of El Niño on the coastal circulation of the Northeast Pacific

Lewis Haldorson, Jack Piccolo and Jennifer Boldt

Effects of marine habitats on growth, condition and survival of juvenile pink salmon in the coastal Gulf of Alaska

Carrie A. Holt and Skip McKinnell

Annual variability in condition factor of sockeye salmon (*Oncorhynchus nerka*) from 1915-1972 in British Columbia, Canada

Tim R. Baumgartner, Guillermo Auad, Hideaki Nakata and Arthur J. Miller

Comparison of the effects of the 1976-77 North Pacific climate shift on the California and Japanese sardine habitats

Juergen Alheit and Andrew Bakun

Comparison of synchronous ecological regime shifts in Humboldt and Kuroshio Currents

Shang Chen and Yoshiro Watanabe

Did regime shift occur in the East China Sea?

Posters

Toby D. Auth and Richard D. Brodeur

Distribution and concentration of ichthyoplankton off the Oregon coast in 2000 and 2002

Rebecca E. Baldwin, Mary Bhuthimethee and Kym C. Jacobson

Comparing macroparasites of juvenile salmon and associated fish collected off the coast of Oregon and northern California

Steven J. Bograd, William R. Crawford, Howard J. Freeland, Adriana Huyer, Jeffrey J. Polovina, Franklin B. Schwing and Robert L. Smith

On the origin and evolution of a "minty" water mass anomaly in the Northeast Pacific

Richard D. Brodeur, Elizabeth A. Daly and Robert A. Schabetsberger

Interannual and interdecadal variability in juvenile salmon diets in relation to environmental changes in the Northern California Current

Alexei I. Pinchuk and Kenneth O. Coyle

Interannual changes in abundance of dominant euphausiids in the northern Gulf of Alaska

Svetlana V. Davidova

Dynamics of the mass pelagic fishes of the Japan/East Sea during the second part of the 20th century and factors responsible for the variation

Svetlana Yu. Glebova

Reorganizations of atmosphere regime over the Far Eastern Seas occurred in 2000-2003

Kym C. Jacobson and Edmundo Casillas

Varying climate-driven ocean conditions and the growth of juvenile salmonids in the California Current system

Julie E. Keister and William T. Peterson

Biological patterns in years of contrasting upwelling-favorable winds

Thomas C. Kline, Jr.

Spatial and temporal variability patterns in the nitrogen and carbon stable isotope composition of sub-arctic Pacific biota during the GLOBEC long-term observational program: Implications for interpreting long-term records

Toru Kobari, Kazuaki Tadokoro, Sanae Chiba, Takashige Sugimoto, Kazuki Kuroda and Naoki Nagai

Interannual variations in diatom abundance during winter and summer in western tropical to subtropical Pacific

Lydia B. Ladah

A coastal ocean monitoring program along the Baja California coastline: Climate change, internal waves and the kelp forest ecosystem

Chung-II Lee, Kyu-Dae Cho and Kwang-Ho Choi

The effects of El Niño events on sea water temperature variation and squid catch in the Korean coastal and off-shore waters

Jae-Bong Lee, Chang-Ik Zhang, Karen-Hyun, Suam Kim and Dong-Woo Lee

Spatio-temporal distributions of small pelagics around Korean waters using a neural network pattern recognition approach

Vadim V. Navrotsky

Climate, ocean ecosystems, and sustainable fisheries

Akira Nihira and Masakazu Takahashi

Decadal variations of demersal fish populations in relation to climate/oceanic regime shifts in the waters off the northeast coast of Japan

Thomas C. Royer, Chester E. Grosch, Thomas J. Weingartner and Seth Danielson

A warmer and fresher Northern Gulf of Alaska?

Amy R. Childers, Terry E. Whitley and Dean A. Stockwell

Seasonal and interannual variability in the distribution and dynamics of nutrients and chlorophyll across the Gulf of Alaska shelf: 1998-2000

CCCC/MODEL Topic Session (S10)

Modeling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans

Co-Convenors: Shin-ichi Ito (Japan), Michio J. Kishi (Japan), Bernard A. Megrey (U.S.A.) and Francisco E. Werner (U.S.A.)

Background

Marine ecosystems are characterized by complex trophic interactions that occur on disparate time and space scales. Modulation by physical and biogeochemical properties further complicate these interactions. To date, most studies of marine ecosystems consider shelf and open ocean regions separately. However, through active migration and/or advective processes, shelf and oceanic populations are coupled. This session invited contributions that consider various domains that integrate across multiple spatial scales, temporal scales and trophic levels, with objective to develop a better understanding of how open ocean and shelf ecosystems are linked.

Summary of presentations

The session was rich in exchanges and discussions with significant advances in physical

and biological modeling approaches and results described. The findings presented showed quantitative and realistic (when compared to field data) descriptions of complex processes spanning multiple physical scales and biological (trophic) levels. Several efforts identified processes of cross-shelf exchange induced by the interaction of offshore currents with shelf regions. Examples included the Kuroshio off the East China Sea and the Alaskan Stream in the Central Gulf of Alaska. It was clear that the source-regions onto the shelf were spatially three-dimensional and temporally variable. The effects of these currents in providing nutrients to the shelf and the implications to the shelf ecosystems, from primary producers to upper trophic levels, were evident. Regional scale models quantified the effect of smaller scale dynamics (and likely associated enhanced mixing) generated by instabilities in the flow and from interactions of the current with bottom topographic features. At the same time, it

became clear that we are gaining new understanding of the role of nutrients other than nitrogen, in particular phosphorous, in determining the biological processes in the shelf regions.

At basin scales, exciting results were presented of long-term simulations of the North Pacific Ocean from 1947-2000. The model results captured and offered possible explanations to many of the signals believed to be related to the observed regime shift of the mid-1970s. The importance of this result is that variations at basin scales in offshore regions are impressed upon the shelves. Without these basin-scale advances, progress in understanding the local (shelf-scale) responses is not possible.

Results from upper trophic models that considered interannual variability of Pacific saury growth using NEMURO.FISH and larval Pollock recruitment using an individual-based model formulation were presented. The results identified important successes as well as areas of

future work. In particular, it was shown that knowledge of larval mortality is necessary to achieve quantitative recruitment forecasts (in the Pollock case), and additional detail in hydrographic features such as freshwater sources (in the saury case) is necessary to capture the stability of the water column needed to properly specify the production of the (lower trophic) prey for saury. A study of an individual based model of copepods off the US west coast suggested that interannual variability in upper water column conditions may lead to mismatches between the timing of copepod re-emergence and subsequent growth of the zooplankton population. Implications of such mismatches to the location and timing of the zooplankton to its predators (*e.g.*, salmon smolt) was discussed.

In summary, the session presented state of the art modeling studies of coupled physical and biological processes in the study of marine ecosystems. Future directions and necessary areas of research were outlined.

List of papers

Oral presentations

Xinyu Guo, Yasumasa Miyazawa and Toshio Yamagata (Invited)

Intrusion of Kuroshio water onto the continental shelf in the East China Sea and its influences on the ecosystem

Jian Su and Lai-Ah Wong

A three-dimensional numerical study of the spirals and water exchange near the shelf front in the northern South China Sea in winter

Tian Tian, Hao Wei, Jian Su and Chang-Soo Chung

Simulations of annual cycle of phytoplankton production and the utilization of nitrogen in the Yellow Sea

Maki N. Aita, Yasuhiro Yamanaka and Michio J. Kishi

Interdecadal variation of lower trophic ecosystems in the Northern Pacific between 1948 and 2002, using a 3-D physical-NEMURO coupled model

Shin-Ichi Ito, Michio J. Kishi, Daiki Mukai, Yutaka Kurita, Yasuhiro Ueno, Yasuhiro Yamanaka, Bernard A. Megrey and Francisco E. Werner

A study for interannual variability of Pacific saury using a simple 3-box model of NEMURO.FISH

Albert J. Hermann, Sarah Hinckley, Elizabeth L. Dobbins and Dale B. Haidvogel

Quantifying cross-shelf and vertical nutrient flux in the Gulf of Alaska with a spatially nested, coupled biophysical model

Carolina Parada and Sarah Hinckley

A biophysical model for walleye pollock in the Gulf of Alaska to study recruitment variability: A coupled modelling approach

Andrew W. Leising

The effects of seasonal variability on copepod overwintering and population success: The match-mismatch of zooplankton and phytoplankton

Posters

Irina V. Ishmukova

Assessing the quality of marine ecosystem models

Daiki Mukai, Fei Chai and Michio J. Kishi

Modeling interannual and decadal variability of Pacific saury

Annette Samuelsen and James J. O'Brien

Influence of energetic meso-scale eddies on the lower trophic levels of the ecosystem in the northeastern tropical Pacific

TCODE E-POSTER Session (S11)

Data visualization of open ocean processes in the North Pacific

Co-Convenors: Mark Merrifield (U.S.A.), Thomas C. Royer (U.S.A.) and Igor Shevchenko (Russia)

Background

Based on the theme of open ocean processes, this session provided opportunities to present technologies that animate remotely sensed data such as TOPEX/Poseidon/Jason altimetry, SeaWiFS and MODIS ocean color and sea surface temperature measurements. The integration of remotely sensed physical, biological and chemical data was encouraged especially with regard to oceanic “hot spots” of biological activity. With the further development of global integrated data bases for handling various classes of data applicable to the PICES region, discussions of techniques of data retrieval and archiving were very timely.

Summary of presentations

The session consisted of 5 presentations. There were two papers describing the manipulation of large, diverse data sets such as GIS (Golik *et al.* and Kaplunenko, *et al.*) that demonstrate interests of young researchers on dealing with the next generation of data and data handling software such as Virtual Database (VDB). Igor

Shevchenko *et al.* presented systems that can deal with the updating and retrieval of data from distributed metadata sets. Peter Etnoyer illustrated the identification of “hot spots” and persistent marine habitats through the manipulation of remotely sensed sea surface temperatures and catch data. He found an important, persistent habitat for blue whales, swordfish and striped marlin off Baja California. Zainuddin *et al.* used basin wide remotely sensed data sets (sea surface temperature, chlorophyll and sea surface height) to provide information on the distribution of albacore tuna. Using a multilayered approach, they found that the tuna responded to “hot spots” created by ocean eddies where biological productivity was enhanced.

While the session began with relatively low attendance (possibly as a function of its relative remoteness to food and drink), at the end of the poster session many individuals were present. The session was extended well beyond the scheduled closing time and was finally terminated when the staff turned off the lights.

List of E-posters

Peter Etnoyer (Invited)

Visualizing pelagic habitat in the Northeast Pacific

Andrew V. Golik and Vitaly K. Fischenko

The technologies of integration of the oceanographic data, tools of their visualization and analysis in internet-based GIS

Dmitry D. Kaplunenko, Young J. Ro , Vyacheslav B. Lobanov and Eung Kim

Development of web-based technology for composing comprehensive oceanographic data sets of the East/Japan Sea

Igor Shevchenko, Georgy Moiseenko and Olga Vasik

Using Marine Biology ontology for metadata exchange

Mukti Zainuddin, Katsuya Saitoh and Sei-ichi Saitoh

Spatio-temporal dynamics of albacore fishing ground and environmental conditions detected by remotely sensed satellite data

BIO Paper Session (BIO)

Convenor: Vladimir I. Radchenko (Russia)

Background

The BIO Committee's area of responsibility is to promote and coordinate biological oceanography and interdisciplinary research in the northern North Pacific. The Committee has an enormous mandate: at the organisms' scale - from microbes to marine mammals and birds, and among associated scientific disciplines - from physical oceanography issues in their effect on different trophic levels of marine biota to marine environmental quality fields related to the harmful algal bloom (HAB), contaminant cycles in food webs, *etc.* In order not to exclude important tendencies arising in contemporary biological oceanography with the traditional practice of only specified topic sessions during the PICES Annual Meetings, papers on all aspects of biological oceanography in the North Pacific and its marginal seas were invited for the BIO Paper Session. The session highlights new research approaches and elucidates promising scientific hypotheses and directions in the biological oceanography developments. The session also reveals up-to-date tendencies in biological oceanography in the North Pacific, and allows the designating of the most topical themes for future BIO Committee activity and efforts that are stated in the approved PICES Strategic Plan.

Summary of presentations

The session consisted of 6 (from the planned eight) oral presentations plus 9 posters. Four papers dealt with diverse aspects of zooplankton ecology: community and population structure, productivity and metabolic characteristics. Four talks and posters were devoted to fish species, including saury and sardine-iwashi stock dynamics, pelagic fish larvae distribution, and flatfish age determination. Three posters dealt with phytoplankton issues, two of them specifically with HAB, namely with the harmful dinoflagellate species detection and dinoflagellate cysts distribution in the Yellow Sea. Two Russian papers were on studies of

benthos community structure and distribution in the Peter the Great Bay and north-eastern Sakhalin shelf areas. Acoustic visualization of vertical biota distribution and site-specific factors affecting reproduction of colonial sea birds were topics for two other presentations. Two scheduled but not presented (due to presenter absence) talks were devoted to the contamination monitoring in the fish body and trophic ecology of micronektonic crustacean assemblages.

Among studied characteristics, quantitative distribution and, rarer, community structure were among the main objects in ten presented studies. New details were found in the vertical distribution of oncaeid copepods, micronektonic crustaceans, and larger nektonic animals as fish and baleen whales. Marine birds' colony distribution with respect to the variety of marine habitats affects their nesting success through the bottom-up, top-down, timing mismatch and colony-specific factors. Chlorophyll, zooplankton and fish distribution appear to be closely related to the vertical and horizontal water mass structure. Fine methods of investigation were presented in the studies of molecular population structure of euphausiids, metabolic rate measurements for copepod, harmful dinoflagellate species detection, and the biological effect of contamination in common benthic fish species. Two talks were devoted to fish stock fluctuations in relation with climate change and oceanographic regime shifts. Age determination using otoliths structure can be considered as routine ichthyologic procedure, however, it allows clarification of the age structure of two tropical flatfish species and has important consequences for fishery management.

The beginning of the session was not well attended due to an overlap with the popular CCCC Topic Session. However, the Committee would like to emphasize that most presentations at the BIO Paper Session were made by young scientists. Paper sessions with more general

topics can serve as a suitable mechanism for young scientist involvement at the PICES Annual Meetings and activities. Avoidance of

time conflict with another major session would be desirable.

List of papers

Oral presentations

Kaoru Nakata, Hiroshi Itoh, Kiyo Kurita and Hiroshi Kiyosawa

Seasonality in the oncaeid copepods in the epipelagic layers of the subtropical water off Kuroshio

Hye-Seon Kim, Ho-Young Soh, Yang-Ho Yoon, Doo-Jin Hwang and Sang-Duk Choi

Molecular population structure of the euphausiid *Pseudeuphausia sinica* from the Northeastern Asia

Vitali Dudarev and Vadim Savinikh

On the fluctuations of sardine-iwashi abundance

Alexey A. Baytalyuk and Vadim F. Savinykh

Abundance dynamics of pacific saury (*Cololabis saira*) in the northwestern Pacific Ocean

Felipe Amezcua, Ivan Martínez-Tovar and Yanira Green

Use of otoliths to determine the age and growth of two subtropical flatfishes, *Cyclopsetta querna*, and *Cyclopsetta panamensis* (Pleuronectiformes: Paralichthyidae), off the southeast coast of the Gulf of California, Mexico

Robert Suryan, David Irons, Evelyn Brown, Patrick Jodice and Daniel Roby

Site-specific factors affecting productivity of an upper trophic level marine predator: Bottom-up, top-down, and mismatch effects on reproduction in a colonial seabird

Posters

Tatyana A. Belan, Elena V. Oleynik, Valentina D. Budaeva, Luisa N. Propp, Marina S. Selina, Vyacheslav G. Makarov and Ludmila S. Belan

Productivity of pelagic communities and distribution patterns of benthos on the continental shelf and slope of the Okhotsk Sea along NE Sakhalin Island

Eun-Seob Cho

PCR-based assays for detecting ichthyotoxic *Cochlodinium polykrikoides* (Gymnodiniales, Dinophyceae) in the South Sea of Korea

Hung-Yen Hsieh, Wen-Tseng Lo, Don-Chung Liu and Wei-Cheng Su

Spatial distribution of fish larvae in relation to hydrographic conditions in the waters around Taiwan

Morio Ichihara, Kazushi Miyashita, Hiroto Murase, Hikaru Watanabe and Shigeyuki Kawahara

Acoustic visualization of the relationship between ocean structure and the vertical distribution of biota in the Kuroshio-Oyashio Transition Zone (KOTZ)

Tsutomu Ikeda, Fumikazu Sano and Atsushi Yamaguchi

Metabolic characteristics of meso- and bathypelagic copepods in the Oyashio region, western North Pacific Ocean

Sam Geon Lee and Seung Heo

The distribution of modern dinoflagellate cysts in the Yellow Sea

Vladimir I. Dulepov and Natalia N. Lelyukh

Study of macrobenthos communities in Peter the Great Bay using an underwater vehicle

Akihiro Shiomoto, Kosei Sasaoka, Mitsuhiro Toratani and Shinji Hashimoto

Relatively high chlorophyll *a* spots in the offshore subarctic North Pacific in summer

FIS Paper Session (FIS)

Convenor: Yukimasa Ishida (Japan)

Background

Fishery science in PICES has a broad field due not only to its species diversity, but also the wide geographical range in the North Pacific

Ocean. Therefore, a specific topic session sometimes does not cover the need of fisheries scientists of PICES member countries. At the FIS meeting at PICES XI (2002), it was noted that there was no FIS Paper Session, and it was

pointed out that convening such a session at PICES XII would enhance FIS activities in PICES and allow participation by more fisheries scientists with different interests. The FIS Paper Session is also a good way to keep opportunities open for students to give presentations. These ideas were also confirmed at the FIS meeting at PICES XIII (2004). The FIS Paper Session in 2004 received 36 papers on various fishery species, submitted by scientists including some from non-PICES countries.

Summary of presentations

The session consisted of 12 oral presentations plus 24 posters. The first half of the session consisted of various topics such as recruitment process of small pelagic fish, analysis fish by-catch, and impact of global change on fisheries resources of a coastal ecosystem. The Kuroshio Current and its branch transport a large amount of the egg of Japanese jack mackerel, and larvae spawned and hatched in the southern East China Sea, north-eastward into the nursery grounds off southern Japan. The relationship between the abundance of small larvae and juveniles suggested that larval survival highly fluctuates

List of papers

Oral presentations

Chiuyuki Sassa and Yoshinobu Konishi

Recruitment process of the Japanese jack mackerel in the East China Sea (ECS) - Spawning ground and larval transport into fishing grounds

Motomitsu Takahashi, Yoshiro Watanabe, Hiroshi Nishida and Akihiko Yatsu

Interannual variation in growth of larval and early juvenile Japanese anchovy in the Kuroshio-Oyashio transition region

Ivan Martinez Tovar, Felipe Amezcua Martinez and Juan Madrid Vera

Analysis of fish bycatch from the commercial shrimp fleet in the Southeast Gulf of California

Ling Tong and Qisheng Tang

Impacts of global change on fisheries resources of a coastal ecosystem

Hiroshige Tanaka, Akinori Takasuka, Ichiro Aoki, Seiji Ohshimo and Yoza Wada

Geographical variations in carbon and nitrogen stable isotope ratios of Japanese anchovy *Engraulis japonicus*

Michael J. Schirripa, Jim J. Colbert and Omar Rodriguez

Interannual changes in Pacific hake (*Merluccius productus*) growth in response to oceanographic conditions

Mikhail A. Stepanenko

Environmental differentiation of pollock reproduction in the Bering Sea

Oleg A. Bulatov

Pollock fishery and total allowable catch in the Bering Sea

Tetsuichiro Funamoto, Keizo Yabuki and Satoshi Honda

Temperature-dependent stock-recruitment model for walleye pollock around Hokkaido, Japan

Jennifer P. Stahl and Gordon H. Kruse

Maturation of walleye pollock, *Theragra chalcogramma*, in the eastern Bering Sea in relation to temporal and spatial factors

year to year probably due to wind and current effects. About the impacts of global change of fisheries resources of a coastal ecosystem, indices of primary production, zooplankton biomass and fish productivity were used to describe the ecosystem productivity at different trophic levels. The results indicate that substantial variation in ecosystem productivity is one of the important characteristics of coastal ecosystem dynamics.

The second half of the session consisted of six walleye pollock presentations. Three issues for pollock fishery managements in the Bering Sea were raised, stock structure, the precision of stock assessment methods, and the magnitude of the exploitation rate. The diet of juvenile walleye pollock analysis revealed that seasonal variation in juvenile pollock diet and condition exists, but its effect on nutritional stress, and perhaps fish survival during winter, might be tempered by geographic variation in prey resources. Stock-recruitment relationship for Japanese local pollock stocks were examined and suggested that the recruitments are affected by sea surface temperature rather than density dependent factors.

Yong-Woo Lee, Bernard A. Megrey and S. Allen Macklin

Predictability of future recruitment by parametric and non-parametric models: Case study of Gulf of Alaska walleye pollock

Andre Buchheister and Matthew T. Wilson

Differential food habits as a mechanism for seasonal and geographic variation in juvenile walleye pollock condition in the western Gulf of Alaska

Posters

Felipe Amezcua, Juan Madrid and Hugo Aguirre

Effect of the artisanal shrimp fishery on the ichthyofauna in a subtropical coastal lagoon in the Gulf of California

Alexander V. Buslov and Oleg B. Tepnin

New data on walleye pollock spawning in waters of the Commander's Islands Preserve

Elena Dulepova

Trophic relations of chum (*Oncorhynchus keta*) and pink salmon (*O. gorbuscha*) in the western Bering Sea

Yukimasa Ishida, Tomonori Azumaya, Masaaki Fukuwaka and Toru Nagasawa

Estimation of catch efficiency of salmon gillnets, distance traveled by salmon, and salmon density in the Bering Sea

Nozomi Ishiko, Hidetada Kiyofuji and Sei-Ichi Saitoh

Prediction of Pacific saury fishing grounds based on physical variability derived from daily satellite remote sensing data

Eun-Jung Kim, Suam Kim, Dae-Yeon Moon and Jeong-Rack Koh

The variations in distribution, catch, and biology of skipjack tuna (*Katsuwonus pelamis*) induced by climate variability

Hee-Yong Kim, Atsushi Kaneda, Taisuke Inai, Xinyu Guo and Hidetaka Takeoka

Effect of the Kuroshio frontal eddy on the recruitment of jack mackerel larvae and juveniles in the Bungo Channel, Shikoku, Japan

Sergey G. Korostelev and P.M. Vasilets

Changes in the composition of demersal fish communities on the western Kamchatka shelf under the influence of fishing

Sergey V. Loboda and Pavel V. Vorobyov

Influence of commercial fishing on the stock conditions of Pacific herring from the northern part of the Okhotsk Sea

Ole A. Mathisen and Lowell Fair

Density dependent growth of sockeye salmon in the ocean

Alexander Nikolaev and Michail Kuznetsov

Acoustic methods for monitoring and ecosystem studies in the Bering and Okhotsk Seas

Todd Sandell, Kym Jacobson, David Teel and Edmundo Casillas

The distribution and prevalence of Bacterial Kidney Disease (*Renibacterium salmoninarum*) in juvenile chinook and coho salmon in the Northeast Pacific Ocean

Anatoly V. Smirnov

Environmental impact of interannual variability of Okhotsk Sea pollock abundance

Gennady V. Avdeev, Anatoly V. Smirnov, Evgeny E. Ovsyannikov and Svetlana L. Ovsyannikova

Variability in sex ratio of the northern Okhotsk Sea walleye pollock spawning stock in 1997-2002

Katsuya Suzuki, Tsutomu Takagi, Shinsuke Torisawa and Kazushi Miyashita

Video analysis of the schooling behavior of Japanese surfmelt (*Hypomesus japonicus*) under light and dark conditions using a mathematical model

Andrey V. Vinnikov, Dmitry A. Terentiev, Alexei M. Tokranov and Boris A. Sheiko

The preliminary estimation of abundance of some fishes in adjacent waters of the Commander Islands by results of bottom long-line catching in 1995-1997

Songguang Xie and Yoshiro Watanabe

Hatch-date dependent difference in growth and development of jack mackerel *Trachurus japonicus* during early life stages recorded in otolith microstructure

Songguang Xie, Yoshiro Watanabe, Toshiro Saruwatari, Reiji Masuda, Yoh Yamashita, Chiyuki Sassa and Yoshinobu Konishi

Growth and morphological development of sagittal otolith of jack mackerel *Trachurus japonicus* in larval and early juvenile stages

Chang Ik Zhang, Jae Bong Lee and In-Ja Yeon

Current status of ecosystem-based fisheries management in Korea

CCCC/REX Workshop (W2)

The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim

Co-Convenors: Kaoru Nakata (Japan) and William T. Peterson (U.S.A.)

Background

The REX Task Team has the responsibility of developing inter-comparisons among regional coastal marine ecosystems. For PICES XIII, REX proposed a comparison of the seasonal cycles of plankton production at sites around the Pacific Rim. Given that a long-term goal of the CCCC Program is the application of models to understanding the influence of climate variability on plankton and fish production in the North Pacific, a near term goal is to learn more about (a) the influence of climate variability on plankton production cycles, and (b) to determine if we can model the seasonal cycle of plankton production with the NEMURO model in many sites around the Pacific Rim.

We need to locate as many site-specific studies as possible that have several years of observations on as many "boxes" in the NEMURO model as possible in order to facilitate model verification studies at some point in the future. Since NEMURO is an NPZ model, successful model-data comparisons will require data on temporal changes in light, nutrients, phytoplankton, and zooplankton over (ideally) several seasonal cycles. Although the long-term goal of the workshop was to facilitate model-data comparisons at many sites around the Pacific Rim (including the Bering Sea), the proximate goal was to discuss linkages and time lags between primary and secondary production cycles, and where possible, the potential match-mismatch between phytoplankton and zooplankton biomass cycles and the spawning and growth of important fish species.

Summary of presentations

The workshop was convened on Thursday, October 14, 2004. At least 43 were present, with most participants attending the full day. The workshop was opened with a few brief remarks from William Peterson, followed by a presentation from Francisco Werner, an

overview of results from the APN/PICES modeling workshop that was held October 10-13, 2004. The participants were reminded of the efforts within the MODEL Task Team to incorporate geographic variations in the growth of fish, especially on herring, into the NEMURO model.

The opening talk was an invited presentation by Yasuhiro Yamanaka. He reviewed the work of his group on the development of e-NEMURO (extended-NEMURO). The original NEMURO model was developed for sub-arctic ecosystems; the "e" means that the model has now been "extended" to include sub-tropical ecosystems. In addition, NEMURO was coupled to a 3-D circulation model which produces interesting (and perhaps even realistic) projections of the impact of climate change on ecosystem structure in the western Pacific. The model focused on phytoplankton, and predicts an earlier spring bloom as well as the co-existence of both subarctic and subtropical species. The suggestion was made that perhaps e-NEMURO could be viewed as an analogue to Dynamic Vegetation Models that are popular in terrestrial ecosystems.

Hiromi Kasai followed with a discussion of the variability and timing of the spring bloom in Oyashio waters through analysis of the A-Line database. Monitoring of the A-Line (Akkeshi Line) off Hokkaido has been done since 1990, and most of the data are freely available on line. Kasai compared the data from 1990-1997 to 1998-2003 to test the hypothesis that a regime shift occurred in 1998 that was detectable in the Oyashio. The recent period has lower nitrate concentrations, higher phytoplankton in spring and autumn, and higher zooplankton in spring but not autumn, and increased stratification in summer.

Atsushi Yamaguchi discussed interannual variations in seasonal timing of the recruitment of the larger copepods (Metridia, Neocalanus,

Eucalanus) at Site-H (off Hokkaido), based on sampling in 1996-1997 and 2002-2004. *Metridia pacifica* had two recruitment periods per year, whereas all other species had one recruitment period. *N. cristatus* recruit in winter, *N. flemingerii* in March and *N. plumchrus* and *E. bungii* in May. In 2003, a salp bloom associated with a warm core ring affected the recruitment of *N. plumchrus* and *E. bungii*, but not the other species.

Kaoru Nakata discussed seasonal differences in plankton community structure in the subtropical waters of the Kuroshio along the O-Line (Cape Omaezaki) off Honshu Island. Her work is part of a new 5-year study, initiated in 2002, that is looking at the impact of climate variability on planktonic ecosystems in Japanese waters. She found that pico-size eukaryotic phytoplankton dominated in winter, centric diatoms were always uncommon, heterotrophic nano flagellates and ciliates were most abundant in spring and lowest in autumn. Small copepods showed no seasonal cycle; larger copepods had lowest biomass in summer but somewhat higher in autumn through spring.

Toru Kobari presented a similar study, on seasonal changes in plankton biomass, production and community structure from pico- to mesoplankton samples collected monthly to bimonthly, at a coastal site off southern Japan off Kyushu Island. Bacteria, autotrophic nano-flagellates (ANF) and copepods dominated plankton biomass throughout the year, however, there were no seasonal variations in phytoplankton and zooplankton biomass. Kobari presented a box model of the plankton dynamics that was clearly ready to be tested with a NEMURO-like model. He concluded that his study site was probably influenced by advection of coastal waters of low salinity from the East China Sea.

Hyung-Cheol Kim discussed the influence of winds and stratification on seasonality of phytoplankton blooms in the Japan/East Sea. The seasonal dynamics of phytoplankton in the central Japan/East Sea showed pronounced year-to-year variability as observed from SeaWiFS (1997~now) and MODIS/Terra (2000~now).

The authors analyzed the daily remotely-sensed wind stress data (AMI-wind, NSCAT and QuickSCAT: 1997~2003) and daily Chl-a concentration from ocean color data. The results were as follows. In spring, phytoplankton bloom started 6~10 days after the wind weakened. In fall, blooming started 1~4 days after the winds strengthened, which mixes water and supplies nutrients to the euphotic layer.

The first talk after lunch was by our other invited speaker, Young-Shil Kang. She spoke on the variability in seasonal cycles of zooplankton in the seas surrounding the Korean peninsula. Three time periods were compared: 1966-1976, 1977-1988 and 1989-2000. Zooplankton biomass showed a typical seasonal cycle with two peaks in spring and autumn. The waters to the west and south of Korea showed a similar seasonal variation in zooplankton biomass, while waters to the east were different. Zooplankton biomass showed a large peak in February and April during the first time period, only a small peak in October in the second period, but peaks in April and October in the 3rd period (1989-2000). Euphausiids showed peaks in April and October in third period, while a small peak in June in the second period.

Christine Abraham discussed the seasonal cycle of euphausiids in the California Current System from the perspective of a predator, the Cassin's auklet. Relative abundance of euphausiids in the stomachs of these birds was used as an index of relative abundance of krill in the ocean. Off Central California *Euphausia pacifica* were more important in the diet in early spring, whereas in early summer *Thysanoessa spinifera* was most prevalent. During "warm years", *Nyctiphanes simplex* were taken (1993-1995; 1998; 2003). In the southern California Current, *N. simplex* dominated, followed by *T. spinifera* and *Nematoscelis difficilis*. This results seems to match the ecology of these species: *N. simplex* is common in the coastal zone of the South California Current; *T. spinifera* is a coastal species throughout the California Current; *E. pacifica* (a Sub-Arctic species) is more abundant in the North and *N. difficilis* is more abundant in the south.

William Peterson summarized results of his coastal ocean monitoring program centered off Newport, Oregon. Measurements of hydrography, nutrients, chlorophyll and zooplankton biomass and species composition have been made at bi-weekly intervals for nine years, beginning in spring 1996. Climatological seasonal cycles were shown with the result that nitrate concentrations tend to peak in late spring, phytoplankton (as chlorophyll) in June-July and copepod biomass in August and September. There was strong cross-shelf variation in variability of all measurements, with the strongest seasonal cycle in mid-shelf waters. Copepods dominated the zooplankton biomass in shelf waters whereas at the shelf break, euphausiids were usually equal to copepods.

Thomas Wainwright delivered the final talk, on the application of the NEMURO model to the Newport data set presented by Peterson. He coupled NEMURO to a 1-D cross-shelf mixed layer model so as to capture the cross-shelf variations in hydrographic and plankton dynamics. Analyses were conducted over 7 years (1997-2003), and the model was found to be stable over this period. The model simulated well the nitrate and phytoplankton responses at all locations modeled. The model does not reflect the observed spatial distribution of copepods, apparently transporting them offshore too rapidly. Despite this, the model may adequately reflect the seasonal dynamics of copepods when summed across the shelf region. Thus, the model may provide a useful translation of upwelling indices to biological production.

List of papers

Oral presentations

Yasuhiro Yamanaka, Naoki Yoshie, Taketo Hoshioka and Michio J. Kishi (Invited)

Extension of NEMURO to represent habitat segregation of plankton groups in the western North Pacific

Hiroimi Kasai and Tsuneo Ono

Variability in timing and magnitude of the spring bloom in the Oyashio water: An analysis from the "A-line" oceanographic database (1990-2003)

Atsushi Yamaguchi, Tsutomu Ikeda, Toru Kobari, Gadi Padmavati, Satoko Shoden, Sei-ichi Saitoh and Kenshi Kuma

Year-to-year variations in developmental timing of large grazing copepods at Site H in the Oyashio region

Kaoru Nakata, Kiyotaka Hidaka, Yutaka Hiroe, Akihiro Shiomoto, Tomoo Watanabe, Kosei Komatsu, Kiyo Kurita and Hiroshi Kiyosawa

Seasonality in the community structure of planktonic ecosystem in the epipelagic layers of the subtropical water off Kuroshio

Toru Kobari

Seasonal changes in plankton biomass, production and community structure in southern Japan

Hyun-Cheol Kim, Sinjae Yoo and Im-Sang Oh

Relation between phytoplankton blooming and wind stress in the central Japan/East Sea

Young-Shil Kang (Invited)

Variability in seasonal cycles of zooplankton in the seas surrounding the Korean peninsula

Christine L. Abraham, Shaye G. Wolf, J. Mark Hipfner and William J. Sydeman

The seasonal cycle of euphausiid zooplankton in the California Current system: A predator's perspective

William Peterson, Rian Hooff, Leah Feinberg and Tracy Shaw

Seasonal cycle of nutrients, phytoplankton and zooplankton in the coastal upwelling zone off Oregon, U.S.A.

Thomas C. Wainwright, Rian C. Hooff and William T. Peterson

Seasonal dynamics of plankton in the northern California Current ecosystem: A model-data comparison

Posters

Hui Liu, Laura M. Slater, Cheryl Clarke and Russell R. Hopcroft

Growth rates, fecundity and development times of *Neocalanus flemingeri* in the Gulf of Alaska: A synthesis of laboratory and field approaches

Alexei I. Pinchuk and Russell R. Hopcroft

Egg production and early development of *Thysanoessa inermis* and *Euphausia pacifica* (Crustacea: Euphausiacea) in the northern Gulf of Alaska

Hyeon-Gyeong Jeong, Ho-Young Soh, Yang-Ho Yoon and Hae-Lip Suh

Seasonal variation of the neustonic zooplankton community in the central region of the South Sea, Korea

Yeong-Ha Jung, Hyung-Ku Kang and Yong-Joo Kang

In situ egg production rate of the planktonic copepod *Acartia steueri* in Ilkwang Bay, southeastern coast of Korea

CCCC Workshop (W3)

Linking open ocean and coastal ecosystems II

Co-Convenors: Kerim Aydin (U.S.A.), Shin-ichi Ito (Japan), Jin-Yeong Kim (Korea), Gordon A. McFarlane (Canada) and Akihiko Yatsu (Japan)

Background

This workshop aimed to develop approaches for synthesis of the CCCC Program on the basis of review of ongoing Task Team activities on modeling of lower trophic levels (NEMURO), forage species (NEMURO.FISH) and upper trophic levels (ECOPATH/ECOSIM) on multiple regions of the North Pacific. The workshop consisted of three components:

1. A critical evaluation of regional and basin-wide trophic models with a focus on the recent results of the BASS, MODEL and REX Task Teams. The development of complementary and comparable approaches to: (a) modeling connections between climate and ecosystems, lower and upper trophic levels, and coastal and oceanic regions; and (b) incorporating seasonal dynamics.
2. As a specific example, the examination of climate-driven processes underlying changes in the distribution (expansion and contraction) of Pacific sardines.
3. Identification of the major issues and gaps in knowledge relating to the understanding of changes in ecosystems under a changing environment, and recommendation of how to develop a new Task Team CFAME (Climate Forcing And Marine Ecosystem Response) in collaboration with the MODEL Task Team.

Summary of presentations

The workshop included 9 oral presentations and 3 poster presentations. Kerim Aydin presented results of modeling of subarctic gyres by the BASS Task Team and scope of expansion for

seasonal and geographic linkages. Shin-ichi Ito described results of the MODEL Task Team on coupled lower trophic level - fish models (NEMURO.FISH) applied to Pacific saury and herring. Application of NEMURO to any regions with lower trophic seasonal data became possible by using a calibration software. Expansions of NEMURO to subtropical regions and to a 3-D model are also on-going. The REX Task Team (William Peterson) reviewed the preceded workshop titled "The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim". NEMURO was found effective in the modeling of seasonal variability of lower trophic level.

Kosei Komatsu presented an example of expansion of NEMURO coupled with the Ocean General Circulation Model to Kuroshio and the Kuroshio Extension. Using hake in the California Current as a case study, Vera Agostini concluded that habitat and life history and their links to environment are important in modeling with appropriate geographic scale. Alec MacCall reviewed climate-driven cyclic changes of dominant small pelagic fishes in the California Current and the Kuroshio Current. He also presented the flow hypothesis that a slower current is favorable for three sardine populations in the Pacific.

In the sardine section, Jake Schweigert and Akihiko Yatsu reviewed the biology and population dynamics associated with environmental factors for California sardine and Japanese sardine, respectively. On the basis of otolith daily growth and survival rates of Japanese sardine, Motomitsu Takahashi hypothesized that temperature condition in the

nursery area is critical if prey is sufficient, based on the inverse relation in growth and survival rates of simultaneously collected juveniles of Japanese sardine and anchovy. A modeling approach for sardine life history was thought promising with combinations of 3-D NEMURO.FISH, "individual based model", ECOSIM and possibly age structure models.

Through the discussion, it was concluded that CFAME synthesis projects should 1) begin with a specific testable hypothesis, 2) quantify our state of knowledge on that hypothesis including communication of key uncertainties, 3) recommend sampling/expeditions/symposia/modeling approaches focused on the hypothesis. An overall hypothesis with testable sub-hypotheses were developed for the following CFAME Task Team meeting.

List of papers

Oral presentations

BASS Task Team

Results of upper trophic level ("whole ecosystem") modeling of the subarctic gyres

MODEL Task Team

Results of coupled lower trophic level-fish models (NEMURO-FISH)

REX Task Team

Overview of REX workshop on seasonal cycles of nutrients, phytoplankton and zooplankton and discussion of opportunities for model/data comparisons among coastal ecosystems around the Pacific Rim

Kosei Komatsu (Invited)

Modeling of transportation of phyto- and zooplankton in the Kuroshio and Kuroshio Extension

Vera N. Agostini (Invited)

Modeling the California Current ecosystem: Can the small inform the large?

Alec D. MacCall (Invited)

Climate-driven fluctuations in fish stocks of the California Current

Jake Schweigert

Recent distribution and ecology of sardines in the north-eastern Pacific Ocean

Akihiko Yatsu, Masayuki Noto, Minoru Ishida, Hiroshi Nishida and Maki Suda

A review of the population dynamics of Japanese sardine in the Northwestern Pacific

Motomitsu Takahashi, Hiroshi Nishida and Akihiko Yatsu

Preliminary study of growth of larval and early juvenile Japanese sardine in the Kuroshio-Oyashio transition region

Posters

Shin-ichi Ito, Miciho J. Kishi, Akihiko Yatsu, Yoshioki Oozeki, Kosei Komatsu, Yasuhiro Yamanaka, Bernard A. Megrey and Francisco E. Werner

An application of NEMURO.FISH for multi-species modeling

Jin Yeong Kim, Eun Seob Cho and Woo-Jin Kim

Population genetic characteristics of the Japanese anchovy, *Engraulis japonicus*, in Korean waters

Yury I. Zuenko, Victoria V. Nadtochy and Marina S. Selina

NPZ monitoring in the coastal area of the Japan Sea

PICES/CLIVAR Workshop (W4)

Scale interactions of climate and marine ecosystems

Co-Convenors: Richard J. Beamish (Canada/PICES), Kuh Kim (Korea/PICES) and Kelvin Richards (U.S.A./CLIVAR) and Ichiro Yasuda (Japan/PICES)

Background

The physical climate system varies on a range of scales: changing storminess and severe weather,

recognized modes of variability (such as NAO, PDO and ENSO), and changes to mean global characteristics. Likewise the marine ecosystem has many interacting scales: small-scale

patchiness *versus* regional, shelf *versus* deep-sea populations, and individuals *versus* communities. The goal of the workshop went beyond the current level of physical climate indices/biological population correlations to formulate causal relationships between the changing physical and biological systems, to understand the direction of energy flow and “information,” and to assess the impact of biological “filtering” of long-lived species on climate signals. The workshop brought together experts in the physical oceanography of the Pacific, climate dynamics, marine ecosystems, biogeochemistry and fisheries.

Summary of presentations

The workshop was charged with the task of producing statements on our present understanding, or lack thereof, of the impact of climate variability on the marine eco- and biogeochemical system, on what we can hope to extract from combining extant datasets, and on strategies for numerical experimentation, observational networks and data assimilation that will improve our knowledge and predictive capabilities. There were 20 presentations and structured discussion over the two-day workshop. It was clear from the outset that the charge reached beyond present capabilities, and that what was required was the development of a paradigm and context for addressing such issues; in this regard the workshop was successful. There were examples of physical-biological interactions from throughout PICES waters. These included watermass limits on the west coast of North America, mixing and advection in the Gulf of Alaska, differences in regional ocean productivity in the Bering Sea, and influence of El Niño on frontal structures and productivity in the central Pacific. What was clear is that there exist low-frequency/high-amplitude changes in different marine populations throughout the Pacific, that these changes can often be linked to physical changes, but that they are mediated through different life-history strategies. For example there are *opportunistic* (fast growing,

short lived), *periodic* (slow growing, high fecundity), and *equilibrium* (fast growing, long lived, low fecundity) species. These groups can interact, as an *opportunistic* strategy is to “out run” their controls. Wind stress influences the ocean in two ways, through direct surface transport which influences SST patterns and mixing, and through Ekman Pumping (current divergence) which influences deeper thermocline response. While low-frequency/high-amplitude examples in ecosystems are often referred to as regime shifts, there was debate about its definition in the physical domain. Some supported the concept that white-noise stochastic atmospheric forcing and a one-year ocean memory can create regime-like features in oceanic time series, while others noted physical processes and statistical tests supporting long-memory regime behavior; the nearly one hundred years of record is not long enough to choose between these conceptual models. A. Bakun summarized our situation as “physics legislates and biology finds and exploits loopholes.” A way forward is through “upscaling”. Conceptual or numerical models can develop hypotheses about specific local connections. These processes are linked to regional indicators and then to large-scale physics, *e.g.*, zooplankton to upwelling to ENSO. Once this link is established, the normally long large-scale time series can be used for historical hindcasts or climate models can generate forecast scenarios (downscaling). Integrated Management approaches are going the same route by defining *operational objectives* about an ecosystem, establishing regional indicators and reference points, and establishing monitoring programs on several scales. It was also clear from the workshop that models are becoming major tools, expanding beyond NPZ models, and that satellite data is useful in spanning scales. The connection between CLIVAR and PICES in the North Pacific was fruitful, and future cooperation would be useful for both groups, *e.g.*, evaluation of future climate/ecosystem projections.

List of papers

Oral presentations

Jacquelynne R. King and Gordon A. McFarlane (Invited)

Implications of climate regime shifts on the management of marine resources

Shoshiro Minobe (Invited)

Global linkages of decadal variability over the North Pacific Ocean

Elizabeth A. Logerwell and Anne B. Hollowed (Invited)

The impact of environmental variability on the effectiveness of fisheries management strategies

Arthur J. Miller (Invited)

Regional impacts of large-scale climate variations on the Pacific Ocean ecosystem

Vladimir I. Radchenko

Coincidence of pink salmon catch trends among the odd-years and even-years populations: Regional and basin scale views

Eleuterio Yáñez, Claudio Silva and María Angela Barbieri

Low frequency environmental fluctuations and main Chilean pelagic fisheries

Franz J. Mueter and Bernard A. Megrey

Spatial scales and magnitudes of covariation among fish populations in the Northeast Pacific

Paul D. Spencer and Tom W. Wilderbuer

Relationships between environmental variability and eastern Bering Sea flatfish population distributions

Troy W. Buckley and Stanislaw Kotwicki

Consideration of spatial scale when assessing the influence of environmental variability on walleye pollock in the eastern Bering Sea

Peter W. Lawson

Climate impacts on OPI coho salmon, *Oncorhynchus kisutch*, production: Insights from a species sensitive to habitat change at daily to centennial time scales

S. Lyn McNutt, Two Crow (AKA, Jim Schumacher) and Phil Mundy

Integrated adaptive management applied to the Gulf Ecosystem Monitoring and Research (GEM) Program

Nathan J. Mantua (Invited)

To upscale or downscale? Thoughts on bridging disparate scales of space and time in linking the planetary to the plankton

Sinjae Yoo, Hyun-Cheol Kim and Stewart M. McKinnell (Invited)

Variability of Chl-a in the North Pacific marine ecosystems

Sei-ichi Saitoh and Takahiro Iida (Invited)

Temporal and spatial variability of phytoplankton biomass and productivity in the Bering Sea in relation to climate variability

Cara Wilson, Steven J. Bograd and Franklin B. Schwing (Invited)

Temporal variability of sea surface chlorophyll and biophysical coupling in the Pacific

Yi Chao and Fei Chai (Invited)

The impact of Pacific climate forcing on marine ecosystem

Ichiro Yasuda and Hiroaki Tatebe

Tide-induced North Pacific Intermediate Water circulation and impact on climate

Vladimir I. Ponomarev, Aleksandr S. Salomatina, Dmitry D. Kaplunenko and Natalya I. Rudykh

Relationship of different scales of climate variability in the Asian Pacific

Richard A. Feely, C. L. Sabine, R. Wanninkhof, A. Murata, R. Key, C. Winn, M. F. Lamb and D. Greeley (Invited)

CLIVAR/CO₂ Repeat Hydrography Program in the North Pacific Ocean

Raghu Murtugudde (Invited)

Tropical and extratropical modes of ecosystem variability

Poster

C. Franco-Gordo, E. Godinez-Dominguez and J. Freire

Interannual variability of the diversity and ichthyoplankton community in the central Pacific off Mexico

MEQ Workshop (W5) and HAB Meeting *Developing a North Pacific HAB data resource - II*

Co-sponsored by the Intergovernmental Oceanographic Commission (IOC)

Co-Convenors: Henrik Enevoldsen (Denmark/IOC), Hak-Gyoon Kim (Korea/PICES) and Vera Trainer (U.S.A./PICES)

Background

Harmful Algal Blooms (HABs) comprise rapid growth of both toxic and non-toxic species, and affect the marine ecology and economy of coastal nations. Monitoring and research activities aimed towards achieving effective HAB predictive and mitigation strategies are underway in each PICES member nation, in many cases dealing with similar organisms or problems. These efforts will benefit from building a common data resource among PICES nations that allow inter-comparison of HAB species composition and the magnitude of environmental and economic impacts. During the PICES XII “Data Harmonization” workshop, national representatives accepted an offer from IOC and ICES to utilize their successful harmful algal database (HAE-DAT) format on a trial basis. The goal of this data workshop was to provide an interim “report card” on the use of this database. The central tasks were:

- ascertain how well the database process worked;
- identify any difficulties in data delivery from member nations;
- assess the effectiveness of the interactive web-based window to the developing resource; and
- determine if further modifications are needed to encompass unique aspects of Pacific Rim marine resources..

Summary of presentations

Nicolaus Adams (U.S.A.) reported that differentiating separate events within sites is difficult given the large segments. Additional information on the form including magnitude of event, duration of event, the number of sites tested, maximum level of toxin, number of tests completed and number of tests above regulatory limit would be helpful. The online form was

easy to use and self-explanatory. Problems arose with reconciling HAE-DAT reports, ascertaining who the data is presented for, what specificity of data was needed, how events are separated, and what data is useful. A suggestion was made to add a more generalized row to input information on what type of “event” is being described.

Ming-Yuan Zhu (China) reported that HABs in China have apparently been increasing rapidly since the 1980s. Routine weekly monitoring started in the 1990s, and 11 red-tide monitoring areas are recognized and used for HAE-DAT data reporting. Most of the historical data is limited to information on location, time, species, economic loss and area affected. Data are hard to access due to various (regional, national and provincial) monitoring centers having responsibility for data, and possible sensitivity issues arising from data sharing. There is difficulty assessing what a “harmful event” is, *e.g.*, should all events be recorded and what levels of toxin are needed in order to record an event as harmful.

Hak-Gyoon Kim (Korea) reported that focus in recent years in his country has been on *Cochlodinium* blooms. Difficulties associated with the HAE-DAT form involve the limited (general) information to be entered. Information on magnitude, density and persistence of events is important. Difficulties arise from inconsistent data among countries and the data base process. Separation of red-tide and shellfish events as well as information on successional changes would be helpful.

Ichiro Imai (Japan) focused on aquaculture in Japan (finfish, shellfish, seaweed) that is impacted by HABs. Types of phytoplankton that cause problems include *raphidophytes*, *Chattonella*, *Heterosigma*, *Dinophysis*, *Karenia*,

Cochlodinium, *Heterocapsa* (kills bivalves) as well as the diatoms *Coscinodiscus*, *Eucampia*, *Skeletonema* (damaging to *Nori* culture, especially in winter - bleaching is bad for product and prices). Problems of HAB toxins are PSP and DSP. Currently, Japan has no ASP problem. Each of Japan's 47 prefectures monitors for red-tide, toxic bloom and shellfish poisoning, therefore there is a large amount of data. For the HAE-DAT trial, primarily *Cochlodinium* blooms were entered into the database. There are a large number of incidents. Japan decided to use 7 zones or "area codes" for HAE-DAT. Data entry is labor intensive. For this year's trial, Japan specifically selected those HAB incidents that caused fishery damage.

Tatiana Orlova (Russia) reported on the limited information entered into HAE-DAT forms. Information submitted included general information, dates and species causing events. Very limited toxicity data is available due to a lack of monitoring efforts. There was difficulty with recommended area confinements, and limited data for the recommended one year of the trial. Three years of data were considered for HAE-DAT inclusion, and the Russian Federation administration territories were used as areas.

Robin Brown (Canada), on behalf of Angelica Peña and Melanie Quenneville, reported that western Canadian HAB research is focused on harmful species affecting aquaculture operations. A large coastline has made comprehensive monitoring difficult, and data consists of marine shellfish toxicity data only. There was difficulty in deciding what constitutes an event. Those measurements where toxin was recorded above the regulatory limits were used. HAE-DAT forms are limited in the ability to comment on annual trends and previous occurrences. Area guidelines of fishery regulation areas were consolidated and used for reporting. No information on environmental parameters or microalgal abundance/presence is available. There are questions involving duration of events, variable data and definition of events, and as to whether the limited data entered for most events would be useful

scientifically. Data are difficult to compare between countries.

Robin Brown also spoke about possible areas where TCODE could integrate with HAB data activities. Some TCODE areas of priority include: data exchange, subject area prioritization, development of standards, identification of resources and collaborations.

Jeanne Allen spoke about Gulf of Mexico data integration. To date, the National Coastal Data Development Center (NCDDC, U.S.A.) has focused on *K. brevis*, through the incorporation of data from five Gulf of Mexico states plus Mexico, including data from government and private labs. Data accessibility was the key component to successful integration. Her presentation stressed the importance of open sharing of data as a key to success in international collaboration.

Conclusion and recommendations

All countries unanimously decided to adopt the HAE-DAT database as the official PICES HAB database. The database will be called the HAE-DAT IOC joint ICES/PICES database. An overall description of the PICES joint database with IOC/ICES and its goals will be written by Henrik Enevoldsen, Robin Brown, Hak-Gyoon Kim and Vera Trainer and placed on the IOC website. Each country will review the description of their monitoring program on the IOC website, and make additions by contacting the IOC point person for changes. Included will be a description of monitoring programs in each country, what constitutes a "harmful event", algae species described in the IOC database as harmful in each country, harmful levels, and "area codes" (those coastline divisions and coordinates that will be used for data entry). The numbering system and area boundaries will also be detailed. Point people for each country are as follows: Angelica Peña (Canada), Ming-Yuan Zhu (China), Yasunori Watanabe (Japan), Hak-Gyoon Kim (Korea), Tatiana Orlova (Russia) and Vera Trainer (U.S.A.). Members agreed to enter data directly into IOC's web-based database for the year 2000 (minimum) and subsequent years, if possible. All data will be

submitted to IOC by July 1, 2005, in order to give Henrik Enevoldsen time to make maps and

a presentation of data reports for PICES XIV in Vladivostok, Russia.

List of papers

Oral presentations at the MEQ Workshop

Henrik Enevoldsen and Monica Lion

The joint IOC-ICES-PICES Harmful Algal Event Data-base, HAE-DAT

Nicolaus G. Adams, Diedre Crawford, William P. Cochlan and Vera L. Trainer

Use of the ICES harmful algal event meta-database to archive data from the west coast of the United States

Ming-Yuan Zhu, Rui-Xiang Li and Zong-Ling Wang

HAB data in China

Hak-Gyoon Kim, Young-Shil Kang, Chang-Kyu Lee, Gui-Young Kim, Wol-Ae Lim, Sook-Yang Kim, Young-Tae Park, Soo-Jung Chang and Hee-Dong Jeong

Use of Korean HAB data for the joint ICES/PICES HAE-DAT database

Ichiro Imai, Shigeru Itakura, Yasunori Watanabe, Akira Ishikawa and Yasuwo Fukuyo

HAB data in Japan and a trial for joining PICES database

Tatiana Yu. Orlova

Entry of HAB data from the east coast of Russia into the ICES/PICES HAE-DAT database format

Angelica Peña and Melanie Quenneville

Testing the ICES harmful algal event meta-database to archive data from the west coast of Canada

Robin Brown

TCODE integration with HAB database efforts

Jeanne S. Allen

Data integration issues within the Gulf of Mexico

Oral presentations at the HAB Meeting

Ming-Yuan Zhu, Rui-Xiang Li and Zong-Ling Wang

The occurrences of HAB in Chinese coastal waters in recent three years

Ichiro Imai, Tomotaka Shiraishi, Kiyohito Nagai, Shingo Hiroishi, Shigeru Itakura, Yasunori Watanabe, Akira Ishikawa and Yasuwo Fukuyo

Monitoring of the shellfish-killing dinoflagellate *Heterocapsa circularisquama* in Japanese coastal sea by indirect fluorescent antibody technique

Angelica Peña

Preliminary proposal of a Canadian Program on the Ecology and Oceanography of Harmful Algal Blooms

Tatiana Yu. Orlova

Harmful algal bloom data for the Russian east coast

Hak-Gyoon Kim, Young-Shil Kang, Chang-Kyu Lee, Gui-Young Kim, Wol-Ae Lim, Sook-Yang Kim, Young-Tae Park, Soo-Jung Chang, Young-Sang Suh and Hee-Dong Jeong

Recent approaches for the prediction and mitigation of *Cochlodinium polykrikoides* blooms in Korean waters

Vera L. Trainer, Barbara M. Hickey, Mark Wells and William P. Cochlan

Ecological linkages between physical and oceanographic conditions and the seasonal growth and distribution of *Pseudo-nitzschia* blooms on the U.S. west coast

Michelle C. Tomlinson, Richard P. Stumpf, Dana L. Woodruff, Nathan R. Evans and Susan Dunham

The use of remote sensing and meteorological data for monitoring HABs through ecological associations

Ying-Lin Zou, Ming-Yuan Zhu, Rui-Xiang Li and Zhen-Xing Wu

Monitoring toxic HAB in the Chinese waters during the recent three years

MBM-AP Workshop (W6)

Combining data sets on diets of marine birds and mammals: Phase II

Co-Convenors: Hidehiro Kato (Japan) and William J. Sydeman (U.S.A.)

Background

The workshop on “Combining data sets on distributions and diets of marine birds and mammals” at PICES XII led to enhanced knowledge of the relations of marine birds and mammals and the environment. Continuation of this workshop would further our understanding of the coupled climate-ecosystem fluctuations in the North Pacific Ocean. The PICES Advisory Panel on *Marine birds and mammals* identified some species with extensive spatial and temporal datasets on food habits and prey characteristics, which were not reviewed at PICES XII and could be examined.

Summary of presentations

Five oral presentations were made, including two talks on marine birds and three talks on marine mammals. The species discussed included Cassin’s Auklet (a secondary predator) and northern fur seal (a tertiary predator). In addition, studies of the toothed whale diet and overall cetacean communities were presented. A long-term study of seabird community response to climate variability in the northern Okhotsk Sea was also presented. A total of sixteen people were in attendance. Presentations revealed the following:

- Ohizumi and Kato demonstrated geographic and temporal variation in the diet of toothed whales in the northwestern Pacific; the importance of myctophids (lantern fish) was of particular interest for animals of the open ocean.
- Kitaysky, Zelenskaya and Glubova revealed contracting responses of planktivorous and piscivorous seabirds in the Okhotsk Sea, and how these responses were related to indices of climate and prey availability.
- Miyashita and Kato discussed the distribution and abundance of the entire cetacean community in the western North Pacific based on 20 years of systematic sighting surveys. They presented data on sperm whale population indices showing

increases in the 1980s, followed by stability in the 1990s and early 2000s.

- Ream and Zepplin reviewed and analyzed information on northern fur seal diets from the late 1950’ to the present, using data from Japan, Russia and the United States. Using an immense dataset, they demonstrated geographic variation in diet, and considered how sampling methodologies may have affected results.
- Wolf, Abraham, Hipfner and Sydeman reviewed dietary changes in Cassin’s Auklets at 4 sites in the California Current, and demonstrated prey switching at decadal and interannual time scales and with latitude. Through presentations above and associated discussions, the following points can be summarized:
 - Diet composition varies between the west and east regions of the North Pacific. Myctophids are an important prey for many species in the open ocean, whereas a series of coastal prey are important in marginal seas. Euphausiids and copepods are important for planktivorous seabirds, but diet compositions have changed through time.
 - Diet composition has switched dramatically at the decadal level, probably related to regime shifts, El Niños, and other climatic factors.
 - Marine birds and mammals including, at least, Cassin’s Auklet and northern fur seal, and species discussed last year, may be useful as ecosystem indicators of climate fluctuations, though there are some limitations with this approach. For example, understanding the dynamics of prey switching and geographic variability in diet composition is essential to interpreting variation in spatio-temporal variation in diet composition. MBM-AP, while highlighting this issue, recommends continued efforts to develop dietary and demographic indices of short-term and low frequency climate-ecosystem fluctuations.

List of papers

Oral presentations:

Hiroshi Ohizumi and Hidehiro Kato

Food of toothed whales in the northern North Pacific: Geographic and temporal variation

Rolf R. Ream and Tonya K. Zeppelin

Historical and contemporary diet of northern fur seals in the North Pacific

Alexander Kitaysky, Larisa Zelenskaya and Elena Golubova

Reproductive responses of planktivorous and piscivorous birds to climate variability in the northern Sea of Okhotsk

Shaye G. Wolf, Christine L. Abraham, L. Mark Hipfner and William J. Sydeman

Spatio-temporal variation in the zooplankton prey of Cassin's auklets in the California Current system

Tomio Miyashita and Hidehiro Kato

Distribution of cetaceans in the western North Pacific inferred from systematic sighting survey

LIST OF MEMBERSHIP (as of October 2004)

83

83

Canada

Sonia D. Batten (CPR)

4737 Vista View Cresc.
Nanaimo, BC, Canada V9V 1N8
soba@sahfos.ac.uk

Richard J. Beamish (FIS, CCCC, WG16)

WG 16 Co-Chairman

Pacific Biological Station
Fisheries and Oceans Canada
3190 Hammond Bay Rd..
Nanaimo, BC, Canada V9T 6N7
BeamishR@pac.dfo-mpo.gc.ca

Susan Bower (WG18)

Pacific Biological Station
Fisheries and Oceans Canada
3190 Hammond Bay Rd..
Nanaimo, BC, Canada V9T 6N7
BowerS@pac.dfo-mpo.gc.ca

Robin Brown (TCODE, WG17)

Institute of Ocean Sciences
Fisheries and Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
BrownRo@dfo-mpo.gc.ca

James Christian (POC)

Canadian Center for Climate Modelling and
Analysis
University of Victoria
P.O. Box 1700 STN CSC
Victoria, BC, Canada V8W 2Y2
Jim.Christian@ec.gc.ca

Estelle Couture (NPDB)

Marine Environmental Data Service
Fisheries & Oceans Canada
12W082 - 200 Kent St.
Ottawa, ON, Canada K1A 0E6
CouturE@meds-sdmm.dfo-mpo.gc.ca

William R. Crawford (CCCC, FERRRS)

Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
CrawfordB@pac.dfo-mpo.gc.ca

John F. Dower (WG14)

School of Earth & Ocean Sciences
University of Victoria
P.O. Box 3055 STN CSC
Victoria, BC, Canada V8W 3P6
dower@uvic.ca

Michael G. Foreman (POC)

Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
ForemanM@pac.dfo-mpo.gc.ca

Douglas E. Hay (FIS)

Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9R 5K6
HayD@pac.dfo-mpo.gc.ca

James R. Irvine (WG16)

Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T 6N7
IrvineJ@pac.dfo-mpo.gc.ca

Glen Jamieson (MEQ, EBMSG)

EBM-SG Co-Chairman

Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T 6N7
JamiesonG@pac.dfo-mpo.gc.ca

Joan Kean-Howie (GC, F&A, MEQ)

Director General, Ocean & Aquaculture Science
Directorate
Fisheries and Oceans Canada
200 Kent St., Station 12W114
Ottawa, ON, Canada K1A 0E6
Kean-HowieJ@dfo-mpo.gc.ca

Jacquelynn R. King (WG16, FERRRS)

FERRRS Chairman

Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T 6N7
KingJac@pac.dfo-mpo.gc.ca

* See List of acronyms on page

David L. Mackas (BIO, MONITOR, WG14, FERRRS, CPR)

Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
MackasD@pac.dfo-mpo.gc.ca

Jennifer Martin (HAB-S)

St. Andrews Biological Station
Fisheries and Oceans Canada
531 Brandy Cove Rd
St. Andrews, NB, Canada E5B 2L9
MartinJl@mar.dfo-mpo.gc.ca

Gordon Alexander McFarlane (BASS, FERRRS)

Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T6N7
McfarlaneS@pac.dfo-mpo.gc.ca

Ron McLaren (NPDB)

NPDB Technical Coordinator
Environment Canada Pacific & Yukon Region
Meteorological Service of Canada
Suite 700 - 1200 West 73rd Ave.
Vancouver, BC, Canada V6P 6H9
Ron.Mclaren@ec.gc.ca

John A. Moores (WG18)

Fisheries and Oceans Canada
220 Kent St.
Ottawa, ON, Canada K1A 0E6
MooresJ@dfo-mpo.gc.ca

Robert O'Boyle (EBMSG)

Bedford Institute of Oceanography
Fisheries and Oceans Canada
1 Challenger Dr.
Dartmouth, NS, Canada B2Y 4A2
OboyleR@mar.dfo-mpo.gc.ca

Brian O'Donnell (NPDB)

Environment Canada Pacific & Yukon Region
Meteorological Service of Canada
Suite 200 - 1200 West 73rd Ave.
Vancouver, BC, Canada V6P 6H9
Brian.o'Donnell@ec.gc.ca

John Page (WG17)

Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
PageJo@pac.dfo-mpo.gc.ca

Angelica Pena (BIO, HAB-S)

Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
PenaA@pac.dfo-mpo.gc.ca

R. Ian Perry (SB, NPESR, FERRRS, SISG)

SB Chairman, NPESR Chairman
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T 6N7
PerryI@pac.dfo-mpo.gc.ca

Neil M. Price (IFEP)

Department of Biology
McGill University
1205 Ave. Docteur Penfield
Montreal, QC, Canada H3A 1B1
NPRICE@BIO1.Lan.McGill.CA

Laura Richards (GC, F&A, FIS, SISG)

Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T 6N7
RichardsL@pac.dfo-mpo.gc.ca

Peter S. Ross (MODEL, MBM)

Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
RossPe@pac.dfo-mpo.gc.ca

Jake Schweigert (MODEL, FERRRS)

Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T 6N7
SchweigertJ@pac.dfo-mpo.gc.ca

Greg Steer (TCODE)

Fisheries & Oceans Canada
300-555 West Hastings St.
Vancouver, BC, Canada V6B 5G3
SteerG@pac.dfo-mpo.gc.ca

David W. Welch (CPR)

3190 Hammond Bay Rd.
Nanaimo, BC, Canada V9T 6N7
david.welch@kintamaresearch.org

Chi Shing Wong (POC, WG17, IFEP)

IFEP Co-Chairman
Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC, Canada V8L 4B2
WongCS@pac.dfo-mpo.gc.ca

Japan

Kenji Asano (REX)

Headquarters
Fisheries Research Agency
Queen's Tower B-15F, Ninatomirai, Nishi
Yokohama, Kanagawa, Japan 220-6115
anchovy@affrc.go.jp

Kiyotaka Hidaka (MONITOR)

National Research Institute of Fisheries Science
2-12-4, Fukuura, Kanazawa
Yokohama, Kanagawa, Japan 236-8648
khidaka@affrc.go.jp

Toyomitsu Horii (WG18)

National Research Institute of Fisheries Science
6-31-1 Nagai
Yokosuka, Kanagawa, Japan 238-0316
thorii@affrc.go.jp

Naoki Iguchi (WG14)

Japan Sea National Fisheries Research Institute
1-5939-22 Suido-cho
Niigata, Japan 951-8121
iguchi@jsnf.affrc.go.jp

Tsutomu Ikeda (BIO)

Graduate School of Fisheries Science
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 041-8611
tom@pop.fish.hokudai.ac.jp

Ichiro Imai (HAB-S)

Graduate School of Agriculture
Kyoto University
Oiwakecho, Kitashirakawa, Sakyo
Kyoto, Japan 606-8502
imai1ro@kais.kyoto-u.ac.jp

Yukimasa Ishida (SB, FIS, NPESR)

FIS Chairman

National Research Institute of Fisheries Science
2-12-4 Fukuura, Kanazawa
Yokohama, Kanagawa, Japan 236-8648
ishiday@fra.affrc.go.jp

Shigeru Itakura (HAB-S)

National Research Institute of Fisheries
and Environment of Inland Sea
2-17-5 Maruishi, Ohno
Saeki, Hiroshima, Japan 739-0452
itakura@affrc.go.jp

Shin-ichi Ito (CCCC, MODEL)

MODEL Co-Chairman

Tohoku National Fisheries Research Institute
3-27-5 Shinhama-cho
Shiogama, Miyagi, Japan 985-0001
goito@affrc.go.jp

Masahide Kaeriyama (CCCC, BASS)

Graduate School of Science and Engineering
Hokkaido Tokai University
5-1-1-1 Minamisawa, Minami-ku
Sapporo, Hokkaido, Japan 005-8601
salmon@dm.htokai.ac.jp

Hidehiro Kato (BIO, BASS, MBM)

MBM Co-Chairman

Cetacean Population Biology Unit
National Research Institute of Far Seas Fisheries
7-1, Shimizu-Orido, 5-chome
Shizuoka, Shizuoka, Japan 424-8633
katohide@affrc.go.jp

Toshio Katukawa (MODEL)

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano
Tokyo, Japan 164-8639
katukawa@ori.u-tokyo.ac.jp

Kouichi Kawaguchi (WG14)

University of Tokyo
2-8-3, C-1019, Someji, Chohu-shi
Tokyo, Japan 182-0023
kawaguch@athena.ocn.ne.jp

Michio J. Kishi (BIO, MODEL)

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 041-8611
kishi@salmon.fish.hokudai.ac.jp

Tokimasa Kobayashi (GC, F&A, SISG)

PICES Vice-Chairman

Seikai National Fisheries Research Institute
1551-8, Taira-machi, Nagasaki
Nagasaki, Japan 851-2213
tokikoba@affrc.go.jp

Isao Kudo (IFEP)

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 041-8611
ikudo@fish.hokudai.ac.jp

Takashi Minami (FIS)

Japan Sea National Fisheries Research Institute
1-5939-22 Suido-cho
Niigata, Japan 951-8121
mtakashi@fra.affrc.go.jp

Kazushi Miyashita (MIE)

Lab. Marine Ecosystem Change Analysis
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 041-8611
miyashi@fish.hokudai.ac.jp

Kazuya Nagasawa (CCCC)

North Pacific Resources Division
National Research Institute of Far Seas Fisheries
7-1, Shimizu-Orido, 5-chome
Shimizu, Shizuoka, Japan 424-8633
ornatus@enyo.affrc.go.jp

Yutaka Nagata (CCCC, MONITOR)

Marine Information Research Center
Japan Hydrographic Association
Mishima Bldg. 5F, 7-15-4 Ginza, Chuo
Tokyo, Japan 104-0061
nagata@mirc.jha.or.jp

Hideaki Nakata (MEQ, EBMSG)

Laboratory of Oceanography
Faculty of Fisheries, Nagasaki University
1-14 Bunkyo-cho
Nagasaki, Japan 852-8521
nakata@net.nagasaki-u.ac.jp

Toshikuni Nakatani (FIS)

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 041-8611
nakatani@fish.hokudai.ac.jp

Yukihiro Nojiri (WG17)**WG 17 Co-Chairman**

Carbon Cycle Research Laboratory
National Institute for Environmental Studies
16-2 Onogawa
Tsukuba, Ibaraki, Japan 305-8506
nojiri@nies.go.jp

Hiroaki Saito (MODEL, IFEP)

Tohoku National Fisheries Research Institute
3-27-5, Shinhama-cho
Shiogama, Miyagi, Japan 985-0001
Phone: (81-22)365-9929
Fax: (81-22)367-1250
E-mail: hsaito@fra.affrc.go.jp

Sei-ichi Saitoh (CCCC, MONITOR)**MONITOR Co-Chairman**

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 041-8611
ssaitoh@salmon.fish.hokudai.ac.jp

Yasunori Sakurai (CCCC)

Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 041-8611
sakurai@fish.hokudai.ac.jp

Satoshi Sato (TCODE)

Oceanographic Data & Information Division
Hydrographic Department Japan Coast Guard
5-3-1 Tsukiji, Chuo
Tokyo, Japan 104-0045
satoshi-satou-2@kaiho.mlit.go.jp

Yasuhiro Sugimori (POC, NPDB)

Center for Environmental Remote Sensing
Chiba University
1-33 Yayoi-cho Inage
Chiba, Japan 263-8522
QWL02211@nifty.ne.jp

Takashige Sugimoto (CPR)

Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano
Tokyo, Japan 164-8639
sugimoto@ori.u-tokyo.ac.jp

Toru Suzuki (WG17)

Marine Information Research Center (MIRC)
Japan Hydrographic Association
Tsukiji Hamarikyu Bldg. 8F 5-3-3, Tsukiji, Chuo
Tokyo, Japan 104-0045
suzuki@mirc.jha.jp

Katsunori Suzuki (MEQ)

Global Environment Issues Division
Global Environment Bureau, Ministry of the Environment
1-2-2 Kasumigaseki, Chiyoda
Tokyo, Japan 100-8975
KATSUNORI_SUZUKI@env.go.jp

Shigenobu Takeda (IFEP)**IFEP Co-Chairman**

Department of Aquatic Bioscience
University of Tokyo
1-1-1 Yayoi, Bunkyo
Tokyo, Japan 113-8657
atakeda@mail.ecc.u-tokyo.ac.jp

Satoru Toda (HAB-S)

National Research Institute of Fisheries
and Environment of Inland Sea
2-17-5, Maruishi, Ohno-cho
Saeki, Hiroshima, Japan 739-0452
satoru@fra.affrc.go.jp

Muneharu Tokimura (TCODE, WG16)

National Research Institute of Fisheries Science
2-12-4, Fukuura, Kanazawa
Yokohama, Kanagawa, Japan 236-8648
tokimura@fra.affrc.go.jp

Atsushi Tsuda (IFEP)
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano
Tokyo, Japan 164-8639
tsuda@ori.u-tokyo.ac.jp

Takanori Uehara (GC, F&A)
International Science Cooperation Division
Foreign Policy Bureau
Ministry of Foreign Affairs
2-2-1 Kasumigaseki, Chiyoda
Tokyo, Japan 100-8919
takanori.uehara@mofa.go.jp

Tokio Wada (CCCC, WG16, EBMSG)
National Research Institute of Far Seas Fisheries
7-1, Shimizu-Orido, 5-chome
Shimizu, Shizuoka, Japan 424-8633
wadat@affrc.go.jp

Masataka Watanabe (MEQ)
Water & Soil Environment Division
National Institute for Environmental Studies
16-2 Onogawa
Tsukuba, Ibaraki, Japan 305-0053

Shuichi Watanabe (WG17)
Mutsu Institute for Oceanography
Japan Marine Science & Technology Center
690 Kitasekine
Sekine, Mutsu, Japan 035-0022
swata@jamstec.go.jp

Yasunori Watanabe (HAB-S)
National Research Institute of Fisheries
and Environment of Inland Sea
2-17-5 Maruishi, Ohno
Saeki, Hiroshima, Japan 739-0452
ywat@affrc.go.jp

Yoshiro Watanabe (CCCC, REX)
REX Co-Chairman
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano
Tokyo, Japan 164-8639
ywatana@ori.u-tokyo.ac.jp

Yutaka Watanabe (WG17)
Division of Ocean & Atmospheric Science
Hokkaido University
Kita 10 Nishi 5 Kita
Sapporo, Hokkaido, Japan 060-0810
yywata@ees.hokudai.ac.jp

Yutaka Watanuki (REX, MBM)
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido, Japan 060-8589
ywata@fish.hokudai.ac.jp

Orio Yamamura (WG14)
WG 14 Co-Chairman
Hokkaido National Fisheries Research Institute
116 Katsurakoi
Kushiro, Hokkaido, Japan 085-0802
orioy@affrc.go.jp

Ichiro Yasuda (POC, NPDB)
Department of Earth & Planetary Science
Graduate School of Science
University of Tokyo
Ri-1-813, Hongo 7-3-1, Bunkyo
Tokyo, Japan 113-0033
Phone: (81-3) 5841-4288
ichiro@eps.s.u-tokyo.ac.jp

Akihiko Yatsu (CCCC, BASS, WG16, FERRRS)
BASS Co-Chairman, WG 16 Co-Chairman
National Research Institute of Fisheries Science
2-12-4 Fukuura, Kanazawa
Yokohama, Kanagawa, Japan 236-8648
yatsua@fra.affrc.go.jp

People's Republic of China

Liqi Chen (CCCC)
State Oceanic Administration
Chinese Arctic & Antarctic Administration
No. 1 Fuxingmenwai Ave.
Beijing, China 100860
lqchen@soa.gov.cn

Yaqu Chen (BIO)
East China Sea Fisheries Research Institute
300 Jungong Rd.
Shanghai, China 200090
yq_chen@citiz.net

Zhi-Xin Chen (F&A)
Department of International Cooperation
Ministry of Agriculture
11 Nongzhanguan Nanli
Beijing, China 100026
chenzhixin@agri.gov.cn

Jia-Hua Cheng (FIS, WG16)
East Sea Fisheries Research Institute
300 Jungong Rd.
Shanghai, China 200090
ziyuan@public9.sta.net.cn

Jian-Guang Fang (WG18)

Mariculture Ecology Division
Yellow Sea Fisheries Research Institute
106 Nanjing Rd.
Qingdao, Shandong, China 266071
fangjg@ysfri.ac.cn

Daoming Guan (MEQ)

National Marine Environmental Monitoring Center
No. 42 Linhe St., Shahekou District
Dalian, Liaoning, China 116023
dmguan@nmemc.gov.cn

Da-Ji Huang (MODEL)

Second Institute of Oceanology
State Oceanic Administration
P.O. Box 1207, 9 Xixihexia
Hangzhou, Zhejiang, China 310012
djh Huang@sio.zj.edu.cn

Xian-Shi Jin (FIS, WG16, EBMSG)

Yellow Sea Fisheries Research Institute
106 Nanjing Rd.
Qingdao, Shandong, China 266071
jin@ysfri.ac.cn

Jie Kong (WG18)

Yellow Sea Fisheries Research Institute
106 Nanjing Rd..
Qingdao, Shandong, China 266071
kongjie@ysfri.ac.cn

Hai-Qing Li (GC)

Department of International Cooperation
State Oceanic Administration
1 Fuxingmenwai Ave.
Beijing, China 100860
hqli@soa.gov.cn

Shengfa Li (WG16)

East China Sea Fisheries Research Institute
300 Jungong Rd.
Shanghai, China 200090
shengfa@china-fishery.online.sh.cn

Yong Li (F&A)

Department of Foreign Exchange & External Finance
Ministry of Finance
3 Nanshanxiang, Shanlilte
Beijing, China 100820

Qiu-Fen Li (HAB-S)

Yellow Sea Fisheries Research Institute
106 Nanjing Rd..
Qingdao, Shandong, China 266071
Phone: +86-532-583-6341
liqf@ysfri.ac.cn

Qian-Fei Liu (SISG)

International Cooperation Division
Ministry of Agriculture
11 Nongzhanguan Nanli
Beijing, China 100026
inter-coop@agri.gov.cn

Xiuren Ning (IFEP)

Second Institute of Oceanography
State Oceanic Administration
No. 9 Xixihexia
Hangzhou, Zhejiang, China 310012
ning@sio.zj.edu.cn

Dun Niu (GC)

Department of International Cooperation
Ministry of Agriculture
11 Nongzhanguan Nanli
Beijing, China 100026
niudun@agri.gov.cn

Xin-Qiang Shen (MEQ)

East Sea Fisheries Research Institute
300 Jungong Rd.
Shanghai, China 200090
esrms@public2.sta.net.cn

Song Sun (BIO, CCCC, CPR)

Institute of Oceanology
Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong, China 266071
sunsong@ms.qdio.ac.cn

Qi-Sheng Tang (REX, FERRRS)

Yellow Sea Fisheries Research Institute
106 Nanjing Rd.
Qingdao, China 266071
ysfri@public.qd.sd.cn

Ling Tong (TCODE, EBMSG)

Yellow Sea Fisheries Research Institute
106 Nanjing Rd.
Qingdao, Shandong, China 266071
tongling@ysfri.ac.cn

Fan Wang (POC)

Institute of Oceanology
Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong, China 266071
fwang@ms.qdio.ac.cn

Qing-Yin Wang (FIS, WG18)

Yellow Sea Fisheries Research Institute
106 Nanjing Rd.
Qingdao, Shandong, China 266071
wangqy@ysfri.ac.cn

Rong Wang (CCCC, REX)
Institute of Oceanology
Chinese Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong, China 266071
wangrong@ms.qdio.ac.cn

Quan Wen (MONITOR, EBMSG)
National Marine Environmental Monitoring Center
42 Linhe St., Shahekou District
Dalian, Liaoning, China 116023
qwen@nmemc.gov.cn

De-Xing Wu (MEQ)
Ocean University of China
5 Yushan Rd.
Qingdao, Shandong, China 266003
dxwu@ouc.edu.cn

Ruguang Yin (TCODE)
National Marine Data & Information Service
No. 93 Liuwei Rd., Hedong District
Tianjin, China 300171
yrg@mail.nmdis.gov.cn

Jin-Ping Zhao (SB, POC, FERRRS)
First Institute of Oceanography
State Oceanic Administration

No. 6 Xianxialin Rd., Hi-Tech Park
Qingdao, Shandong, China 266061
zhaojp@fio.org.cn

Xian-Yong Zhao (MONITOR, EBMSG, MIE)
Yellow Sea Fisheries Research Institute
106 Nanjing Rd.
Qingdao, Shandong, China 266071
zhaoxy@ysfri.ac.cn

Ming-Yu Zhou (POC, IFEP)
National Marine Environmental Forecasting Centre
8 Dahuisi Rd., Haidian District
Beijing, China 100081
mzhou@ht.rol.cn.net

Ming-Yuan Zhu (BIO, HAB-S)
First Institute of Oceanography
State Oceanic Administration
6 Xianxialing Rd., Hi-tech Industrial Park
Qingdao, Shandong, China 266061
myzhu@public.qd.sd.cn

Zhi-Meng Zhuang (CPR)
Yellow Sea Fisheries Research Institute
106 Nanjing Rd.
Qingdao, Shandong, China 266071
zhuangzm@ysfri.ac.cn

Republic of Korea

Young-Jean Choi (MONITOR)
Forecast Research Laboratory
Meteorological Research Institute
2 Waryong-dong, Chongno-gu
Seoul, Korea 110-360
yjchoi@iris.metri.re.kr

Young-Hoon Chung (GC, F&A)
Research Planning & Development Division
Ministry of Maritime Affairs and Fisheries
139 Chungjeong-No 3, Seodaemun-Gu
Seoul, Korea 120-715
yhcfish@momaf.go.kr

Ik-Kyo Chung (WG18)
WG-18 Co-Chairman
Marine Science Department
Pusan National University
San 30, Jangjun-dong, Geumjung-gu
Busan, Korea 609-735
ikchung@pusan.ac.kr

Gi-Hoon Hong (IFEP)
Ocean Climate and Environment Research Division
Korea Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
ghhong@kordi.re.kr

Hyung-Tack Huh (GC, SISG)
PICES Past Chairman
Marine Living Resources Research Division
Korea Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
hthuh@kordi.re.kr

Hee-Dong Jeong (POC, TCODE)
Ocean Research Team
National Fisheries Research & Development Institute
408-1 Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-902
hdjeong@nfrdi.re.kr

Hae-Seok Kang (TCODE)
Ocean Data and Information Department
Korea Ocean Research and Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
hskang@kordi.re.kr

Young-Shil Kang (BIO)
Marine Harmful Organisms Division
National Fisheries Research & Development Institute
408-1, Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-902
yskang@nfrdi.re.kr

Hak-Gyoon Kim (MEQ, HAB-S)
HAB-S Co-Chairman
South Sea Fisheries Institute
National Fisheries Research & Development Institute
347, Anpo-ri, Hwayang-myeon
Yeosu, Jeonnam, Korea 556-820
hgkim@nfrdi.re.kr

Jin-Yeong Kim (FIS, REX, WG16)
South Sea Fisheries Institute
National Fisheries Research & Development Institute
347, Anpo-ri, Hwayang-myeon
Yeosu, Jeonnam, Korea 556-820
jykim@nfrdi.re.kr

Kuh Kim (SB, POC, NPESR)
POC Chairman
School of Earth & Environmental Sciences
Seoul National University
San 56-1 Shillim-dong, Kwanaka-ku
kuhkim@ocean.snu.ac.kr

Suam Kim (SB, CCCC, BASS, NPESR, WG16, FERRRS)
CCCC Co-Chairman
Department of Marine Biology
Pukyong National University
599-1 Daeyeon -dong, Nam-gu
Busan, Korea 608-737
suamkim@pknu.ac.kr

Woong-Seo Kim (BIO)
Marine Geoenvironment and Resource Research Division
Korea Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
wskim@kordi.re.kr

Yeong-Hye Kim (CCCC)
Fisheries Resources Research Team
National Fisheries Research & Development Institute
408-1, Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-902
yhkim@nfrdi.re.kr

Zang-Guen Kim (MBM)
Fisheries Resources Research Team
National Fisheries Research & Development Institute
408-1 Shirang-ri, Gijang-Up, Gijang-Gun
Busan, Korea 619-902
zgkim@nfrdi.re.kr

Jang-In Kwon (WG18)
Crustacean Research Center
National Fisheries Research & Development Institute
408-1 Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-900
jangik@nfrdi.re.kr

Chang-Kyu Lee (HAB-S)
Marine Harmful Organisms Team
National Fisheries Research & Development Institute
408-1 Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-900
cklee@nfrdi.re.kr

Jae-Bong Lee (EBMSG)
Fisheries Resources Research & Management
National Fisheries Research & Development Institute
408-1, Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-902
leejb@nfrdi.re.kr

Jae-Hak Lee (MODEL)
Ocean Climate and Environment Research Division
Korea Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
jhlee@sari.kordi.re.kr

Jang-Uk Lee (BASS)
Pukyong National University
599-1 Daeyeon -dong Nam-gu
Busan, Korea 608-737
julee0922@korea.com

Tong-Sup Lee (WG17)
Department of Marine Science
Division of Earth Environmental System
Pusan National University
30 Changjeon-dong, Geumjeong-gu
Busan, Korea 609-735
tle@pusan.ac.kr

Jae-Cheol Nam (NPDB)
Meteorological Research Institute
460-18 Shindaebang-dong, Dongjak-gu
Seoul, Korea 156-720
jcnam@metri.re.kr

Chul Park (GC, MONITOR, WG14)
Marine Environment & Oceanography Department
National Fisheries Research & Development Institute
408-1, Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-902
chulpark@nfrdi.re.kr

Young-Gyu Park (POC)
Ocean Climate and Environment Research Division
Korea Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
Seoul, Korea 425-600
ypark@kordi.re.kr

Young-Chul Shin (FIS)
Korea Polar Research Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
Seoul, Korea 425-600
hcsin@kopri.re.kr

Moon-Sik Suk (NPDB)

Ocean Climate and Environment Research Division
Korean Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
Seoul, Korea 425-600
mssuk@kordi.re.kr

Dong-Beom Yang (MEQ)

Ocean Climate and Environment Research Division
Korean Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
Seoul, Korea 425-600
dbyang@kordi.re.kr

In-Ja Yeon (EBMSG)

West Sea Fisheries Research Institute
National Fisheries Research & Development Institute
707 Eulwang-dong, Jung-gu
Incheon, Korea. 400-420
ijyeon@nfrdi.re.kr

Sinjae Yoo (BIO, CCCC, MODEL, CPR)

Marine Living Resources Research Division
Korean Ocean Research & Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi, Korea 425-600
Seoul, Korea 425-600
sjyoo@kordi.re.kr

Won-Duk Yoon (WG14, MIE)

National Fisheries Research & Development Institute
408-1 Shirang-ri, Gijang-up, Gijang-gun
Busan, Korea 619-902
wdyoon@nfrdi.re.kr

Chang-Ik Zhang (FIS, CCCC, REX, WG16, EBMSG)**EBMSG Co-Chairman**

Department of Marine Production Management
Pukyong National University
599-1 Daeyeon -dong, Nam-gu
Busan, Korea 608-737
cizhang@pknu.ac.kr

Russia

Victor A. Akulich (NPDB)

Pacific Oceanological Institute
Far East Branch of Russian Academy of Sciences
43 Baltiyskaya St.
Vladivostok, Russia 690041
akulich@marine.febras.ru

Andrey G. Andreev (WG17)

Pacific Oceanological Institute
Far East Branch of Russian Academy of Sciences
43 Baltiyskaya St..
Vladivostok, Russia 690041
andreev@poi.dvo.ru

Tatyana A. Belan (MEQ)

Department of Oceanography & Marine Ecology
Far Eastern Regional Hydrometeorological Research
Institute
24 Fontannaya St.
Vladivostok, Russia 690990
tbelan@hydromet.com

Alexander A. Belov (CCCC, IFEP)

Russian Federal Research Institute of Fisheries &
Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow, Russia 107140
belov@vniro.ru

Vladimir A. Belyaev (FIS)

Khabarovsk Branch
Pacific Scientific Research Fisheries Centre
9 Shevchenko St.
Khabarovsk, Russia 68000
belyaev@tinro.khv.ru

Lev N. Bocharov (GC)

Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
bocharov@tinro.ru

Eugene E. Borisovets (WG18)

Pacific Scientific Research Fisheries Center
4 Schevchenko Alley
Vladivostok, Russia 690950
sep@tinro.ru

Nickolay A. Chebanov (WG18)

Kamchatka Research Institute of Fisheries &
Oceanography
18 Naberezhnaya St.
Petropavlovsk-Kamchatsky, Russia 683602
chebanov@kamniro.ru

Elena P. Dulepova (FIS, REX, WG16)

Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
dep@tinro.ru

Dmitry Galanin (WG18)

Sakhalin Research Institute of Fisheries and Oceanography
196 Komsomolskaya St.
Yuzhno-Sakhalinsk, Russia 693000
galanin@sakhniro.ru

Sergey V. Gladyshev (POC)
Pacific Oceanological Institute
Far East Branch of Russian Academy of Sciences
43 Baltiyskaya St.
Vladivostok, Russia 690041
gladyshev@poi.dvo.ru

Alexander I. Glubokov (FIS)
Russian Federal Research Institute of Fisheries &
Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow, Russia 107140
glubokov@vniro.ru

Lev M. Gramm-Osipov (MEQ, IFEP)
Pacific Oceanological Institute
Far East Branch of Russian Academy of Sciences
43 Baltiyskaya St.
Vladivostok, Russia 690041
pacific@online.marine.su

Gennady A. Kantakov (MODEL, HAB-S, NPDB)
Sakhalin Research Institute of Fisheries & Oceanography
196 Komsomolskaya St.
Yuzhno-Sakhalinsk, Russia 693023
okhotsk@sakhniro.ru

Oleg N. Katugin (CCCC)
Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
okatugin@mail.ru

Nina G. Klochkova (HAB-S)
Kamchatka Research Institute of Fisheries &
Oceanography
18 Naberezhnaya St.
Petropavlovsk-Kamchatsky, Russia 683000
klochkova@kamniro.ru

Natalia V. Klovach (REX)
Russian Federal Research Institute of Fisheries &
Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow, Russia 107140
dvres@vniro.ru

Boris N. Kotenev (BIO)
Russian Federal Research Institute of Fisheries &
Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow, Russia 107140
orgotdel@vniro.ru

Andrei S. Krovnin (CCCC, BASS)
Russian Federal Research Institute of Fisheries &
Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow, Russia 107140
akrovnin@vniro.ru

Victor Lapko (FERRRS)
Sakhalin Research Institute of Fisheries and Oceanography
196 Komsomol St.
Yuzhno-Sakhalinsk, Russia 693023
lapko@sakhniro.ru

Vyacheslav B. Lobanov (POC, MONITOR)
Pacific Oceanological Institute
Far East Branch of Russian Academy of Sciences
43 Baltiyskaya St.
Vladivostok, Russia 690041
lobanov@poi.dvo.ru

Alexei Yu. Merzlyakov (EBMSG)
Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
interdept@tinro.ru

Georgiy Moiseenko (TCODE)
Russian Federal Research Institute of Fisheries &
Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow, Russia 107140
georgem@vniro.ru

Alexei M. Orlov (BIO, WG16)
Russian Federal Research Institute of Fisheries &
Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow, Russia 107140
orlov@vniro.ru

Tatiana Yu. Orlova (HAB-S)
Institute of Marine Biology
Far East Branch of Russian Academy of Sciences
17 Palchevskogo St.
Vladivostok, Russia 690041
torlova@whoi.edu

Vladimir I. Radchenko (SB, BIO, NPESR, SISG, CPR)
SB Vice-Chairman, BIO Chairman
Sakhalin Research Institute of Fisheries & Oceanography
196 Komsomolskaya St.
Yuzhno-Sakhalinsk, Russia 693023
vlrad@sakhniro.ru

Nikolay A. Rykov (MONITOR)
Regional Oceanographic Data Center
Far Eastern Regional Hydrometeorological Research
Institute
24 Fontannaya St.
Vladivostok, Russia 690990
rodc@hydromet.com

Vadim F. Savinykh (BASS, WG14, MIE)
Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
savinykh@tinro.ru

Igor I. Shevchenko (F&A, SB, TCODE, NPESR)

TCODE Chairman

Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
igor@tinro.ru

Vladimir M. Shulkin (IFEP)

Pacific Geographical Institute
Far Eastern Branch Russian Academy of Sciences
7 Radio St.
Vladivostok, Russia 690041
shulkin@tig.dvo.ru

Vjatcheslav P. Shuntov (MBM)

Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
interdept@tinro.ru

Mikhail Stepanenko (MONITOR)

Pacific Scientific Research Fisheries Center
4 Schevchenko Alley
Vladivostok, Russia 690950.
stepanenko@tinro.ru

Pavel Ya. Tishchenko (WG17)

Pacific Oceanological Institute
Far East Branch of Russian Academy of Sciences
43 Baltiyskaya St.
Vladivostok, Russia 690041
tpavel@poi.dvo.ru

Alexander V. Tkalin (MEQ)

Department of Oceanography and Marine Ecology
Far Eastern Regional Hydrometeorological Research
Institute
24 Fontannaya St.
Vladivostok, Russia 690990
atkalin@hydromet.com

Anatoly F. Volkov (CPR)

Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
vaf413@tinro.ru

Yuri N. Volkov (NPDB)

Far Eastern Regional Hydrometeorological Research
Institute
24 Fontannaya St.
Vladivostok, Russia 690900
hydromet@online.ru

Yury I. Zuenko (POC, MODEL)

Pacific Scientific Research Fisheries Center
4 Shevchenko Alley
Vladivostok, Russia 690950
zuenko@tinro.ru

U.S.A.

Vera Alexander (GC, SISG)

PICES Chairman, SISG Chairman

School of Fisheries & Ocean Sciences
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK, U.S.A. 99775-7220
vera@sfos.uaf.edu

Kerim Y. Aydin (CCCC, BASS)

BASS Co-Chairman

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Kerim.Aydin@noaa.gov

Jack A. Barth (MONITOR)

College of Oceanic & Atmospheric Sciences
Oregon State University
104 Ocean Administration Bldg.
Corvallis, OR, U.S.A. 97331-5503
barth@coas.oregonstate.edu

Harold P. Batchelder (SB, CCCC, NPESR, FERRS)

CCCC Co-Chairman

College of Oceanic & Atmospheric Sciences
Oregon State University
104 Ocean Administration Bldg.
Corvallis, OR
U.S.A. 97331-5503
hbatchelder@coas.oregonstate.edu

George W. Boehlert (GC, FIS, SISG)

Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR, U.S.A. 97365-5296
george.boehlert@oregonstate.edu

Steven J. Bograd (POC, WG16)

Pacific Fisheries Environmental Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
1352 Lighthouse Ave.
Pacific Grove, CA, U.S.A. 93950
sbograd@pfeg.noaa.gov

Jennifer L Boldt (FERRRS)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
jennifer.boldt@noaa.gov

Richard D. Brodeur (BIO, WG14, CPR, MIE)

WG 14 Co-Chairman

Hatfield Marine Science Center
Northwest Fisheries Science Center
National Marine Fisheries Service
2030 SE Marine Science Dr.
Newport, OR, U.S.A. 97365
Rick.Brodeur@noaa.gov

Kenneth Coale (IFEP)

Moss Landing Marine Laboratories
California State University
8272 Moss Landing Rd.
Moss Landing, CA, U.S.A. 95039
coale@mlml.calstate.edu

William P. Cochlan (HAB-S, IFEP)

Romberg Tiburon Center for Environmental Studies
San Francisco State University
3152 Paradise Dr.
Tiburon, CA, U.S.A. 94920-1205
cochlan@sfsu.edu

Kenneth O. Coyle (WG14)

School of Fisheries & Ocean Sciences
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK, U.S.A. 99775-7220
coyle@ims.uaf.edu

Michael J. Dagg (BIO)

Louisiana Universities Marine Consortium
8124 Highway 56
Chauvin, LA, U.S.A. 70344
mdagg@lumcon.edu

Andrew G. Dickson (WG17)

WG 17 Co-Chairman

Scripps Institution of Oceanography
University of California, San Diego
9500 Gilman Dr.
La Jolla, CA, U.S.A. 92093-0244
adickson@ucsd.edu

Steven R. Emerson (WG17)

School of Oceanography
University of Washington
Box 357940
Seattle, WA, U.S.A. 98195-6000
emerson@u.washington.edu

Richard A. Feely (WG17)

Pacific Marine Environmental Laboratory
National Oceanic & Atmospheric Administration
7600 Sand Point Way NE
Seattle, WA, U.S.A. 98115-6349
Richard.A.Feely@noaa.gov

David L. Fluharty (EBMSG)

School of Marine Affairs
University of Washington
3707 Brooklyn Ave. NE
Seattle, WA, U.S.A. 98105
fluharty@u.washington.edu

Carolyn S. Friedman (WG18)

WG 18 Co-Chairman

School of Aquatic and Fishery Sciences
University of Washington
P.O. Box 355020
Seattle, WA, U.S.A. 98107
carolyfn@u.washington.edu

Hernan Eduardo Garcia (WG17)

National Ocean Data Center
National Oceanic & Atmospheric Administration
SSMC-III, E/OC5, Room 4326
1315 East-West Highway
Silver Spring, MD, U.S.A. 20910-3282
Hernan.Garcia@noaa.gov

Steven R. Hare (WG16)

International Pacific Halibut Commission
P.O. Box 95009
Seattle, WA, U.S.A. 98145-2009
hare@iphc.washington.edu

Christopher James Harvey (EBMSG)

Northwest Fisheries Science Center
National Marine Science Fisheries Service
2725 Montlake Blvd. E
Seattle, WA, U.S.A. 98112
Chris.Harvey@noaa.gov

Selina Heppell (EBMSG)

Department of Fisheries and Wildlife
Oregon State University
104 Nash Hall
Corvallis, OR., U.S.A. 97331
Selina.Heppell@orst.edu

Anne B. Hollowed (FERRRS)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Anne.Hollowed@noaa.gov

Elizabeth Horton (NPDB)

Naval Oceanographic Office
1002 Balch Blvd.
Stennis Space Center
MS, U.S.A. 39529
hortone@navo.navy.mil

George L. Hunt, Jr. (REX)

Department of Ecology & Evolutionary Biology
University of California, Irvine
321 Steinhaus Hall
Irvine, CA, U.S.A. 92697-2525
glhunt@uci.edu

Linda Jones (MODEL)

Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Boulevard, East
Seattle, WA, U.S.A. 98112-2097
Linda.Jones@noaa.gov

Alexander Kozyr (WG17)

Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory
Bldg. 1509, Mail Stop 6335,
1 Bethel Valley Rd.
Oak Ridge, TN, U.S.A. 37831-6335
kozyra@ornl.gov

Gordon H. Kruse (FIS)

Juneau Center
University of Alaska Fairbanks
11120 Glacier Highway
Juneau, AK, U.S.A. 99801-8677
Gordon.Kruse@uaf.edu

Patricia Livingston (EBMSG)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Pat.Livingston@noaa.gov

Elizabeth A. Logerwell (FIS)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Libby.Logerwell@noaa.gov

Thomas R. Loughlin (BASS)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Tom.Loughlin@noaa.gov

Alec D. MacCall (FERRRS)

Santa Cruz Laboratory
National Marine Fisheries Service
110 Shaffer Rd.
Santa Cruz, CA, U.S.A. 95060
Alec.MacCall@noaa.gov

Nathan J. Mantua (FERRRS)

Department of Atmospheric Sciences, JISAO
University of Washington
P.O. Box 354235
Seattle, WA, U.S.A. 98107
nmantua@u.washington.edu

Richard J. Marasco (GC, F&A)

F & A Committee Chairman
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Rich.Marasco@noaa.gov

Bernard A. Megrey (TCODE, CCCC, MODEL)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Bern.Megrey@noaa.gov

Charles B. Miller (CPR)

CPR Chairman
College of Oceanic & Atmospheric Sciences
Oregon State University
Oceanography Administration Bldg.
Corvallis, OR, U.S.A. 97331-5503
cmiller@coas.oregonstate.edu

Paul F. Moersdorf (NPDB)

National Data Buoy Center
1100 Balch Blvd.
John C. Stennis Space Center
MS, U.S.A. 39529
Paul.Moersdorf@noaa.gov

Phillip R. Mundy (CCCC, MONITOR)

MONITOR Co-Chairman
Exxon Valdez Oil Spill Trustee Council
441 West 5th Ave., Suite 500
Anchorage, AK, U.S.A. 99501
phil_mundy@evostc.state.ak.us

Jeffrey M. Napp (MONITOR, CPR)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
Jeff.Napp@noaa.gov

Brenda L. Norcross (CCCC, REX)

School of Fisheries & Ocean Sciences
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK, U.S.A. 99775-7220
norcross@ims.uaf.edu

James E. Overland (POC, FERRRS)

Pacific Marine Environmental Laboratory
National Oceanic & Atmospheric Administration
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
James.E.Overland@noaa.gov

Julia K. Parrish (MEQ)

School of Aquatic & Fishery Sciences
University of Washington
1122 NE Boat St., Box 355020
Seattle, WA, U.S.A. 98195-5020
jparrish@u.washington.edu

William T. Peterson (CCCC, REX)

REX Task Team Co-Chairman

Hatfield Marine Science Center
Northwest Fisheries Science Center
National Marine Fisheries Service
2030 SE Marine Science Dr.
Newport, OR, U.S.A. 97365
Bill.Peterson@noaa.gov

Jeffrey J. Polovina (FERRRS)

Pacific Islands Fisheries Science Center
National Marine Fisheries Service
2570 Dole St.
Honolulu, HI, U.S.A. 96734
Jeffrey.Polovina@noaa.gov

Paul Quay (WG17)

School of Oceanography
University of Washington
P.O. Box 355351
Seattle, WA, U.S.A. 98195-6000
pdquay@u.washington.edu

Rolf R. Ream (MBM)

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
rolf.ream@noaa.gov

Stephen C. Riser (POC)

School of Oceanography
University of Washington
P.O. Box 355351
Seattle, WA, U.S.A. 98195
riser@ocean.washington.edu

Thomas C. Royer (TCODE, MONITOR)

Center for Coastal Physical Oceanography
Old Dominion University
768 W. 52nd St.
Norfolk, VA, U.S.A. 23508-2055
royer@ccpo.odu.edu

Michael B. Rust (WG18)

Northwest Fisheries Science Center
National Marine Science Fisheries Service
2725 Montlake Blvd. E
Seattle, WA, U.S.A. 98112
Mike.Rust@noaa.gov

Christopher L. Sabine (WG17)

Pacific Marine Environmental Laboratory
National Oceanic & Atmospheric Administration
7600 Sand Point Way NE, Bldg. 4
Seattle, WA, U.S.A. 98115
chris.sabine@noaa.gov

Franklin B. Schwing (FERRRS)

Pacific Fisheries Environmental Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
1352 Lighthouse Ave.
Pacific Grove, CA, U.S.A. 93950
franklin.schwing@noaa.gov

Michael P. Seki (WG14, MIE)

MSIC Advisory Panel Co-Chairman

Pacific Islands Fisheries Science Center
National Marine Fisheries Service
2570 Dole St.
Honolulu, HI, U.S.A. 96822-2396
Michael.Seki@noaa.gov

John E. Stein (SB, MEQ, NPESR)

MEQ Chairman

Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E
Seattle, WA, U.S.A. 98112
John.E.Stein@noaa.gov

William J. Sydeman (MONITOR, MBM)

MBM Co-Chairman

Marine Ecology Division
Point Reyes Bird Observatory
4990 Shoreline Highway
Stinson Beach, CA, U.S.A. 94970
wjsydeman@prbo.org

Elizabeth J. Tirpak (F&A)

OES/OA Room 5805
U.S. Department of State
2201 C St. NW
Washington, DC, U.S.A. 20520
tirpakej@state.gov

Vera L. Trainer (HAB-S)
HAB-S Co-Chairman
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E
Seattle, WA, U.S.A. 98112
Vera.L.Trainer@noaa.gov

Thomas C. Wainwright (MODEL)
Newport Research Station
Northwest Fisheries Science Center
National Marine Fisheries Service
2032 Southeast OSU Dr.
Newport, OR, U.S.A. 97365-5296
thomas.wainwright@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
watson.michael@epa.gov

Mark L. Wells (HAB-S, IFEP)
School of Marine Sciences
University of Maine
5741 Libby Hall
Orono, ME, U.S.A. 04469
mlwells@maine.edu

Francisco E. Werner (CCCC, MODEL)
MODEL Co-Chairman
Department of Marine Sciences
University of North Carolina
12-7 Venable Hall, CB# 3300
Chapel Hill, NC, U.S.A. 27599-3300
cisco@unc.edu

Patricia A. Wheeler (BIO, BASS)
College of Oceanic & Atmospheric Sciences
Oregon State University
Ocean Administration Bldg. 104
Corvallis, OR, U.S.A. 97331
pwheeler@coas.oregonstate.edu

Warren S. Wooster (NPESR, CPR)
School of Marine Affairs
University of Washington
3707 Brooklyn Ave.
Seattle, WA, U.S.A. 98105-6715
wooster@u.washington.edu

LIST OF PARTICIPANTS

☞

☛

Australia

Hallegraeff, Gustaaf Marinus
School of Plant Science
University of Tasmania
Private Bag 55, College Rd.
Hobart, Tasmania
Australia. 7001
Hallegraeff@utas.edu.au

Taylor, Peter
Department of Environment and
Heritage
PO Box 787
Canberra,
Australia. 2607
peter.taylor@deh.gov.au

Canada

Arai, Mary Needler
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
araim@island.net

Batten, Sonia D.
4737 Vista View Crescent
Nanaimo, BC
Canada. V9V 1N8
soba@sahfos.ac.uk

Beamish, Richard J.
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
BeamishR@pac.dfo-mpo.gc.ca

Bodtker, Karin M.
Fisheries Centre
Marine Mammal Research Unit
University of British Columbia
Hut B3-6248 Biological Sciences Rd.
Vancouver, BC
Canada. V6T 1Z4
bodtker@zoology.ubc.ca

Brown, Robin M.
Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
BrownRo@dfo-mpo.gc.ca

Christian, James
Canadian Centre for Climate
Modelling and Analysis
University of Victoria
PO Box 1700 STN CSC
Victoria, BC
Canada. V8W 2Y2
jim.christian@ec.gc.ca

Crawford, William R.
Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
CrawfordB@pac.dfo-mpo.gc.ca

de la Mare, William
Resource and Environmental
Management
Simon Fraser University
8888 University Dr.
Burnaby, BC
Canada. V5A 1S6
delamare@sfu.ca

Foreman, Michael G.
Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
ForemanM@pac.dfo-mpo.gc.ca

Hay, Douglas E.
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9R 5K6
HayD@pac.dfo-mpo.gc.ca

Holt, Carrie
School of Resource & Environmental
Management
Simon Fraser University
8888 University Dr.
Burnaby, BC
Canada. V5A 1S6
cholt@sfu.ca

Ianson, Debby
Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
IansonD@pac.dfo-mpo.gc.ca

Jamieson, Glen
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
JamiesonG@pac.dfo-mpo.gc.ca

King, Jacquelynne R.
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
KingJac@pac.dfo-mpo.gc.ca

LeBlond, Paul H.
S42,C7, RR#2
Galiano Island, BC
Canada. V0N 1P0
leblond@gulfislands.com

Li, Michelle (Jing)
Earth and Atmospheric Sciences
University of Alberta
1-26 Earth Sciences Building
Edmonton, AB
Canada. T6G 2G3
jl19@ualberta.ca

McFarlane, Gordon Alexander
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada, V9T6N7
McfarlaneS@pac.dfo-mpo.gc.ca

Moores, John A.
Fisheries & Oceans Canada
220 Kent St.
Ottawa, ON
Canada. K1A 0E6
MooresJ@dfo-mpo.gc.ca

O'Hara, Patrick D.
Department of Biology
University of Victoria
PO Box 3020, Station SCS
Victoria, BC
Canada. V8W 3N5
paddio@uvic.ca

Pakhomov, Evgeny
Department of Earth and Sciences
University of British Columbia
6339 Stores Rd.
Vancouver, BC
Canada. VCT 1Z4
epakhomov@eos.ubc.ca

Peña, Angelica
Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
PenaA@pac.dfo-mpo.gc.ca

Richards, Laura
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
RichardsL@pac.dfo-mpo.gc.ca

Schweigert, Jake
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
SchweigertJ@pac.dfo-mpo.gc.ca

Trites, Andrew W
Marine Mammal Research Unit
University of British Columbia
6248 Biological Sciences Rd.
Vancouver, BC
Canada. V6T 1Z4
trites@zoology.ubc.ca

Welch, David W.
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
david.welch@kintamaresearch.org

Wonham, Marjorie
Centre for Mathematical Biology
University of Alberta
632 Central Academic Bldg.
Edmonton, AB
Canada. T6G 2G1
mwonham@math.ualberta.ca

Yelland, Douglas R.
Institute of Ocean Sciences
Fisheries & Oceans Canada
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
YellandD@pac.dfo-mpo.gc.ca

Chile

Silva, Claudio Gallinato
Remote Sensing and GIS in Fisheries
Pontificia Universidad Catolica de
Valparaiso
Av. Altamirano 1480
Valparaiso, Valparaiso
Chile. Casilla 1020
claudio.silva@ucv.cl

Yanez, Eleuterio
Escuela de Ciencias del Mar
Pontificia Universidad Catolica de
Valparaiso
Av. Altamirano 1480
Valparaiso, Valparaiso
Chile. Casilla 1020
eyanez@ucv.cl

China-Taipei

Chen, Chen-Tung Arthur
Institute of Marine Biology &
Oceanography
National Sun Yat-Sen University
P.O. Box 59-60, Room 3054
Kaohsiung
China-Taipei. 804
ctchen@mail.nsysu.edu.tw

Hsieh, Hung-Yen
Institute of Marine Resources
National Sun Yat-sen University
70 Lien-hai Rd.
Kaohsiung
China-Taipei. 804
d9152801@student.nsysu.edu.tw

Hsu, Pei-Kai
Institute of Marine Resources
National Sun Yat-Sen University
70 Lien-hai Rd.
Kaohsiung
China-Taipei. 804
m9052606@student.nsysu.edu.tw

Yu, Shwu-Feng
Institute of Marine Resources
National Sun Yat-Sen University
70 Lien-hai Rd.
Kaohsiung
China-Taipei. 804
b8952044@student.nsysu.edu.tw

France

Cury, Philippe Maurice
IRD, CRHMT
Avenue Jean Monnet
SETE Cedex
France. 34203
pcury@ifremer.fr

Rodgers, Keith B
LODYC
T 45-55, 4E, Paris
France. 75252
rodgers@lodyc.jussieu.fr

Germany

Alheit, Juergen
Baltic Sea Research Institute
Seestr.12, Warnemuende
Germany. 18119
juergen.alheit@io-warnemuende.de

Gollasch, Stephan
GoConsult
Bahrenfelder Str. 73a, Hamburg
Germany. 22765
sgollasch@aol.com

Ireland

Minchin, Dan
Marine Organism Investigations
3 Marina Village, Ballina, Killaloe
Co Clare
Ireland. IRL
minchin@indigo.ie

Japan

Aita, Maki Noguchi
Ecosystem Change Research Program
Frontier Research Center for Global
Change
3173-25, Showa-machi, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-0001
macky@jamstec.go.jp

Asano, Kenji
Headquaters
Fisheries Research Agency
Queen's Tower B-15F, Ninatomirai,
Nishi-ku
Yokohama, Kanagawa
Japan. 220-6115
anchovy@affrc.go.jp

Bower, John R.
Northern Biosphere Field Science
Center, Hakodate Branch
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
akaika@fish.hokudai.ac.jp

Chiba, Sanae
Ecosystem Change Research Program
Frontier Research Center for Global
Change
3173-25 Showa-machi, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-0001
chibas@jamstec.go.jp

Fujise, Yoshihiro
The Institute of Cetacean Research
4-5, Toyomi-cho, Chuo-ku
Tokyo
Japan. 104-0055
fujise@cetacean.jp

Fujita, Junzo
International of Foreign Affairs
Ministry of Foreign Affairs
2-2-1 Kasumigaseki, Chiyoda-Ku
Tokyo
Japan. 100-8919
junzo.fujita@mofa.go.jp

Fukuyo, Yasuwo
Asian Natural Environment Science
Center
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku, Tokyo
Japan. 113-8657
ufukuyo@mail.ecc.u-tokyo.ac.jp

Funamoto, Tetsuichiro
Hokkaido national fisheries research
institute
Kushiro, Hokkaido
Japan. 085-0802
tetsuf@fra.affrc.go.jp

Guo, Xinyu
Center for Marine Environmental
Studies
Ehime University
2-5 Bunkyo-cho
Matsuyama, EHIME
Japan. 790-8577
guoxinyu@dpc.ehime-u.ac.jp

Hanawa, Kimio
Department of Geophysics
Tohoku University Graduate School of
Science
6-3 Aramaki-aza-Aoba, Aoba-ku
Sendai, Miyagi
Japan. 980-8578
hanawa@pol.geophys.tohoku.ac.jp

Hidaka, Kiyotaka
National Research Institute of
Fisheries Science
2-12-4, Fukuura, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-8648
khidaka@affrc.go.jp

Horii, Toyomitsu
National Research Institute of
Fisheries Science
6-31-1 Nagai
Yokosuka, Kanagawa
Japan. 238-0316
thorii@affrc.go.jp

Ichihara, Morio
Graduate School of Fisheries Sciences
Hokkaido University
3-7 B-205, Leoplace, Chitose-cho
Hakodate, Hokkaido
Japan. 041-8611
ichihara@fish.hokudai.ac.jp

Ikeda, Tsutomu
Graduate School of Fisheries Science
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
tom@pop.fish.hokudai.ac.jp

Imai, Ichiro
Graduate School of Agriculture
Kyoto University
Oiwakecho, Kitashirakawa, Sakyo
Kyoto
Japan. 606-8502
imai1ro@kais.kyoto-u.ac.jp

Inagake, Denzo
National Research Institute of Far
Seas Fisheries
5-7-1, Shimizu-orido
Shizuoka, Shizuoka
Japan. 424-8633
ina@affrc.go.jp

Ishida, Yukimasa
National Research Institute of
Fisheries Science
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-8648
ishiday@fra.affrc.go.jp

Ishii, Masao
Geochemical Research Department
Meteorological Research Institute
1-1 Nagamine
Tsukuba, Ibaraki
Japan. 305-0052
mishii@mri-jma.go.jp

Ishiko, Nozomi
Laboratory of Marine Environment
and Resource Sensing
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
nozomi@salmon.fish.hokudai.ac.jp

Ito, Shin-ichi
Tohoku National Fisheries Research
Institute
3-27-5 Shinhamacho
Shiogama, Miyagi
Japan. 985-0001
goito@affrc.go.jp

Itoh, Sachihiko
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan. 164-8639
itohsach@ori.u-tokyo.ac.jp

Kaeriyama, Masahide
Graduate School of Science and
Engineering
Hokkaido Tokai University
5-1-1-1 Minamisawa, Minami-ku
Sapporo, Hokkaido
Japan. 005-8601
salmon@dm.htokai.ac.jp

Kamachi, Masafumi
Oceanographic Research Department
Meteorological Research Institute
1-1 Nagamine
Tsukuba, Ibaraki
Japan. 305-0052
mkamachi@mri-jma.go.jp

Kaneda, Atsushi
Center for Marine Environmental
Studies
Ehime University
2-5 Bunkyocho
Matsuyama, Ehime
Japan. 790-8577
kaneda@dpc.ehime-u.ac.jp

Kasai, Hiromi
Hokkaido National Fisheries Research
Institute
Subarctic Fisheries Oceanography
Division
116 Katsurakoi
Kushiro, Hokkaido
Japan. 085-0802
kasaih@fra.affrc.go.jp

Kato, Hidehiro
National Research Institute of Far
Seas Fisheries
Cetacean Population Biology Unit
7-1, Shimizu-Orido, 5-chome
Shizuoka, Shizuoka
Japan. 424-8633
katohide@affrc.go.jp

Kimura, Shingo
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan. 164-8639
kimuras@ori.u-tokyo.ac.jp

Kishi, Michio J.
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
kishi@salmon.fish.hokudai.ac.jp

Kishida, Tatsu
Research and Technological Guidance
Division
1-2-1, Kasumigaseki, Chiyoda-ku
Tokyo,
Japan. 100-8907
tatsu@affrc.go.jp

Kobari, Toru
Marine Aquatic Research Laboratory,
Faculty of Fisheries
Kagoshima University
4-50-20 Shimoarata,
Kagoshima,
Japan. 890-0056
kobari@fish.kagoshima-u.ac.jp

Kobayashi, Tokimasa
Seikai National Fisheries Research
Institute
1551-8, Taira-machi
Nagasaki,
Japan. 851-2213
tokikoba@affrc.go.jp

Kohama, Takeshi
Center for Marine Environmental
Studies
Ehime University
2-5, Bunkyo-Cho
Matsuyama, Ehime
Japan. 790-8577
kohama@dpc.ehime-u.ac.jp

Komatsu, Kosei
National Research Institute of
Fisheries Science
Fukuura 2-12-4, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-8648
kosei@affrc.go.jp

Magome, Shinya
Center for Marine Environmental
Studies
Ehime University
2-5, Bunkyo-Cho.
Matsuyama, Ehime
Japan. 790-8577
magome@dpc.ehime-u.ac.jp

Matsuda, Hiroyuki
Environment and Information
Sciences
Yokohama National University
79-7 Tokiwadai, Hodogaya-ku
Yokohama, Kanagawa
Japan. 240-8501
matsuda@ynu.ac.jp

Matsueda, Hidekazu
Geochemical Research Department
Meteorological Research Institute
1-1 Nagamine,
Tsukuba, Ibaraki-ken
Japan. 305-0052
hmatsued@mri-jma.go.jp

Midorikawa, Takashi
Climate and Marine Department
Japan Meteorological Agency
Otemachi 1-3-4, Chiyoda-ku
Tokyo, Tokyo
Japan. 100-8122
midorikawa@met.kishou.go.jp

Minami, Takashi
Japan Sea National Fisheries Research
Institute
1-5939-22 Suido-cho
Niigata, Niigata
Japan. 951-8121
mtakashi@fra.affrc.go.jp

Minobe, Shoshiro
Graduate School of Sciences
Hokkaido University
N-10, W-8,
Sapporo, Hokkaido
Japan. 060-0810
minobe@ep.sci.hokudai.ac.jp

Miyashita, Kazushi
Lab. Marine Ecosystem Change
Analysis
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
miyashi@fish.hokudai.ac.jp

Miyashita, Tomio
National Institute of Far Seas
Fisheries
5-7-1 Shimizu-orido
Shizuoka,
Japan. 424-8633
miyachan@fra.affrc.go.jp

Morita, Kentaro
Hokkaido National Fisheries Research
Institute
116 Katsurakoi
Kushiro, Hokkaido
Japan. 085-0802
moritak@affrc.go.jp

Nakata, Kaoru
National Research Institute of
Fisheries Science
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-8648
may31@affrc.go.jp

Nakatani, Toshikuni
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
nakatani@fish.hokudai.ac.jp

Nihira, Akira
Ibaraki Fisheries Research Center
1314-24, Tarazaki,
Hitachinaka, Ibaraki
Japan. 312-0003
nihira@ignaisuisi.ecnet.jp

Nishikawa, Jun
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai
Nakano, Tokyo
Japan. 164-8639

jn@ori.u-tokyo.ac.jp
Nishioka, Jun
Central Research Institute of Electric
Power Industry
1646 Abiko
Abiko, Chiba
Japan. 270-1194
nishioka@criepi.denken.or.jp

Noto, Masayuki
National Research Institute of
Fisheries Science
2-12-4, Fukuura, Kanazawa-ku,
Yokohama, Japan
Yokohama,
Japan. 236-8648
noto@affrc.go.jp

Oguma, Sachiko
Marine and Atmospheric
Geochemistry Laboratory
Hokkaido University
Kita 10 Nishi 5
Sapporo, Hokkaido
Japan. 060-0810
oguma@ees.hokudai.ac.jp

Ohizumi, Hiroshi
Department of Fisheries, School of
Marine Science and Technology
Tokai University
3-2-1 Shimizu-Orido
Shizuoka, Shizuoka
Japan. 424-8610
ohizumi@scc.u-tokai.ac.jp

Oozeki, Yoshioki
National Research Institute of
Fisheries Science
2-12-4 Fukuura, Kanazawa
Yokohama, Kanagawa
Japan. 236-8648
oozeki@affrc.go.jp

Saito, Hiroaki
Tohoku National Fisheries Research
Institute
3-27-5, Shinhamma-cho
Shiogama, Miyagi
Japan. 985-0001
hsaito@fra.affrc.go.jp

Saitoh, Sei-ichi
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
ssaitoh@salmon.fish.hokudai.ac.jp

Sakurai, Toshiyuki
Office of Marine Prediction, Climate
& Marine Department
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku
Tokyo
Japan. 100-8122
tsakurai@met.kishou.go.jp

Sakurai, Yasunori
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
sakurai@fish.hokudai.ac.jp

Sasaoka, Kosei
Earth Observation Research and
Application Center
Japan Aerospace Exploration Agency
Triton Square Office Tower X
1-8-10 Harumi, Chuo-ku
Tokyo
Japan. 104-6023
sasaoka@eorc.jaxa.jp

Sassa, Chiyuki
Seikai National Fisheries Research
Institute
1551-8 Taira-machi
Nagasaki,
Japan. 851-2213
csassa@fra.affrc.go.jp

Shimura, Saya
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
shimura@fish.hokudai.ac.jp

Shimoto, Akihiro
National Research Institute of
Fisheries Science
2-12-4, Fukuura, Kanazawa-ku,
Yokohama, Kanagawa
Japan. 236-8648
shimoto@fra.affrc.go.jp

Suzuki, Katsuya
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
katsuya@fish.hokudai.ac.jp

Suzuki, Toru
Marine Information Research Center
Japan Hydrographic Association
Tsukiji Hamarikyū Bldg. 8F
5-3-3, Tsukiji, Chuo-ku
Tokyo
Japan. 104-0045
suzuki@mirc.jha.jp

Tadokoro, Kazuaki
Frontier Research Center for Global
Change
3173-25 Showa-machi, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-0001
denden@jamstec.go.jp

Takahashi, Masakazu
Baraki Fisheries Research Center
3551-8, Mitsuzuka
Hiraio, Hitachinaka
Ibaraki
Japan. 311-1203
marthin@juno.ocn.ne.jp

Takahashi, Motomitsu
National Research Institute of
Fisheries Science
2-12-4 Fukuura Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-8648
takahamt@fra.affrc.go.jp

Takasuka, Akinori
National Research Institute of
Fisheries Science
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-8648
takasuka@affrc.go.jp

Takeda, Shigenobu
Department of Aquatic Bioscience
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo
Japan. 113-8657
atakeda@mail.ecc.u-tokyo.ac.jp

Takemura, Hiroki
Laboratory of Marine Environment
and Resource Sensing
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
Takemura@salmon.fish.hokudai.ac.jp

Tanaka, Hiroshige
Department of Aquatic Bioscience
University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo
Japan. 113-8657
aa37052@mail.ecc.u-tokyo.ac.jp

Tanaka, Shinichi S.
108,AP26,26,N6,E11,Chuouku
Sapporo, Hokkaido
Japan. 060-0006
shinichi@ees.hokudai.ac.jp

Terazaki, Makoto
Ocean Research Institute
University of Tokyo
Akahama Otsuchi Iwate
Japan. 028-1102
terazaki@ori.u-tokyo.ac.jp

Tian, Yongjun
Japan Sea National Fisheries Research
Institute
1-5939-22, Suido-cho
Niigata, Niigata
Japan. 951-8121
yjtian@fra.affrc.go.jp

Tokieda, Takayuki
Geochemical Research Department
Meteorological Research Institute
1-1 Nagamine
Tsukuba, Ibaraki
Japan. 305-0052
ttokieda@mri-jma.go.jp

Tsurushima, Nobuo
Institute for Environmental
Management Technology
National Institute of Advanced
Industrial Science and Technology
Onogawa 16-1
Tsukuba, Ibaraki
Japan. 305-8569
tsurushima-n@aist.go.jp

Uwai, Shinya
Research Center for Inland Seas
Kobe University
Rokkodai 1-1, Nadaku
Kobe, Hyogo
Japan. 657-8501
uwai@kobe-u.ac.jp

Wada, Tokio
Ministry of Agriculture, Forestry and
Fisheries of Japan
1-2-1 Kaumigaseki, Chiyoda-ku
Tokyo
100-8907 Japan
wadat@affre.go.jp

Watanabe, Shuichi
Japan Marine Science & Technology
Center
690 Kitasekine
Sekine, Mutsu
Japan. 035-0022
swata@jamstec.go.jp

Watanabe, Tatsuro
Japan Sea National Fisheries Research
Institute
1-5939-22, Suido-cho
Niigata,
Japan. 951-8121
tatsuro@fra.affrc.go.jp

Watanabe, Yasunori
National Research Institute of
Fisheries and Environment of Inland
Sea
2-17-5, Maruishi, Ohno-cho
Hiroshima Prefecture
Japan. 739-0452
ywat@affrc.go.jp

Watanabe, Yoshiro
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan. 164-8639
ywatanab@ori.u-tokyo.ac.jp

Watanabe, Yutaka
Division of Ocean & Atmospheric
Science
Hokkaido University
Kita10 Nishi5 Kita-ku
Sapporo, Hokkaido
Japan. 060-0810
yywata@ees.hokudai.ac.jp

Watanuki, Yutaka
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1 Minato-cho
Hakodate, Hokkaido
Japan. 060-8589
ywata@fish.hokudai.ac.jp

Xie, Songguang
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan. 164-8639
sgxie@ori.u-tokyo.ac.jp

Yamaguchi, Atsushi
Marine Biodiversity Laboratory
Hokkaido University
3-1-1 Minatomachi
Hakodate, Hokkaido
Japan. 041-8611
a-yama@fish.hokudai.ac.jp

Yamanaka, Yasuhiro
Graduate School of Environmental
Earth Science
Hokkaido University
N10W5
Sapporo, Hokkaido
Japan. 060-0810
galapen@ees.hokudai.ac.jp

Yasuda, Ichiro
Graduate School of Science
University of Tokyo
7-3-1, Bunkyo-ku
Tokyo
Japan. 113-0033
ichiro@eps.s.u-tokyo.ac.jp

Yatsu, Akihiko
National Research Institute of
Fisheries Science
2-12-4 Fukuura, Kanazawa-ku
Yokohama, Kanagawa
Japan. 236-8648
yatsua@fra.affrc.go.jp

Yoshikawa-Inoue, Hisayuki
Graduate School of Environmental
Earth Science
Hokkaido University
Kita 10, Nishi 5
Sapporo, Hokkaido
Japan. 060-0810
hyoshika@ees.hokudai.ac.jp

Zainuddin, Mukti
Graduate School of Fisheries Sciences
Hokkaido University
3-1-1, Minato-cho
Hakodate, Hokkaido
Japan. 041-8611
mukti@salmon.fish.hokudai.ac

Mexico

Amezcuca, Felipe
Instituto de Ciencias del Mar
Universidad Nacional Autonoma de
Mexico
Joel Montes Camarena s/n
Mazatlan, Sinaloa
México. 82040
famezcua@ola.icmyl.unam.mx

Baumgartner, Tim R.
Biological Oceanography
CICESE
Km 107 Carretera Tijuana-Ensedada
Ensenada, Baja California
México. 228960
tbaumgar@cicese.mx

Franco-Gordo, Carmen
Centro de Ecología Costera
Universidad de Guadalajara
Gmez Faras 82
Mpio. Cihuatlan, Jalisco
México. 48980
cfranco@costera.melaque.udg.mx

Godinez-Dominguez, Enrique
Centro de Ecología Costera
Universidad de Guadalajara
Gomez Farias 82,
San Patricio-Melaque, Jalisco
México. 48980
egodinez@costera.melaque.udg.mx

Ladah, Lydia B.
Biological Oceanography
CICESE
Apdo Postal # 2732
Ensenada, Baja California
México. 22800
lladah@cicese.mx

Martinez Tovar, Ivan
Fisheries
Universidad Nacional Autonoma de
Mexico
Joel Montes Camarena s/n
Mazatlan, Sinaloa
México. 82040
ivan@ola.icmyl.unam.mx

Rodriguez-Sanchez, Ruben
Centro Interdisciplinario de Ciencias
Marinas
Avenida Instituto Politecnico
Nacional s/n
La Paz, Baja California Sur
México. 23000
rrodrig@ipn.mx

Norway

Drinkwater, Kenneth F,
Institute of Marine Research
P.O. Box 1870,
Nordnes, Bergen,
Norway. N-5018
ken.drinkwater@imr.no

People's Republic of China

Chen, Shang
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai, Nakano-ku
Tokyo
Japan. 164-8639
qdc@163.com

Cui, Mao-Chang
Institute of Oceanology, Chinese
Academy of Sciences
7 Nanhai Rd.
Qingdao, Shandong
People's Republic of China. 266071
mccui@ms.qdio.ac.cn

Liu, Qian-Fei
International Cooperation Division
Bureau of Fisheries
Ministry of Agriculture
11 Nongzhanguan Nanli
Beijing
People's Republic of China. 100026
inter-coop@agri.gov.cn

Shujiang, Li
First Institute of Oceanography
State Oceanic Administration
6 Xianxialing Rd., Hi-tech Zone
Qingdao, Shandong,
People's Republic of China. 266061
lisj@fio.org.cn

Su, Jian
Institute of Physical Oceanography
Ocean University of China
5 Yushan Rd.
Qingdao, Shandong,
People's Republic of China. 266003
sujian@ouc.edu.cn

Tan, Gongke
China-Korea Joint Ocean Research
Centre
6 Xianxialing Rd., High-Tech Zone
Qingdao, Shandong
People's Republic of China. 266101
gongke_tan@fio.org.cn

Tian, Tian
Institute of Physical Oceanography
Ocean University of China
5 Yushan Rd.
Qingdao, Shandong
People's Republic of China. 266003
tiantian@ouc.edu.cn

Tong, Ling
Yellow Sea Fisheries Research
Institute
106 Nanjing Rd.
Qingdao, Shandong
People's Republic of China. 266071
tongling@ysfri.ac.cn

Zhang, Xuelei
First Institute of Oceanography
State Oceanic Administration
6 Xianxialing Rd., Hi-tech Zone
Qingdao, Shandong
People's Republic of China. 266061
zhangxl@fio.org.cn

Zhao, Jin-Ping
First Institute of Oceanography
State Oceanic Administration
Xianxialin Rd., Hi-tech Zone
Qingdao, Shandong,
People's Republic of China. 266061
zhaojp@fio.org.cn

Zhu, Ming-Yuan
First Institute of Oceanography
State Oceanic Administration
6 Xianxialing Rd., Hi-tech Zone
Qingdao, Shandong
People's Republic of China. 266061
myzhu@public.qd.sd.cn

Zhu, Wen-Xi
Department of International
Cooperation
State Oceanic Administration
1 Fuxingmenwai Ave.
Beijing,
People's Republic of China. 100860

Zou, Yinglin
First Institute of Oceanography
State Oceanic Administration
6 Xianxialing Rd., Hi-tech Zone
Qingdao, Shandong
People's Republic of China. 266061
ylzou@fio.org.cn

Republic of Korea

Chang, Man
South Sea Institute
Korea Ocean Research &
Development Institute
391 Jangmok-ri, Jangmok-myeon
Geoje, Gyeongnam
Republic of Korea. 656-830
mchang@kordi.re.kr

Cho, Eun-Seob
South Sea Fisheries Institute
National Fisheries Research &
Development Institute
347, Anpo-ri, Hwayang-myeon
Yeosu, Jeonnam
Republic of Korea. 556-820
eun-5657@hanmail.net

Cho, Kyu-Dae
College of Environmental and Marine
Sciences and Technology
Pukyong National University
599-1 Daeyeon-dong, Nam-gu
Busan
Republic of Korea. 608-737
kdcho@pknu.ac.kr

Choi, Sang-Hwa
Data Management Section
Korea Ocean Research &
Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
choish@kordi.re.kr

Chung, Ik-Kyo
Marine Science Department
Pusan National University
San 30, Jangjun-dong, Geumjung-gu
Busan
Republic of Korea. 609-735
ikchung@pusan.ac.kr

Chung, Young-Hoon
Marine Research & Development
Division
Ministry of Maritime Affairs and
Fisheries
50 Chungjeong-no, Seodaemun-Gu
Seoul
Republic of Korea. 120-715
yhcfish@momaf.go.kr

Huh, Hyung-Tack
Marine Living Resources Research
Division
Korea Ocean Research & Development
Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
hthuh@kordi.re.kr

Jeon, Dong-Chull
Ocean Climate & Environment
Research Division
Korea Ocean Research & Development
Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
dcjeon@kordi.re.kr

Jeong, Hee-Dong
Ocean Research Team
National Fisheries Research &
Development Institute
408-1 Shirang-ri, Gijang-eup, Gijang-
gun
Busan
Republic of Korea. 619-902
hdjeong@nfrdi.re.kr

Kang, Hae-Seok
Ocean Data and Information
Department
Korea Ocean Research & Development
Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
hskang@kordi.re.kr

Kang, Hyung-Ku
Marine Living Resources Research
Division
Korea Ocean Research & Development
Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
kanghk@kordi.re.kr

Kang, Jung-Hoon
South Sea Institute
Korea Ocean Research & Development
Institute
391 Jangmok-ri, Jangmok-myeon
Geoje, Gyeongnam
Republic of Korea. 656-830
jhkang@kordi.re.kr

Kang, Suk-Yung
Fisheries Resources Department
National Fisheries Research and
Development Institute
408-1 Shirang-ri, Gijang-eup, Gijang-
gun
Busan
Republic of Korea. 619-902
kangsk@mail1.pknu.ac.kr

Kang, Young-Chul
Korea Polar Research Institute
Korea Ocean Research &
Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
yckang@kordi.re.kr

Kang, Young-Shil
Marine Harmful Organisms Division
National Fisheries Research &
Development Institute
408-1, Shirang-ri, Gijang-eup,
Gijang-gun
Busan
Republic of Korea. 619-902
yskang@nfrdi.re.kr

Kim, Eun-Jung
Department of Marine Biology
Pukyong National University
559-1 Daeyeon-dong Nam-gu
Busan
Republic of Korea. 608-737
eunjung.kim@gmail.com

Kim, Hak-Gyoon
South Sea Fisheries Institute
National Fisheries Research &
Development Institute
347, Anpo-ri, Hwayang-myeon
Yeosu, Jeonnam
Republic of Korea. 619-902
hgkim@nfrdi.re.kr

Kim, Hye-Seon
Department of Fisheries Science
Yosu National University
San 96-1 Dundeok-dong
Yeosu, Jeonnam
Republic of Korea. 550-749
khs99@yosu.ac.kr

Kim, Hyun-Cheol
Marine Living Resource Research
Division
Korea Ocean Research &
Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
kimhc@kordi.re.kr

Kim, Jin-Yeong
South Sea Fisheries Institute
National Fisheries Research &
Development Institute
347, Anpo-ri, Hwang-myeon
Yeosu, Jeonnam
Republic of Korea. 556-820
jiykim@nfrdi.re.kr

Kim, Jung-Hyun
National Oceanographic Research
Institute
1-17, 7-ga, Hang-dong, Jung-gu
Incheon
Republic of Korea. 400-800
kimjh@nori.go.kr

Kim, Kee-Hyun
Department of Oceanography
Chungnam National University
220 Gung-dong, Yuseong-gu
Daejeon
Republic of Korea. 305-764
khkim@cnu.ac.kr

Kim, Keun-Oh
Marine Research & Development
Division
Ministry of Maritime Affairs and
Fisheries
50 Chungjeong-no, Seodaemun-Gu
Seoul
Republic of Korea. 120-715
conti2169@momaf.go.kr

Kim, Kuh
School of Earth & Environmental
Sciences
Seoul National University
San 56-1 Shillim-dong, Kwanak-gu
Seoul,
Republic of Korea. 151-742
kuhkim@ocean.snu.ac.kr

Kim, Sook-Yang
National Fisheries Research &
Development Institute
408-1 Shirang-ri, Gijang-eup, Gijang-
gun
Busan
Republic of Korea. 619-902
sookyang@nfrdi.re.kr

Kim, Suam
Department of Marine Biology
Pukyong National University
599-1 Daeyeon-dong, Nam-gu
Busan
Republic of Korea. 608-737
suamkim@pknu.ac.kr

Lee, Chung-Il
Department of Oceanography
Pukyong National University
599-1 Daeyeon-dong, Nam-gu
Busan
Republic of Korea. 608-737
leeci@mail1.pknu.ac.kr

Lee, Hwa-Hyun
Biology Education
Pukyong National University
599-1 Daeyeon-dong, Nam-gu
Busan
Republic of Korea. 608-737
proxima07@hanmail.net

Lee, Jae-Bong
Fisheries Resources Research &
Management
National Fisheries Research &
Development Institute
408-1 Shirang-ri, Gijang-eup, Gijang-
gun
Busan
Republic of Korea. 619-902
leejb@nfrdi.re.kr

Lee, Jang-Uk
Pukyong National University
599-1 Daeyeon-dong Nam-gu
Busan
Republic of Korea. 608-737
julee0922@korea.com

Lee, Youn-Ho
Marine Living Resources Research
Division
Korea Ocean Research & Development
Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
ylee@kordi.re.kr

Nam, Sung-Hyun
RIO/School of Earth and
Environmental Sciences
Seoul National University
San 56-1, Shillim-Dong, Gwanak-Gu
Seoul
Republic of Korea. 151-742
namsh@ocean.snu.ac.kr

Park, Chul
Marine Environment &
Oceanography Department
National Fisheries Research &
Development Institute
408-1, Shirang-ri, Gijang-eup,
Gijang-gun
Busan
Republic of Korea. 619-902
chulpark@nfrdi.re.kr

Park, Eun-Ok
College of Fisheries and Ocean
Science
Yosu National University
San 96-1 Dundeok-dong
Yeosu, Jeonnam
Republic of Korea. 550-749
ej0731@hanmail.net

Park, Jong-Jin
School of Earth and Environmental
Sciences
Seoul National University
San 56-1, Shillim-Dong, Gwanak-Gu
Seoul
Republic of Korea. 151-742
jpark@ocean.snu.ac.kr

Seo, Hyun-Ju
Department of Marine Biology
Pukyong National University
599-1 Daeyeon-dong, Nam-gu
Busan
Republic of Korea. 608-737
uagiri@hanmail.net

Shim, Jeong Hee
Ocean Climate and Environment
Research Division
Korea Ocean Research &
Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
jhshim@kordi.re.kr

Soh, Ho-Young
Yosu National University
San 96-1 Dundeok-dong
Yeosu, Jeonnam
Republic of Korea. 550-749
hysoh@yosu.ac.kr

Yang, Dong Beom
Ocean Climate and Environment
Research Division
Korea Ocean Research &
Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
dbyang@kordi.re.kr

Yeon, In-Ja
West Sea Fisheries Research Institute
National Fisheries Research &
Development Institute
707 Eulwang-dong, Jung-gu
Incheon
Republic of Korea. 400-420
ijyeon@nfrdi.re.kr

Yoo, Sinjae
Marine Living Resources Research
Division
Korea Ocean Research &
Development Institute
1270 Sa-dong, Sangrok-gu
Ansan, Gyeonggi
Republic of Korea. 426-744
sjyoo@kordi.re.kr

Yoon, Ho-Seop
Department of Fisheries Science
Yosu National University
San 96-1, Dundok-dong
Yeosu, Jeonnam
Republic of Korea. 550-749
yoonhs@yosu.ac.kr

Zhang, Chang-Ik
Department of Marine Production
Management
Pukyong National University
599-1 Daeyeon -dong, Nam-gu
Busan
Republic of Korea. 608-737
cizhang@pknu.ac.kr

Russia

Andreev, Andrey G.
Pacific Oceanological Institute
43 Baltiyskaya St.
Vladivostok
Russia. 690041
andreev@poi.dvo.ru

Belan, Tatyana A.
Far Eastern Regional Hydrometeoro-
logical Research Institute
24 Fontannaya St.
Vladivostok
Russia. 690990
tbelan@hydromet.com

Bocharov, Lev N.
Pacific Scientific Research Fisheries
Center
4 Shevchenko Alley
Vladivostok
Russia. 690950
bocharov@tinro.ru

Bogdanovsky, Alexander A.
Far Eastern Regional Hydrometeoro-
logical Research Institute
24 Fontannaya St.
Vladivostok
Russia. 690990
abogdanovsky@hydromet.com

Borozdinova, Elena Sergeevna
Far Eastern Regional Hydrometeoro-
logical Research Institute
24 Fontannaya St.
Vladivostok
Russia. 690990
eborozdinova@hydromet.com

Bulatov, Oleg A.
Russian Federal Research Institute of
Fisheries & Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow,
Russia. 107140
obulatov@vniro.ru

Buslov, Alexander V.
Kamchatka Research Institute of
Fisheries & Oceanography
18 Naberezhnaya St
Petropavlovsk-Kamchatsky
Russia. 683000
Buslov@kamniro.ru

Dulepova, Elena P.
Pacific Scientific Research Fisheries
Center
4 Shevchenko Alley
Vladivostok
Russia. 690950
dep@tinro.ru

Fayman, Pavel A.
Far Eastern Regional Hydrometeoro-
logical Research Institute
24, Fontannaya St.
Vladivostok
Russia. 690600
PFayman@hydromet.com

Glubokov, Alexander I.
Russian Federal Research Institute of
Fisheries & Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow,
Russia. 107140
glubokov@vniro.ru

Golik, Andrey V.
Pacific Oceanological Institute
43 Baltiyskaya St.
Vladivostok
Russia. 690041
duha@math.dvgu.ru

Ishmukova, Irina Vladimirovna
Pacific Scientific Research Fisheries
Center
4 Shevchenko Alley
Vladivostok Primorsky Region
Russia. 690650
ishmukova@tinro.ru

Kaplunenko, Dmitry D.
Pacific Oceanological Institute
43 Baltiyskaya St.,
Vladivostok
Russia. 690041
dimkap@poi.dvo.ru

Katugin, Oleg N.
Pacific Scientific Research Fisheries
Center
4 Shevchenko Alley
Vladivostok
Russia. 690950
okatugin@mail.ru

Kovatcheva, Nikoliona Petkova
Russian Federal Research Institute of
Fisheries & Oceanography
17 Verkhnyaya Krasnoselskaya
Moscow,
Russia. 107140
nikolinak@mail.ru

Lobanov, Vyacheslav B.
Pacific Oceanological Institute
43 Baltiyskaya St.
Vladivostok
Russia. 690041
lobanov@poi.dvo.ru

Lukyanova, Olga N.
Pacific Research Fisheries Centre
4 Shevchenko Al.
Vladivostok
Russia. 690950
olgaluk@hotmail.com

Maksimov, Sergey V.
Federal Agency for Fisheries
12, Rozhdestvenskii
Moscow
Russia. 107996
maksimovsv@fishcom.ru

Navrotsky, Vadim V.
Pacific Oceanological Institute
43 Baltiyskaya St.
Vladivostok
Russia. 690041
navrotskyv@poi.dvo.ru

Nazarov, Victor A.
Pacific Scientific Research Fisheries
Centre
4 Shevchenko Alley
Vladivostok
Russia. 690950
nazarov@tinro.ru

Orlova, Tatiana Yu.
Institute of Marine Biology
17 Palchevskogo St.
Vladivostok
Russia. 690041
torlova@whoi.edu

Ponomarev, Vladimir I.
Pacific Oceanological Institute
43 Baltiyskaya St.
Vladivostok
Russia. 690041
ponomarev@poi.dvo.ru

Radchenko, Vladimir I.
Sakhalin Research Institute of Fisheries
& Oceanography
196 Komsomolskaya St.
Yuzhno-Sakhalinsk,
Russia. 693023
vlrad@sakhniro.ru

Savinykh, Vadim F.
Pacific Scientific Research Fisheries
Center
4 Shevchenko Alley
Vladivostok
Russia. 690950
savinykh@tinro.ru

Shevchenko, George V.
Sakhalin Research Institute of Fishery
& Oceanography
196 Komsomolskaya St.
Yuzhno-Sakhalinsk,
Russia. 693023
shevchenko@sakhniro.ru

Shevchenko, Igor I.
Pacific Scientific Research Fisheries
Center
4 Shevchenko Alley
Vladivostok
Russia. 690950
igor@tinro.ru

Stepanenko, Mikhail
Pacific Research Fisheries Center
4 Schevchenko Alley
Vladivostok
Russia. 690950
stepanenko@tinro.ru

Velikanov, Anatoliy
Sakhalin Research Institute of
Fisheries & Oceanography
196, Komsomolskaya St.
Yuzhno-Sakhalinsk,
Russia. 693023
velikanov@sakhniro.ru

Vorobyov, Pavel V.
Pacific Scientific Research Fisheries
Center
4-Shevchenko Alley
Vladivostok
Russia. 690950
vorobyov@tinro.ru

Zolotov, Oleg G.
Kamchatka Fisheries Research
Institute
Fisheries Agency of Russian
Federation
18 Naberezhnaya St.
Petropavlovsk-Kamchatsky,
Russia. 683000
zolotov@kamniro.ru

Zuenko, Yury I.
Pacific Scientific Research Fisheries
Center
4 Shevchenko Alley
Vladivostok
Russia. 690950
zuenko@tinro.ru

U.S.A.

Abraham, Christine L.
Marine Ecology Division
PRBO Conservation Science
4990 Shoreline Highway
Stinson Beach, California
U.S.A. 94970
cabraham@prbo.org

Adams, Nicolaus Gale
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E.
Seattle, WA
U.S.A. 98112
Nicolaus.Adams@noaa.gov

Agostini, Vera N.
School of Aquatic & Fishery Sciences
University of Washington
SAFS Box 355020
Seattle, WA
U.S.A. 98102

Allen, Jeanne
NOAA NCDDC
Bldg 1100, Room 101
Stennis Space Center, MS
U.S.A. 39529
Jeanne.S.Allen@noaa.gov

A'mar, Teresa
School of Aquatic & Fishery Science
University of Washington
Box 355020
Seattle, WA
U.S.A. 98195-5020
zta@u.washington.edu

Armstrong, David A.
School of Aquatic & Fishery Sciences
University of Washington
Box 355020
Seattle, WA
U.S.A. 98195-5020
davearm@u.washington.edu

Armstrong, Janet L
School of Aquatic & Fishery Science
University of Washington
Box 355020
Seattle, WA
U.S.A. 98195-5020
janeta@u.washington.edu

Auth, Toby Daniel
Hatfield Marine Science Center
CIMRS
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
toby.auth@noaa.gov

Aydin, Kerim Y.
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-0070
Kerim.Aydin@noaa.gov

Bakun, Andrew
Rosenstiel School of Marine and
Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami, FL
U.S.A. 33149-1098
abakun@rsmas.miami.edu

Baldwin, Rebecca
Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, Oregon
U.S.A. 97365
becky.baldwin@oregonstate.edu

Barth, Jack A.
College of Oceanic & Atmospheric
Sciences
Oregon State University
104 COAS Admin Bldg
Corvallis, OR
U.S.A. 97331-5503
barth@coas.oregonstate.edu

Batchelder, Harold P.
College of Oceanic & Atmospheric
Sciences
Oregon State University
104 Ocean Administration Bldg.
Corvallis, OR
U.S.A. 97331-5503
hbatchelder@coas.oregonstate.edu

Beauchamp, David A.
School of Aquatic & Fisheries
Sciences
University of Washington
Box 355020
Seattle, WA
U.S.A. 98195-5020
davebea@u.washington.edu

Bhuthimethee, Mary
Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
mary.bhuthimethee@oregonstate.edu

Bidigare, Robert R.
Oceanography
University of Hawaii
1000 Pope Rd.
Honolulu, HI
U.S.A. 96822
bidigare@hawaii.edu

Bill, Brian D.
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd E.
Seattle, WA
U.S.A. 98112
brian.d.bill@noaa.gov

Boehlert, George W.
Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365-5296
george.boehlert@oregonstate.edu

Boehme, Jennifer
Darling Marine Center
University of Maine
193 Clarks Cove Rd.
Walpole, ME
U.S.A. 04573
jboehme@maine.edu

Bograd, Steven J.
Pacific Fisheries Environmental
Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
1352 Lighthouse Ave.
Pacific Grove, CA
U.S.A. 93950
sbograd@pfeg.noaa.gov

Bradley, Russell
PRBO Conservation Science
4990 Shoreline Highway
Stinson Beach, CA
U.S.A. 94970
blangabeer@prbo.org

Brodeur, Richard D.
Hatfield Marine Science Center
Northwest Fisheries Science Center
National Marine Fisheries Service
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
Rick.Brodeur@noaa.gov

Buchheister, Andre
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA
U.S.A. 98115
andre.buchheister@noaa.gov

Buckley, Troy W.
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA
U.S.A. 98115
Troy.Buckley@noaa.gov

Chai, Fei
School of Marine Sciences
University of Maine
5741 Libby Hall
Orono, ME
U.S.A. 04469-5741
fchai@maine.edu

Cochlan, William P.
Romberg Tiburon Center for
Environmental Studies
San Francisco State University
3152 Paradise Dr.
Tiburon, CA
U.S.A. 94920-1205
cochlan@sfsu.edu

Costa, Daniel Paul
Ecology & Evolutionary Biology
University of California
100 Shaffer Rd.
Santa Cruz, CA
U.S.A. 95060
costa@biology.ucsc.edu

Coyle, Kenneth O.
School of Fisheries & Ocean Sciences
University of Alaska Fairbanks
Institute of Marine Science
P.O. Box 757220
Fairbanks, AK
U.S.A. 99775-7220
coyle@ims.uaf.edu

Curchitser, Enrique N
Ocean and Climate Physics
Lamont Doherty Earth Observatory of
Columbia University
61 Route 9W
Oceanography 201-C
New York, NY
U.S.A. 10964
enrique@ldeo.columbia.edu

Dagg, Michael J.
Louisiana Universities Marine
Consortium
8124 Highway 56
Chauvin, LA
U.S.A. 70344
mdagg@lumcon.edu

Deutsch, Curtis
University of Washington
Box 355351
Seattle, WA
U.S.A. 98105
cdeutsch@ocean.washington.edu

Dickson, Andrew G
Scripps Institution of Oceanography
University of California, San Diego
9500 Gilman Dr.
La Jolla, CA
U.S.A. 92093-0244
adickson@ucsd.edu

Dobbins, Elizabeth L.
Pacific Marine Environmental
Laboratory
National Oceanic & Atmospheric
Administration
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
Elizabeth.Dobbins@noaa.gov

Domokos, Reka
Pacific Islands Fisheries Science
Center
National Marine Fisheries Service
2570 Dole St.
Honolulu, HI
U.S.A. 96822-2396
reka.domokos@noaa.gov

Etnoyer, Peter
Aquanautix
3777 Griffith View Dr.
Los Angeles, CA
U.S.A. 90039
peter@aquanautix.com

Fagan, Kathryn E.
University of Hawaii
1000 Pope Rd.
Honolulu, HI
U.S.A. 96822
kfagan@hawaii.edu

Faris, Tamra
National Marine Fisheries Service,
1601 Kapiolani Blvd.
Suite 1110
Honolulu, HI
U.S.A. 96814
Tamara.Faris@noaa.gov

Feely, Richard A.
Pacific Marine Environmental
Laboratory
National Oceanic & Atmospheric
Administration
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
Richard.A.Feely@noaa.gov

Fiedler, Paul
La Jolla Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
8604 La Jolla Shores Dr.
La Jolla, CA
U.S.A. 92037
Paul.Fiedler@noaa.gov

Field, John C.
Santa Cruz Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
110 Shaffer Rd.
Santa Cruz, CA
U.S.A. 95060
John.Field@noaa.gov

Foy, Robert J
School of Fisheries & Ocean Science
University of Alaska Fairbanks
118 Trident Way
Fairbanks, AK
U.S.A. 99775-7220

Friedman, Carolyn S.
School of Aquatic & Fishery Sciences
University of Washington
Box 355020
Seattle, WA
U.S.A. 98195
carolynf@u.washington.edu

Gallagher, Brett
Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
gallagham@onid.orst.edu

Gallucci, Vincent
School of Aquatic & Fishery Sciences
University of Washington
Box 355020
Seattle, WA
U.S.A. 98195-5020
vgallucc@u.washington.edu

Garcia, Hernan Eduardo
National Ocean Data Center
National Oceanic & Atmospheric
Administration
SSMC-III, E/OC5, Room 4326
1315 East-West Highway
Silver Spring, MD
U.S.A. 20910-3282
Hernan.Garcia@noaa.gov

Gende, Scott
Glacier Bay Field Station
National Park Service
3100 National Park Rd.
Juneau, AK
U.S.A. 99801
Scott_Gende@nps.gov

Gertseva, Vladlena V.
Hatfield Marine Science Center
Northwest Fisheries Science Center
National Marine Fisheries Service
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
vladlena.gertseva@noaa.gov

Godwin, Scott
Natural Sciences, Bishop Museum
1525 Bernice St.
Honolulu, HI
U.S.A. 96817-2704
sgodwin@bishopmuseum.org

Grimes, Churchill B.
Santa Cruz Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
110 Shaffer Rd.
Santa Cruz, CA
U.S.A. 95060
Churchill.Grimes@noaa.gov

Grosch, Chester E.
Center for Coastal Physical
Oceanography
Old Dominion University
Hampton Blvd.
Norfolk, VA
U.S.A. 23529
enright@ccpo.odu.edu

Gruber, Nicolas
IGPP & Department of Atmospheric
and Oceanic Sciences
University of California, Los Angeles
5853 Slichter Hall
Los Angeles, CA
U.S.A. 90095
ngruber@igpp.ucla.edu

Hamner, William M.
Department of Ecology &
Evolutionary Biology
University of California Los Angeles
Box 951606
Los Angeles, CA
U.S.A. 90095-1606
whamner@ucla.edu

Hannides, Cecelia Catherine Sheridan
Department of Oceanography
University of Hawaii
1000 Pope Rd.
Honolulu, HI
U.S.A. 96822
sheridan@hawaii.edu

Harvey, Christopher James
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E.
Seattle, WA
U.S.A. 98112
Chris.Harvey@noaa.gov

Helle, John Harold
Auke Bay Laboratory
National Marine Fisheries Service
11305 Glacier Hwy
Juneau, AK
U.S.A. 99801
Jack.Helle@noaa.gov

Hermann, Albert Joseph
Joint Institute for the Study of the
Atmosphere and Ocean
University of Washington
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98117
Albert.J.Hermann@noaa.gov

Hinckley, Sarah
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA
U.S.A. 98115-0070
Sarah.Hinckley@noaa.gov

Hollowed, Anne B.
Alaska Fisheries Science Center
National Marine Fisheries Service,
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
Anne.Hollowed@noaa.gov

Hopcroft, Russell R.
Institute of Marine Science
University of Alaska
Fairbanks, AK
U.S.A. 99775
hopcroft@ims.uaf.edu

Howell, Evan A
Pacific Islands Fisheries Science
Center
National Marine Fisheries Service
2570 Dole St.
Honolulu, HI
U.S.A. 96822
evan.howell@noaa.gov

Hunt, Jr., George L.
Department of Ecology &
Evolutionary Biology
University of California, Irvine
321 Steinhaus Hall
Irvine, CA
U.S.A. 92697-2525
glhunt@uci.edu

Hyrenbach, K. David
Duke Marine Laboratory
Duke University
135 Duke Marine Lab. Rd.
Beaufort, NC
U.S.A. 28516
khyrenba@duke.edu

Jacobson, Kym C.
Hatfield Marine Science Center
Northwest Fisheries Science Center
National Marine Fisheries Service
2030 S. Marine Science Dr.
Newport, OR
U.S.A. 97365
kym.jacobson@noaa.gov

Karl, David M.
Oceanography
University of Hawaii
1000 Pope Rd. MSB 629
Honolulu, HI
U.S.A. 96822
dkarl@hawaii.edu

Keister, Julie E.
College of Oceanic and Atmospheric
Sciences
Oregon State University
104 Ocean Admin Bldg.
Corvallis, OR
U.S.A. 97331
julie.keister@noaa.gov

Kitagawa, Takashi
Hopkins Marine Station
Stanford University
120 Oceanview blvd.
Pacific Grove, CA
U.S.A. 93950-3094
takashik@ori.u-tokyo.ac.jp

Kitaysky, Alexander S.
Institute of Arctic Biology
University of Alaska Fairbanks
311 Irving Hall
Fairbanks, AK
U.S.A. 99775
ffask@uaf.edu

Kline, Thomas Clayton
Prince William Sound Science Center
P O Box 705
Cordova, AK
U.S.A. 99574
tkline@pwssc.gen.ak.us

Kobayashi, Donald R.
Pacific Islands Fisheries Science
Center
National Marine Fisheries Service
2570 Dole St.
Honolulu, HI
U.S.A. 96822
Donald.Kobayashi@noaa.gov

Kozyr, Alexander
Carbon Dioxide Information Analysis
Center
Oak Ridge National Laboratory
Bld. 1509, Mail Stop 6335
1 Bethel Valley Rd.
Oak Ridge, TN
U.S.A. 37831-6335
kozyra@ornl.gov

Kruse, Gordon H.
Juneau Center
University of Alaska Fairbanks
11120 Glacier Highway
Juneau, AK
U.S.A. 99801-8677
Gordon.Kruse@uaf.edu

Landry, Michael R.
Scripps Institution of Oceanography
University of California, San Diego
9500 Gilman Dr.
La Jolla, CA
U.S.A. 92093-0227
mlandry@ucsd.edu

Lawson, Peter Wayne
Hatfield Marine Science Center
Northwest Fisheries Science Center
National Marine Fisheries Service
2030 SE Marine Science Dr.
Newport, Oregon
U.S.A. 97365
peter.w.lawson@noaa.gov

Lee, Yong-Woo
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sandpoint Way NE
Seattle, WA
U.S.A. 98115
yongwoo.lee@noaa.gov

Leising, Andrew
Pacific Fisheries Environmental
Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
1352 Lighthouse Ave.
Pacific Grove, CA
U.S.A. 93950
aleising@pfeg.noaa.gov

Livingston, Patricia
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
Pat.Livingston@noaa.gov

Logerwell, Elizabeth A.
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
Libby.Logerwell@noaa.gov

MacCall, Alec D.
Santa Cruz Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service,
110 Shaffer Rd.
Santa Cruz, CA
U.S.A. 95060
Alec.MacCall@noaa.gov

Macklin, Stewart Allen
Pacific Marine Environmental
Laboratory
National Oceanic & Atmospheric
Administration
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
allen.macklin@noaa.gov

Mantua, Nathan J.
Department of Atmospheric Sciences
University of Washington
Box 354235
Seattle, WA
U.S.A. 98107
nmantua@u.washington.edu

Marasco, Richard J.
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
Richard.Marasco@noaa.gov

Ole Mathisen
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA
U.S.A. 98115
randim@rockisland.com

Maximenko, Nikolai A.
International Pacific Research Center
University of Hawaii
1680 East West Rd., POST #401
Honolulu, HI
U.S.A. 96822
nikolai@soest.hawaii.edu

Maxwell, Sara
Marine Conservation Biology
Institute
419 E Boylston Ave #2
Seattle, WA
U.S.A. 98102
sara@mcbi.org

McCarthy, Abigail
Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
abigail.mccarthy@oregonstate.edu

McNutt, Lyn
Geophysical Institute
University of Alaska
903 Koyukuk Dr.
Fairbanks, AK
U.S.A. 99775-7230
lyn@gi.alaska.edu

Mecking, Sabine
Woods Hole Oceanographic
Institution
1613 N 53rd St
Seattle, WA
U.S.A. 98103
smecking@whoi.edu

Megrey, Bernard A.
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
Bern.Megrey@noaa.gov

Miller, Arthur J.
Scripps Institution of Oceanography
University of California
Nierenberg Hall, Room 439
La Jolla, CA
U.S.A. 92093-0224
ajmiller@ucsd.edu

Miller, Charles B.
College of Oceanic & Atmospheric
Sciences
Oregon State University
Oceanography Administration Bldg.
Corvallis, OR
U.S.A. 97331-5503
cmiller@coas.oregonstate.edu

Morgan, Lance
Marine Conservation Biology
Institute
4878 Warm Springs Rd
Glen Ellen, CA
U.S.A. 95442
lance@mcbi.org

Mueter, Franz
JISAO
University of Washington
697 Fordham Dr.
Fairbanks, AK
U.S.A. 99709
fmueter@alaska.net

Mundy, Phillip R.
Exxon Valdez Oil Spill Trustee
Council
441 West 5th Avenue, Suite 500
Anchorage, AK
U.S.A. 99501
phil_mundy@evostc.state.ak.us

Murtugudde, Raghu G
University of Maryland
CSS Bldg, Room 2201
College Park, MD
U.S.A. 20742
ragu@essic.umd.edu

Napp, Jeffrey M.
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, WA
U.S.A. 98115-0070
Jeff.Napp@noaa.gov

Nielsen, Jennifer
Marine and Freshwater Ecology
USGS Alaska Science Center
1011 East Tudor Rd.
Anchorage, AK
U.S.A. 99503
jennifer_nielsen@usgs.gov

Norcross, Brenda L.
School of Fisheries & Ocean Science
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK
U.S.A. 99775-7220
norcross@ims.uaf.edu

Ortiz, Ivonne
School of Aquatic & Fishery Sciences
University of Washington
Box 355020
Seattle, WA
U.S.A. 98195
ivonne@u.washington.edu

Overland, James E.
Pacific Marine Environmental
Laboratory
National Oceanic & Atmospheric
Administration
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
James.E.Overland@noaa.gov

Pantelev, Gleb
International Arctic Research Center
P.O.Box 757340
930 Koyukuk Dr.
Fairbanks, AK
U.S.A. 99775-7340
gleb@iarc.uaf.edu

Parada, Carolina
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way N.E. Bldg. 4
Seattle, WA
U.S.A. 98105
carolina.parada@noaa.gov

Peterson, William T.
Hatfield Marine Science Center
National Marine Fisheries Service
2030 S. Marine Science Dr.
Newport, OR
U.S.A. 97365
Bill.Peterson@noaa.gov

Pinchuk, Alexei
Institute of Marine Science
University of Alaska
P.O.Box 730
Seward, Alaska
U.S.A. 99664
ftaip1@uaf.edu

Polovina, Jeffrey J.
Pacific Islands Fisheries Science
National Marine Fisheries Service
2570 Dole St.
Honolulu, HI
U.S.A. 96734
Jeffrey.Polovina@noaa.gov

Power, Mary E.
Department of Integrative Biology
University of California, Berkeley
3060 Valley Life Sciences Bldg.
Berkeley, CA
U.S.A. 94720-3140
mepower@socrates.berkeley.edu

Purcell, Jennifer Estelle
Shannon Point Marine Center
Western Washington University
1900 Shannon Point Rd
Anacortes, WA
U.S.A. 98221
purcelj@cc.wvu.edu

Rand, Peter S.
State of the Salmon
Wild Salmon Center
721 NW 9th Avenue, Suite 290
Portland, OR
U.S.A. 97209
prand@wildsalmoncenter.org

Ream, Rolf R.
National Marine Mammal Laboratory
National Marine Fisheries Service
7600 Sand Point Way NE Bldg. 4
Seattle, WA
U.S.A. 98115
rolf.ream@noaa.gov

Reese, Douglas C
College of Oceanic & Atmospheric
Sciences
Oregon State University
104 Ocean Admin Bldg.
Corvallis, OR
U.S.A. 97331
dreese@coas.oregonstate.edu

Richert, John E
University of California, Davis
Wildlife, Fish, and Conservation
Biology
One Shields Ave.
Davis, CA
U.S.A. 95616
jerichert@ucdavis.edu

Riser, Stephen C.
School of Oceanography
University of Washington
Box 355351
Seattle, WA
U.S.A. 98195
riser@ocean.washington.edu

Royer, Thomas C.
Ocean, Earth & Atmospheric Sciences
Old Dominion University
768 W. 52nd St.
Norfolk, VA
U.S.A. 23508-2055
royer@ccpo.odu.edu

Rust, Michael B.
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E.
Seattle, WA
U.S.A. 98112
Mike.Rust@noaa.gov

Sabine, Christopher L.
Pacific Marine Environmental
Laboratory
National Oceanic & Atmospheric
Administration
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115-6349
chris.sabine@noaa.gov

Sadler, Daniel W.
SOEST
University of Hawaii
1000 Pope Rd.
Honolulu, HI
U.S.A. 96822
sadler@hawaii.edu

Samuelson, Annette
Department of Oceanography
Florida State University
R.M. Johnson Bldg. - Suite 200
Tallahassee, FL
U.S.A. 32310
samuelse@coaps.fsu.edu

Sandell, Todd A.
Oregon State University
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
todd.sandell@noaa.gov

Sands, Norma Jean
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd E
Seattle, WA
U.S.A. 98112-2013
norma.sands@noaa.gov

Schick, Robert Schilling
Santa Cruz Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
110 Shaffer Rd.
Santa Cruz, CA
U.S.A. 95060
robert.schick@noaa.gov

Schirripa, Michael J.
Hatfield Marine Science Center
Northwest Fisheries Science Center
National Marine Fisheries Service
2030 SE Marine Science Dr.
Newport, OR
U.S.A. 97365
Michael.Schirripa@noaa.gov

Schneider, Niklas
International Pacific Research Center
University of Hawaii
1680 East West Rd. POST #401
Honolulu, HI
U.S.A. 96822
nschneid@hawaii.edu

Schwing, Franklin B.
Pacific Fisheries Environmental
Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
1352 Lighthouse Ave.
Pacific Grove, CA
U.S.A. 93950
franklin.schwing@noaa.gov

Seki, Michael P.
Pacific Islands Fisheries Science
Center
National Marine Fisheries Service
2570 Dole St.
Honolulu, HI
U.S.A. 96822-2396
Michael.Seki@noaa.gov

Sissenwine, Michael P.
Director of Scientific Programs
National Marine Fisheries Service
1315 East-West highway
Silver Spring, MD
U.S.A. 20910
michael.sissenwine@noaa.gov

Spencer, Paul
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
paul.spencer@noaa.gov

Stahl, Jennifer Paige
Fisheries
University of Alaska Fairbanks
PO Box 210546
Auke Bay, AK
U.S.A. 99821
j.stahl@uaf.edu

Stein, John E.
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E
Seattle, WA
U.S.A. 98112-2097
John.E.Stein@noaa.gov

Strub, P. Ted
College of Oceanic & Atmospheric
Sciences
Oregon State University
104 COAS Administration Bldg.
Corvallis, OR
U.S.A. 97331-5503
tstrub@coas.oregonstate.edu

Suchman, Cynthia
Virginia Sea Grant
University of Virginia
Madison House – 170 Rugby Rd.
Charlottesville, VA
U.S.A. 22903
csuchman@virginia.edu

Suntsov, Andrei V.
Fish and Plankton Ecology
Department
Harbor Branch Oceanographic
Institution
5600 US 1 North
Fort Pierce, FL
U.S.A. 34946
asuntsov@mail.ru

Suryan, Robert
Hatfield Marine Science Center
Oregon State University
2030 S.E. Marine Science Dr.
Newport, OR
U.S.A. 97365
rob.suryan@oregonstate.edu

Sydeman, William J.
Marine Ecology Division
Point Reyes Bird Observatory
4990 Shoreline Highway
Stinson Beach, CA
U.S.A. 94970
wjsydeman@prbo.org

Taylor, Phillip
Division of Ocean Sciences
U.S. National Science Foundation
4201 Wilson Blvd., Suite 725
Arlington, VA
U.S.A. 20816
prtaylor@nsf.gov

Tirpak, Elizabeth J.
U.S. Department of State
OES/OA Room 5805
2201 C St. NW
Washington, DC
U.S.A. 20520
tirpakej@state.gov

Tomlinson, Michelle
Center for Coastal Monitoring and
Assessment
National Oceanic and Atmospheric
Administration
1305 East-West Highway, SSMC4,
#9244
Silver Spring, MD
U.S.A. 20910-3282
Michelle.Tomlinson@noaa.gov

Trainer, Vera L.
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd., E
Seattle, WA
U.S.A. 98112
Vera.L.Trainer@noaa.gov

Vilchis, Ignacio
Integrative Oceanography
Scripps Institution of Oceanography
9500 Gilman Dr.
La Jolla, CA
U.S.A. 92093-0227
lvilchis@ucsd.edu

Wainwright, Thomas C.
Newport Research Station
Northwest Fisheries Science Center
National Marine Fisheries Service
2032 Southeast OSU Dr.
Newport, OR
U.S.A. 97365-5296
thomas.wainwright@noaa.gov

Wallace, Leon
435 N. Roxbury Dr. #303
Beverly Hills, CA
U.S.A. 90210
leonfern@aol.com

Watson, C. Michael
US EPA Region 10
Office of Environmental Assessment
1200 sixth ave.
OEA-095
seattle, WA
U.S.A. 98101
watson.michael@epa.gov

Weingartner, Thomas J.
Institute of Marine Science
University of Alaska
Fairbanks, AK
U.S.A. 99775
weingart@ims.uaf.edu

Wells, Brian K
Santa Cruz Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
110 Shaffer Rd.
Santa Cruz, CA
U.S.A. 95060
brian.wells@noaa.gov

Wells, Mark L.
School of Marine Sciences
University of Maine
5741 Libby Hall
Orono, ME
U.S.A. 04469
mlwells@maine.edu

Werner, Francisco E.
Department of Marine Sciences
University of North Carolina
12-7 Venable Hall, CB# 3300
Chapel Hill, NC
U.S.A. 27599-3300
cisco@unc.edu

Wespestad, Vidar G.
Pacific Whiting Conservation
Cooperative
21231 8th Place West
Lynnwood, WA
U.S.A. 98036
vidar@att.net

Wheeler, Patricia A.
College of Oceanic & Atmospheric
Sciences
Oregon State University
Ocean Administration Bldg. 104
Corvallis, OR
U.S.A. 97331
pwheeler@coas.oregonstate.edu

Whitledge, Terry E.
School of Fisheries & Ocean Sciences
University of Alaska Fairbanks
PO Box 757220
Fairbanks, AK
U.S.A. 99775-7220
terry@ims.uaf.edu

Whitmire, Curt E.
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E
Seattle, WA
U.S.A. 98112-2097
Curt.Whitmire@noaa.gov

Wilson, Cara
Pacific Fisheries Environmental
Laboratory
Southwest Fisheries Science Center
National Marine Fisheries Service
1352 Lighthouse Ave.
Pacific Grove, CA
U.S.A. 93955
cwilson@pfe.noaa.gov

Wolf, Shaye
Ecology and Evolutionary Biology
University of California, Santa Cruz
100 Shaffer Rd.
Santa Cruz, California
U.S.A. 95060
wolf@biology.ucsc.edu

Wooster, Warren S.
School of Marine Affairs
University of Washington
3707 Brooklyn Ave.
Seattle, WA
U.S.A. 98105-6715
wooster@u.washington.edu

Yoshinari, Hiroshi
International Pacific Research Center
University of Hawaii
1680 East West Rd. POST #401
Honolulu, HI
U.S.A. 96822
hy@hawaii.edu

Youngbluth, Marsh J.
Harbor Branch Oceanographic
Institution
Marine Science
5600 U.S. 1, North
Fort Pierce, FL
U.S.A. 34946
youngbluth@hboi.edu

Zheng, Jie
Division of Commercial Fisheries
Alaska Department of Fish & Game
P.O. Box 25526
Juneau, AK
U.S.A. 99802-5526
jje_zheng@fishgame.state.ak.us

Organizations

AOOS

McCammon, Molly
Alaska Ocean Observing System
1007 West Third Avenue, Suite 100
Anchorage, AK
U.S.A. 99517
mccammon@aoos.org

Argo

Gould, W John
Argo Project Office
Scripps Institution of Oceanography
9500 Gilman Dr.
La Jolla, CA
U.S.A. 92093-0230
wjg@ucsd.edu

CLIVAR

Richards, Kelvin
International Pacific Research Center
University of Hawaii
1680 East West Rd. POST #401
Honolulu, HI
U.S.A. 96822
rkelvin@hawaii.edu

GOOS

Malone, Thomas C.
National Ocean Research Leadership
Council
Ocean.US Office
2300 Clarendon Blvd.
Arlington, VA
U.S.A. 22201-3667
t.malone@ocean.us

ICES

Griffith, David
General Secretary
International Council for the
Exploration of the Sea (ICES)
H.C. Andersen Boulevard 44-46
Copenhagen V,
Denmark. DK-1553
david@ices.dk

IOC

Enevoldsen, Henrik Oksfeldt
Science and Communication Centre
on Harmful Algae
Intergovernmental Oceanographic
Commission of UNESCO
O. Farimagsgade 2D, University of
Copenhagen
Copenhagen
Denmark. 1353 K
henrike@bot.ku.dk

Hood, Maria
Ocean Science
Intergovernmental Oceanographic
Commission of UNESCO
IOC-UNESCO, 1, rue Miollis
Paris,
France. 75732 Cedex 15
m.hood@unesco.org

NASCO

Hutchinson, Peter
NASCO Secretariat
11 Rutland Square
Edinburgh
United Kingdom. EH12AS
peter@phutchinson.net

NPAFC

Low, Loh-Lee
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA
U.S.A. 98115
Loh-Lee.Low@noaa.gov

NPRB

Pautzke, Clarence
Executive Director
North Pacific Research Board
1007 West 3rd Ave., Suite 100
Anchorage, AK
U.S.A. 99501
cpautzke@nprb.org

PaCOS

Clarke, M. Elizabeth
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd. E.
Seattle, WA
U.S.A. 98112
Elizabeth.Clarke@noaa.gov

Fox, Jr., William W.
Southwest Fisheries Science Center
National Marine Fisheries Service
8604 La Jolla Shores Dr.
La Jolla, CA
U.S.A. 92037
william.fox@noaa.gov

Hunter, John R.
Scripps Institution of Oceanography
University of California San Diego
105 Vaughn Hall
La Jolla, CA
U.S.A. 92093-0227
John.Hunter@noaa.gov

Varanasi, Usha
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Blvd., East
Seattle, WA
U.S.A. 98112-3217
Usha.Varanasi@noaa.gov

PICES

Alexander, Vera
PICES Chairman
School of Fisheries & Ocean Sciences
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK
U.S.A. 99775-7220
vera@sfos.uaf.edu

Perry, R. Ian
PICES Science Board Chairman
Pacific Biological Station
Fisheries & Oceans Canada
3190 Hammond Bay Rd.
Nanaimo, BC
Canada. V9T 6N7
PerryI@pac.dfo-mpo.gc.ca

SCOR

Hall, Julie A.
National Institute of Water and
Atmospheric Research Ltd
PO Box 11-15
Hillcrest, Hamilton
New Zealand. 2001
j.hall@niwa.co.nz

WESTPAC

Fortes, Miguel D.
WESTPAC Secretariat
IOC/WESTPAC
196 Phaholyothin Rd., Chatujak, c/o
NRCT
Bangkok, None
Thailand. 10900
m.fortes@unesco-bkk.org

PICES Secretariat

Gong-Gu Back
Intern
PICES Secretariat
c/o Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
intern@pices.int

Bychkov, Alexander
Executive Secretary
PICES Secretariat
c/o Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
bychkov@pices.int

Chiu, Christina
Deputy Executive Secretary on
Administration
PICES Secretariat
c/o Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
christina@pices.int

McKinnell, Stewart (Skip) M.
Deputy Executive Secretary
PICES Secretariat
c/o Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
mckinnell@pices.int

Yazvenko, Julia
Database & web Administrator
PICES Secretariat
c/o Institute of Ocean Sciences
P.O. Box 6000
Sidney, BC
Canada. V8L 4B2
secretariat@pices.int

LIST OF ACRONYMS

ACIA	Arctic Climate Impact Assessment Program (ACIAP of AMAP)
AFSC	Alaska Fisheries Science Center
AFS-CAR	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
Argo	International Program for deployment of profiling floats
ASLO	American Society of Limnology and Oceanography
BASIS	Bering-Aleutian Salmon International Survey, NPAFC
BASS	Basin Studies Task Team, PICES
BIO	Biological Oceanography Committee, PICES
CCCC	Climate Change and Carrying Capacity Program, PICES
CDIAC	Carbon Dioxide Information and Analysis Center
CFAME (TT)	Climate Forcing and Marine Ecosystem Task Team, PICES
CLIVAR	Climate Variability and Predictability Program
CoML	Census of Marine Life Program
CPR-AP	Advisory Panel on the Continuous Plankton Recorder Survey in the North Pacific, PICES
CREAMS	Circulation Research of the East Asian Marginal Seas Program
DBCP	Data Buoy Cooperation Panel
EBM	Ecosystem-Based Management
EC/IP	Executive Committee / Implementation Panel for CCCC
ECOHAB	Ecology and Oceanography of Harmful Algal Blooms Program
ECOR	Engineering Committee on Oceanic Resources
EML	Ecological Metadatabase Language
ENSO	El Niño-Southern Oscillation
EVOS	Exxon Valdez Oilspill Trustee Council
FAO	Food and Agriculture Organization
FERRRS	Study Group on Fisheries and Ecosystem Responses to Recent Regime Shifts, PICES
FIS	Fishery Science Committee, PICES
FRA	Fisheries Research Agency of Japan
GCM	General Circulation Model
GCOS	Global Climate Observing System
GCP	Global Carbon Project
GEM	Gulf of Alaska Ecosystem Monitoring and Research Program of EVOS
GEOHAB	Global Ecology and Oceanography of Harmful Algal Blooms
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GIPME	Global Investigation of Pollution in the Marine Environment
GLOBEC	Global Ocean Ecosystem Dynamics Programme
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GRA	GOOS Regional Alliances
GRAND	GOOS Regional Alliances Networking Development project
HAB	Harmful Algal Blooms

HAB-S	Section on Harmful Algal Blooms, PICES
HAE-DAT	ICES-IOC Harmful Algal Event Data Base
HTL	Higher Trophic Level
IAI	Intra-American Institute
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
IFEP-AP	Advisory Panel on Iron Fertilization Experiment in the Subarctic Pacific, PICES
IGBP	International Geosphere Biosphere Programme
IGOSS	Integrated Global Ocean Services System
IHDP	International Human Dimensions Programme on Global Environmental Change
IMBER*	Integrated Marine Biogeochemistry and Ecosystems Research (former OCEANS)
IOC	Intergovernmental Oceanographic Commission
IOCCP	International Ocean Carbon Coordinated Project
IODE	International Oceanographic Data Information Exchange (IOC)
IOS	Institute of Ocean Sciences
IPCC	International Panel on Climate Change
IPHC	International Pacific Halibut Commission
IPO	International Programme Office
IPRC	International Pacific Research Center
IWC	International Whaling Commission
JAMSTEC	Japan Marine Science & Technology Center
JMA	Japan Meteorological Agency
JODC	Japanese Oceanographic Data Center
KODC	Korean Ocean Data Center
KORDI	Korea Ocean Research and Development Institute
LAS	Life Assess Server
LTL	Lower Trophic Level
MBM-AP	Advisory Panel on Marine Birds and Mammals, PICES
MEDS	Marine Environmental Data Service
MEQ	Marine Environmental Committee, PICES
MIE-AP	Advisory Panel on Micronekton Inter-calibration Experiment, PICES
MIRC	Marine Information Research Center
MODEL (TT)	Conceptual / Theoretical and Modeling Studies Task Team, PICES
MOMAF	Ministry of Maritime Affairs and Fisheries, Korea
MONITOR (TT)	Monitor Task Team, PICES
NAFO	North Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NASA	National Aeronautics and Space Administration, U.S.A.
NEAR-GOOS	North East Asian Regional GOOS
NEMURO	North Pacific Ecosystem Model for Understanding Regional Oceanography
NEXT	NEMURO Experimental Planning Team
NIES	National Institute for Environmental Studies, Japan
NMFS	National Marine Fisheries Service, U.S.A.
NOAA	National Oceanographic and Atmospheric Administration, U.S.A.
NODC	National Oceanographic Data Center
NORI	National Ocean Research Institute, Korea
NOWPAP	Northwest Pacific Action Plan
NPAFC	North Pacific Anadromous Fish Commission

NPDB-AP	North Pacific Data Buoy Advisory Panel, PICES
NPEMD	North Pacific Ecosystem Data Base
NPESR	North Pacific Ecosystem Status Report
NPRB	North Pacific Research Board
NSF	National Science Foundation, U.S.A.
NWFSC	Northwest Fisheries Science Center
OBIS	Ocean Biological Information System, CoML
PaCOS	Pacific Coast Observing System
PICES	North Pacific Marine Science Organization
PICNIC	PICES Carbon Dioxide Related Data Integration for the North Pacific
PIFSC	Pacific Islands Fisheries Science Center
PNW-IOOS	Pacific Northwest Integrated Ocean Observing System
POC	Physical Oceanography and Climate Committee, PICES
POGO	Partnership for Observation of the Global Ocean
PSA	Pacific Science Association
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
PSP	Paralytic Shellfish Poisoning
REX (TT)	Regional Experiments (Task Team), PICES
SAHFOS	Sir Alister Hardy Foundation for Ocean Science
SB	Science Board, PICES
SCOPE	Scientific Committee on Problems of the Environment
SCOR	Scientific Committee on Oceanic Research
SEEDS	Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study
SERIES	Subarctic Ecosystem Response to Iron Enrichment Study
SGCP	Studu Group on Capacity Building, PICES
SGEBM	Study Group on Ecosystem-based management and its applications to the North Pacific, PICES
SISS	Study Group on Strategic Issues, PICES
SOLAS	Surface Ocean Low Atmosphere Study
SPACC	Small Pelagic Fishes and Climate Change Program of GLOBEC
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program
START	South Asian Regional Committee for the System for Analysis, Research and Training
SWFSC	Southwest Fisheries Science Center
TCODE	Technical Committee on Data Exchange, PICES
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WCRP	World Climate Research Program
WESTPAC	IOC Sub-Commission for the Western Pacific
WG	Working Group
WGBOSV	Working Group on Ballast Waters and Other Ship Vectors, ICES/IOC/IMO
WGITMO	Working Group on Introductions and Transfers of Marine Organisms, ICES
WGZE	Working Group on Zooplankton Ecology, ICES
WMO	World Meteorological Organization
XML	Extensible Markup Language