Report of Science Board

Science Board met in Yeosu, Korea, from 12:30 to 14:30 on October 19, 2014. Science Board Chairman, Dr. Thomas Therriault, welcomed guests and members to the meeting and self-introductions were made (*SB Endnote 1*). The agenda was adopted without revisions, but some items were re-ordered to accommodate invited observers (*SB Endnote 2*). A second meeting was held after the Closing Session, from 14:00 to 18:00 on October 24 and a one-day meeting was held from 9:00 to 18:00 on October 25.

Participants of the Science Board meeting at PICES-2014 (from left): Angelica Peña (BIO), Elizabeth (Libby) Logerwell (FIS), Jennifer Boldt (MONITOR), Harold (Hal) Batchelder (PICES Deputy Executive Secretary), Toru Suzuki (TCODE), Kyung-Il Chang (POC), Hiroaki Saito (Science Board Vice-Chairman; AP-COVE), Thomas Therriault (Science Board Chairman), Chuanlin Huo (MEQ), Phillip Mundy (AP-SOFE), Steven Bograd (AP-AICE), Igor Shevchenko (representing Russia).

Sunday, October 19, 2014

AGENDA ITEM 2
Procedures for Science Board Symposium and Session awards

Three topic sessions were switched to different Committees to provide better balance for judging. POC was to judge S10, TCODE would judge S4 and MONITOR would judge S9. Dr. Elizabeth Logerwell was delegated to write the summary for the Science Board Symposium (S1).

AGENDA ITEM 3
Relations with specific international programs/organizations

International Council for the Exploration of the Sea (ICES)

ICES representative, Dr. Kenneth Drinkwater, announced that theme sessions were in the process of being merged for its 2015 Annual Science Conference and for ICES inter-sessional symposia. [Documents were received by the Secretariat and forwarded to the Committee Chairs for evaluation on the day of the individual Committee meetings.]

PICES was invited to co-sponsor a symposium on "*Understanding marine socio-ecological systems: Including the human dimension in Integrated Ecosystem Assessments*" February/March 2016, in Paris, France by providing a member to the SSC and supporting speaker(s). The resolution for the symposium was distributed to Committee Chairs for discussion with their members. Science Board requested ICES to correct the tentative date of fall 2016 for the PICES/ICES Symposium on "*Drivers of dynamics of small pelagic fish resources*" to early spring 2016.

The first meeting of a "new" group to review the ICES/PICES Strategic Initiative took place at ICES 2015 ASC in A Coruña, Spain. The review will be continued in 2015.

Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)

Dr. Drinkwater, representing IMBER, presented an overview of IMBER's plans to transition to Future Earth. A human dimension aspect will be folded into Future Earth, something IMBER also has been working on as evidenced by some of IMBER's research themes. IMBER appreciates its collaboration with PICES. Although a proposal for co-sponsorship of IMBIZO IV to be held October 27–30, 2015 in Trieste, Italy, has not been submitted to PICES yet, Science Board agreed in principle to support the meeting. S-CC member, Dr. Masao Ishii, was formally accepted as an IMBER SSC member.

International Oceanographic Commission of UNESCO and its Sub-commission for the Western Pacific (IOC/WESTPAC)

Dr. Yutaka Michida, representing IOC and its sub-commission, WESTPAC, discussed ongoing WESTPAC-PICES collaboration in areas of training programs, joint symposia, ocean observing systems, and the sharing of oceanographic data. PICES was invited to participate in the 10th Inter-governmental Session of WESTPAC in May 12-15, 2015 in Phuket, Thailand, the Pacific Tsunami Warning and Mitigation System session in May 2015 in Honolulu, and the IOC Assembly meeting in June 2015 in Paris. PICES was invited to join IODE as an IODE Associate Data Unit member. No action was taken by Science Board at this time.

Intergovernmental Panel on Climate Change

Dr. Hans Pörtner reported that the 5th assessment report of the IPCC was close to completion – by 2015. It will have a physical/chemical ocean chapter and a regional chapter; the first time there will be two oceanographic chapters in the report. He encouraged PICES to be represented in the AR process by having its experts engage in a scoping meeting to discuss the contents of the ocean chapters and suggested that PICES might collaborate with ICES on this. He also suggested that PICES scientists actively publishing register to be reviewers.

PICES was encouraged to submit proposals for theme sessions at the International Scientific Conference on "*Our common future under climate change*" to be held July 7–10, 2015 in Paris, France by November 2014, and to attend COP 21 (Conference of the United Nations Framework Convention on Climate Change) in Paris, France (November 30–December 11, 2015).

Scientific Committee on Oceanic Research (SCOR)

Dr. Sinjae Yoo noted that Korea will be nominating a Korean scientist who is already a PICES member to the SCOR Working Group on Radioactivity in the Ocean, 5 Decades Later (RiO5). The linkage would be stronger if China was willing to support Dr. Yusheng Zhang, Co-Chair of WG 30 on *Assessment of Marine Environmental Quality of Radiation around the North Pacific*. (Science Board consensus was not to support a PICES member for associate status on the RiO5 Working Group)

Dr. Yoo observed there were four areas where SCOR and PICES could raise the level of collaboration: co-sponsoring meetings/symposia, supporting large-scale projects, capacity building, and having PICES affiliate members on SCOR working groups. Alternatively, PICES could submit a proposal to establish a joint SCOR/PICES expert group but the mechanism to do this would need coordination with SCOR. It was noted that BIO is actively collaborating with GEOTRACES as the program moves its focus from the Atlantic to the Pacific.

Partnership for Observation of the Global Oceans (POGO)

Dr. Jae-Hak Lee, representing POGO, informed Science Board that POGO was a consortium of international oceanographic institutes that worked through partnerships with other organizations and programs. Potential collaborations between PICES, POGO and SCOR could be through capacity building, a fellowship program, contributing to the development of GACs, or through a training workshop on CPR operation/sampling in relation to IIOE-2. POGO-16 will take place in Tenerife, Spain, on January 27–29, 2015 and PICES was encouraged to send a representative to present on areas of mutual interest with POGO. Science Board agreed to continue tracking events related to CPR and IIOE-2.

Friday, October 24, 2014

AGENDA ITEM 3, CONTINUED
Relations with specific international programs/organizations

Global Ocean Observing System (GOOS)

Dr. Jennifer Boldt, MONITOR Chair, affirmed that PICES (i.e., CPR/MONITOR activities) will continue to play an active role in GOOS.

50th Anniversary of the International Indian Ocean Expedition (IIOE-2)

Dr. Batchelder attended an IIOE-2 workshop that was held just prior to the SCOR Annual Meeting in Bremen, Germany (September 2014). An IIOE-2 Science Plan will be completed by late January 2015. SCOR will conduct their Annual Meeting in Goa in December 2015 in celebration of IIOE's 50th Anniversary. China, Japan, Korea and the US will participate in IIOE-2. Russia expressed interest but cannot provide resources. Canada is not involved. PICES will continue to track activities through Dr. Batchelder's connection with SCOR.

Northwest Pacific Action Plan (NOWPAP)

Dr. Toru Suzuki represented PICES at the NOWPAP CEARAC Focal Points Meeting July 2–3, 2014, in Toyama, Japan and Dr. Chuanlin Huo represented PICES at the NOWPAP DINRAC Focal Points Meeting June 16–17, 2014, in Bejing, China. Dr. Suzuki noted that a CEARAC Action Plan is developed every 2 years, and advised Science Board that it may not be necessary to send representatives to RAC Focal Points meetings every year, although it is important that PICES be engaged with the RACs and be involved when the Plans are developed. In addition, the joint PICES/NOWPAP Study Group on *Scientific Cooperation in the North Pacific* is developing a framework for strategic cooperation between PICES and NOWPAP (SG document expected by PICES-2015).

Climate Variability and Predictability Program (CLIVAR)

CLIVAR (Climate Variability and Predictability Program) has officially changed its name to "Climate and Ocean – Variability, Predictability, and Change". Drs. Shoshiro Minobe and Enrique Curchitser continue to be very active in CLIVAR and PICES.

North Pacific Anadromous Fish Commission (NPAFC)

The first activity under the NPAFC/PICES Framework for Enhanced Scientific Cooperation in the North Pacific, approved by Governing Council in June 2014, was to hold a 1-day FIS Workshop (W2) on "*Linkages between the winter distribution of Pacific salmon and their marine ecosystems and how this might be altered with climate change*". The results of the workshop will be a collaborative paper led by Dr. Shoshiro Minobe that will be presented at the NPAPFC International Symposium on "*Pacific salmon and steelhead production in a changing climate: Past, present, and future*" May 17–19, 2015 in Kobe, Japan.

NPAFC is proposing to establish an International Year of the Salmon to provide the opportunity for collaborative international research on salmon-ocean ecology and how climate change will affect future abundance. A scoping meeting to develop a prospectus will be held in Vancouver, Canada, in February 2015 and NPAFC requested a PICES representative to attend. NPAFC/PICES SG-SC-NP member, Dr. James Irvine, will be attending the Kobe symposium and Science Board suggested that he report back to PICES when more is known about this proposal.

Action: Dr. Logerwell to contact Dr. Irvine to ensure that ecology will be presented under the framework at the scoping meeting.

ICES (continued)

Science Board reviewed the list of ICES theme sessions that were chosen for PICES co-sponsorship by the Standing Committees at their meetings on Wednesday, October 22. The selections are listed under Science Board recommendations in Agenda Item 8.

AGENDA ITEM 4
FUTURE Evaluation Team recommendations and next steps

Some feedback on the proposed changes in governance of FUTURE was provided at the joint FUTURE Advisory Panel meeting (October 18, 2014). Science Board agreed that the new struture would consist of a Scientific Steering Committee (SSC) made up of two Co-Chairmen and 12 members. The Section on *Human Dimensions of Marine Systems* will be part of the membership. The current Advisory Panels will be disbanded although some elements of SOFE will need to be retained such as PICES' high priority activity, North Pacfic Ecosystem Status Report (see the proposal for a Study Group on NPESR) and outreach. It was suggested that the outreach aspect be removed from an expert group (formerly AP-SOFE) and be allocated to the Secretariat, although there will still need to be a scientist-professional interface to communicate the science to the target audiences. Drs. Hiroaki Saito (AP-COVE) and Steven Bograd (AP-AICE) accepted the nominations by Science Board for Co-Chairmanship. To refine and advance the FUTURE work plan, an SSC meeting should be held as soon as possible (tentatively January 2015).

Recommendation: FUTURE Advisory Panels to be disbanded and a FUTURE SSC, under the direction of Science Board, be established.

AGENDA ITEM 5
Next phase of NPESR

The proposal for the establishment of a Study Group on the *North Pacific Ecosystem Status Report* was brought forward by Dr. Phillip Mundy from ISB-2014, where it was approved in principle by Science Board. Terms of Reference were updated to include an Implementation Plan for the production of the next generation of NPESR (*SB Endnote 3*). Because of the complexity in changing over to a new mechanism for delivering the next phase of the report, Dr. Mundy proposed that the Study Group be in place for 2 years to develop the plan.

Recommendation: Science Board recommends the establishment of a Study Group on NPESR.

AGENDA ITEM 6
Reports from expert groups under Science Board

Study Group on *Biodiversity Conservation*

SG-BC Chair, Dr. Jannelle Curtis, presented a brief report of the Study Group since its establishement at PICES-2013. During its term, the SG identified five biodiversity themes for potential research, and made recommendations for the establishment of a Working Group on *Biodiversity of Biogenic Habitats*, with an initial focus on coral- and sponge-dominated ecosystems, under the direction of three potential parents – BIO, FIS and MEQ. Although there was agreement that the new expert group would be useful in filling a gap in FUTURE, some committees suggested that the group be deferred until after the restructuring of FUTURE. In addition, FIS and MEQ had concerns that they would be the right parent for the group. Due to lack of consensus on whether or not the group should go forward, Dr. Therriault instructed the Committee Chairs to review the terms of reference before presenting a final decision.

Action: Committee Chairs to provide decision on supporting/not supporting a new working group.

Saturday, October 25, 2014

AGENDA ITEM 6 (CONTINUED)
Reports from expert groups under Science Board

Study Group on *Socio-Ecological-Environmental Systems* (SG-SEES)

SG-SEES Chair, Dr. Emanuele Di Lorenzo, was unable to attend the Science Board meeting but provided a brief written summary. The SG requested a one year extension of its term, originally set to expire at the end of 2014, to plan, format and organize a proposed Workshop entitled "*Towards a transdisciplinary approach in coastal SEES*" with the goal of bringing together scientists from different disciplines to engage/practice a transdisciplinary dialogue on a selected SEES issue. Venue and dates for the proposed workshop will be decided later.

Joint PICES/NOWPAP Study Group on *Scientific Cooperation in the North Pacific Ocean* (SG-SCOOP)

SG-SCOOP Co-Chair, Dr. Chuanlin Huo, announced that the SG held its first meeting (October 15-16) during PICES-2014 to discuss potential areas of collaboration. Both Organizations agreed on a list of activities to undertake jointly within the next 5 years.

Section on *Human Dimensions of Marine Ecosystems* (S-HD)

A brief written report on completed, ongoing and future activities was circulated to Science Board on October 9, as neither Co-Chairman (Drs. Mitsutaku Makino and Keith Criddle) was able to attend the Science Board meeting. See Agenda Item 5 on plans for holding a symposium.

AGENDA ITEM 7
3rd Climate Change Symposium in 2015

Planning for the 3rd PICES/ICES/IOC Symposium on the "*Effects of climate change on the world's oceans*", to be held March 23-27, 2015, in Santos, Brazil is well under way. There were no issues to discuss.

AGENDA ITEM 8
Status of PICES-sponsored conferences/workshops/symposia

PICES/ICES/IOC Open Science Meeting on "*Harmful algal blooms and climate change*"

A request by the Co-Convenor of the proposed OSM, Dr. Mark Wells, to MEQ was conveyed to Science Board and was for travel support of $15,000 for Western Pacific PICES scientists and himself to attend the OSM in Gothenburg, Sweden (May 19-25, 2015). Science Board agreed it was important to continue to support the meeting, *i.e*., Dr. Well's activities, but considered the amount requested excessive especially given PICES fully supported the first scoping meeting and others were to fund the OSM. Science Board agreed to only support travel for Dr. Wells as PICES Co-Convenor. ICES endorsed the OSM but do not intend to provide funding.

PICES/ICES Symposium on "*Drivers of dynamics of small pelagic neritic fish resources*"

Japan agreed to host the symposium, originally set for early 2016 at ISB-2014, but not earlier than August 2016 and ideally January or February 2017. Science Board agreed that the slippage in dates would be better for PICES in order to have more time to prepare for the zooplankton production symposium, also scheduled for 2016 (see below). Science Board still needs to hear if ICES is agreeable to the change in dates. The tentative local host will be FRA and the tentative venue is Yokohama.

Action: Secretariat to contact ICES in regard to change in dates.
Outcome: Dates and venue were changed to March 6–11, 2017, in Victoria, Canada.

PICES/ICES/IOC 6th International Zooplankton Production Symposium

Symposium convenors and SSC members are in place for the PICES/ICES/IOC Symposium on "*Zooplankton in a changing ocean: New challenges and tools*" to take place May 9–13, 2016 in Bergen, Norway.

Human Dimensions symposium

The Section on *Human Dimensions of Marine Systems* opted to be more modestly engaged and not provide full co-sponsorship to the ICES Symposium on "*Understanding marine socio-ecological systems: Including the human dimension in Integrated Ecosystem Assessments*" scheduled for February/March 2016 in Paris, France, and will recommend an invited speaker. The Section's original goal of organizing its own symposium (as in its Terms of Reference) in 2017/18 remains.

NPAFC Symposium on "*Pacific salmon and steelhead production in a changing climate: Past, present, and future*"

Science Board recommended that PICES co-sponsor the NPAFC symposium to be held May 17–19, 2015, in Kobe, Japan (see Agenda Item 3) by providing travel funds for invited speakers, Drs. Skip McKinnell, Emanuele Di Lorenzo and Shoshiro Minobe.

9th International Conference on Marine Bioinvasions

Science Board agreed to co-sponsor the conference, slated for January 26-29, 2016, in Sydney, Australia at the same level of support as for previous meetings. Suggestions were made to provide travel support for a co-convenor/invited speaker plus students/early career scientists.

AGENDA ITEM 9
Capacity building/summer schools

Nothing to report.

AGENDA ITEM 10
PICES-2015

There was consensus that not enough time was allowed for Committees to conduct their business meetings, especially if they had to accommodate observers wanting to make presentations on collaboration with PICES. Time issues were also a factor in scheduling the FUTURE meeting to allow for both wider participation by the PICES community and time for two-way communication with Committees/Expert Groups. Holding the FUTURE plenary before the Opening Cerimonies (on a Sunday) does not allow for everyone to be present; moving it forward does not allow the FUTURE APs (or new SSC) enough time to sythesize all the information provided by the Expert Groups at the plenary to make decisions before the Committee meetings mid-week. Integrating FUTURE into the main part of the meeting would entail giving up some session time unless 4 parallel sessions were considered. Science Board was unable to resolve the matter and will request feedback from Governing Council. Fully integrating FUTURE into PICES remains a challenge.

The on-line ranking system for topic session and workshop proposals is in its third year of use. Dissatisfaction was voiced by some members that the table fields had incomplete information (not updated by the submitter). There also was confusion regarding the closing date for ranking on the website. There was spirited debate on whether or not to allow "late" proposals for workshops to be included after the close of on-line submissions, *i.e*., during the Annual Meeting. Ultimately, it was decided that these submissions would be considered.
Action: Science Board to discuss use and potential changes to the on-line system (submission and ranking) at ISB-2015.

The theme for PICES-2015 is "*Change and sustainability of the North Pacific*". The Annual Meeting will be held from October 15–25, 2015, in Qingdao, China. The following topic sessions and workshops were recommended by Science Board (final descriptions can be found in *SB Endnote 4*):

¾-day Science Board Symposium
Change and sustainability of the North Pacific

1½-day Topic Session
Marine resource and environment carrying capacity and sustainable development [folded into Science Board Symposium]

½-day BIO Contributed Paper Session

1-day BIO/MONITOR/TCODE Topic Session
The 2014/15 El Niño and anomalous warming of the North Pacific: What happened?

1-day POC/BIO/TCODE Topic Session
Past, present, and future climate in the North Pacific Ocean: Updates of our understanding since IPCC AR5

1-day Topic Session
Advances in the Coupled General Circulation Models (CGCMs) [merged with "*Past, present, and future climate in the North Pacific Ocean: Updates of our understanding since IPCC AR5*]

½-day FIS Contributed Paper Session

1-day FIS Topic Session (co-sponsored by ICES)
Change and sustainability of fisheries: Lessons from eastern-western cultures for global food security [later renamed "*Eastern-western approaches to fisheries: Resource utilization and ecosystem impacts*"]

1-day FIS Topic Session (co-sponsored by ICES)
Marine ecosystem services and economics of marine living resources

½-day FIS Topic Session
Experiences and lessons learned in managing shared/transboundary stock fisheries

½-day MEQ Contributed Paper Session

1-day MEQ Topic Session
Indicators of emerging pollution issues in the North Pacific Ocean

½-day SB Topic Session
The human dimensions of harmful algal blooms

½-day MEQ Topic Session
Marine pollution preparedness and response to oil and HNS spill incidents in the North Pacific [incorporated into MEQ Workshop on *Marine environmental emergencies*]

1-day POC Contributed Paper Session

1-day POC/BIO/MONITOR/TCODE Topic Session
Ocean Acidification Observation Network for the Arctic and sub-Arctic Pacific oceans [later renamed "*Ocean Acidification Observation Network for the North Pacific and adjacent areas of the Arctic Ocean*"]

1-day Topic Session
Ocean circulation of Western Pacific and its response to climate change

1-day Topic Session
Seaweeds in the North Pacific Rim – Their biology, ecology and exploitation [declined by Science Board]

1-day Topic Session
The environmental impact of ocean energy development and its countermeasures [declined by Science Board]

1-day MEQ Workshop
Contrasting conditions for success of selected harmful algal species in the western and eastern Pacific – A comparative ecosystem approach [later renamed as "*Contrasting conditions for success of fish-killing flagellates in the western and eastern Pacific — A comparative ecosystem approach*"]

1-day Workshop
Identifying major threats to marine biodiversity and ecosystems in the North Pacific

1-day Workshop
Linking climate change and anthropogenic impacts to higher trophic level via primary producers
1-day MEQ Workshop (co-sponsored by ICES)
Marine environment emergencies: Detection, monitoring, response, and impacts

½-day Workshop
Monitoring and assessment of environmental radioactivity in the North Pacific

1-day Workshop
"*Best practices for and scientific progress from North Pacific Coastal Ocean Observing Systems*"

The following are business meeting requests at PICES-2015:
- 3-hour overture meeting and 1½-day meeting of Science Board, preceded by a joint meeting with the FUTURE SSC;
- 2-hour overture meetings and ½-day meetings of Scientific and Technical Committees;
- 2-hour overture meeting and ½-day meeting of the SB Section on *Human Dimensions of Marine Systems* (S-HD);
- 1-day meeting of the joint PICES/ICES Section on *Climate Change Effects on Marine Ecosystems* (S-CCME);
- 1-day meeting of the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (S-HAB);
- 1-day meeting of the Section on *Carbon and Climate* (S-CC);
- 1-day meeting of the Working Group on *North Pacific Climate Variability and Change* (WG 27);
- 2-day meeting of the Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28);
- 1-day meeting of the Working Group on *Regional Climate Modeling* (WG 29);
- 1-day meeting of the Working Group on *Assessment of Marine Environmental Quality of Radiation around the North Pacific* (WG 30);
- 1-day meeting of the Working Group on *Emerging Topics on Marine Pollution* (WG 31);
- 2-day meeting of the Working Group on Working Group on *Biodiversity of Biogenic Habitats* (WG 32);
- 1-day meeting of the BIO Advisory Panel on Marine Birds and Mammals (AP-MBM);
- ½-day meeting of the Advisory Panel for a CREAMS/PICES Program in East Asian Marginal Seas (AP-CREAMS);
- 1-day meeting of the Advisory Panel on North Pacific Coastal Ocean Observing System (AP-NPCOOS);
- ½-day meeting of the SB Study Group on *Socio-Ecological-Environmental Systems* (SG-SEES);
- ½-day meeting of the SB Study Group on *North Pacific Ecosystem Status Report-3* (SG-NPESR3);
- ½-day meeting of the FUTURE SSC, preceded by a ½-day FUTURE Symposium;

AGENDA ITEM 11
Reports from Scientific and Technical Committees

Science Board recommendations

Proposed new expert groups
- FUTURE Scientific Steering Committee (FUTURE SSC; *SB Endnote 5*);
- Working Group on *Biodiversity of Biogenic Habitats* (WG 32; *SB Endnote 6*);
- Study Group on *North Pacific Ecosystem Status Report* (SG-NPESR3; *SB Endnote 3*);
- Joint PICES/ISC Study Group on *Scientific Cooperation in the North Pacific Ocean* [later renamed as Study Group for *Scientific Cooperation of ISC and PICES*; *SB Endnote 7*);
- Advisory Panel on *North Pacific Coastal Ocean Observing Systems* (AP-NPCOOS; see *MONITOR Endnote 6*)

Expert group proposals to be deferred
- Study Group on *Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems*

Expert groups to be disbanded
- FUTURE Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems* (AP-AICE);
- FUTURE Advisory Panel on *Climate, Oceanographic Variability and Ecosystems* (AP-COVE);
- FUTURE Advisory Panel on Status, Outlooks, Forecasts, and Engagement (AP-SOFE);
- Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific* (AP-CPR);
- Study Group on *Biodiversity Conservation* (SG-BC)

Extension of existing expert groups
- Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* (AP-CREAMS) for 5 more years to PICES-2019;
- Section on *Ecology of Harmful Algal Blooms in the North Pacific* (S-HAB) for 3 more years to PICES-2017;
- Section on *Human Dimensions of Marine Systems* (S-HD) for 3 more years to PICES-2017;
- Joint PICES/ICES Section on Climate Change Effects on Marine Ecosystems (S-CCME) for 3 more years to PICES-2017;
- Study Group on *Socio-Ecological-Environmental Systems* (SG-SEES) for 1 year to PICES-2015;

Joint ICES/PICES theme sessions at the ICES 2015 Annual Science Conference in Copenhagen, Denmark
- *Managing marine ecosystem services in a changing climate*;
- *Ocean acidification: Understanding chemical, biological and biochemical responses in marine ecosystems*;
- *Ecosystem monitoring in practice.*

Inter-sessional symposia/sessions/workshops/meetings
- 3-day inter-sessional meeting of the FUTURE Scientific Steering Committee, March 1–3, 2015, La Jolla, USA;
- 3-day inter-sessional Science Board meeting, May 18–20, 2015, Busan, Korea;
- 2-day inter-sessional workshop on "*Identifying key physical processes driving the ecosystems in the North Pacific focusing on phenomena unresolvable in current global climate models*", May 16–17, 2015, Busan, Korea;
- NPAFC Symposium on "Pacific salmon and steelhead production in a changing climate: Past, present, and future", May 17–19, 2015, Kobe, Japan (co-sponsored by PICES);
- International Symposium on "*Harmful algal blooms and climate change*", May 19–22, 2015, Göteborg, Sweden (co-sponsored by PICES);
- PICES/ICES Session on "*Impacts of climate change on marine ecosystems and their services*" at the International Scientific Conference on "*Our common future under climate change*", July 7–10, 2015, Paris, France;
- 3-day PICES/ICES workshop on "*Modelling the effects of climate change on fish and fisheries*", August 10–12, 2015, Princeton, USA.

Capacity building
No events proposed for 2015.

Priority items with funding implications
Inter-sessional events
- S-HAB member to attend IPHAB-XII meeting, April 28–30, 2015, Paris, France;
- S-HAB Co-convenor to participate in the International Symposium on "*Harmful algal blooms and climate change*", May 19–22, 2015, Göteborg, Sweden;
- 3 invited speakers to attend the NPAFC International Symposium on "*Pacific salmon and steelhead production on changing climate: Past, present, and future*", May 17–19, 2015, Kobe, Japan;
- S-CCME Co-Chairman to attend the side event workshop organized by/under the International Conference on "*Our common future under climate change*", July 7–10, 2015, Paris, France;
- 2–3 early career scientists/lecturers to attend IOC/SCOR IOCCP training course on "*Instrumenting our oceans for better observation: A training course on autonomous biogeochemical sensors*", June 22–July 1, 2015, Kristineberg, Sweden;
- POC scientist to attend the ESSAS Annual Science Meeting, June 15–17, 2015, Seattle, USA;
- PICES affiliate member (Dr. Lisa Miller) of SCOR WG 140 (Biogeochemical Exchange Processes at the Sea–Ice Interfaces; BEPSII) to attend WG 140 meeting (March 20, 2015, Barga, Italy) in conjunction with the Gordon Research Conference on "*Polar shelves and shelf break exchange in times of rapid climate warming*";

- 3 PICES convenors to attend ICES 2015 Annual Science Conference for 3 joint ICES/PICES theme sessions, September 21–25, 2015, Copenhagen, Denmark;
- 1 invited speaker or convenor to attend ICES Symposium on "*Understanding marine socio-ecological systems: Including the human dimensions in Integrated Ecosystem Assessments*", February/March 2016, Paris, France;
- 1 invited speaker or convenor to attend 9th International Conference on Marine Bioinvasions, January 26–29, 2016, Sydney, Australia.

Publications

Special issues of primary journals (2015–2016)

- WG 28 paper on "*Developing ecosystem indicators for responses to multiple stressors*" (lead author: Jennifer L. Boldt) to be published in *Oceanography* December 2014;
- Paper from the 2014 FIS Workshop on "*Linkages between the winter distribution of Pacific salmon and their marine ecosystems and how this might be altered with climate change*" (lead author: S. Minobe) to be submitted to a peer-reviewed journal in mid-2015;
- Review paper based on findings from the 2013 PICES/ICES/GEOHAB workshop on "*Harmful algal blooms in a changing world*" (Lead Author: M. Wells) to be published in Harmful Algae in 2015;
- Special issue of *Archives of Environmental Contamination and Toxicology* on selected papers from 2014 MEQ Topic Session on "*Marine debris in the Ocean: Sources, transport, fate and effects of macro- and micro-plastics*" (Guest Editors: W.J. Shim and R.C. Thompson), to be submitted in March 2015 and published early 2016.
- Review paper on "*The legal and regulatory foundations of fisheries management in PICES member countries*" (Lead author: K. Criddle) to be submitted to a peer-reviewed journal in 2015.

PICES Scientific Reports (2015-2016)

- AP-MBM Final report on "*Spatial ecology of marine top predators in the North Pacific: Tools for integrating across datasets and identifying high use areas*" (Editors: R. Ream, W. Sydeman, R. Suryan and Y. Watanuki) to be published in 2015;
- Final Report of the Working Group 27 on *North Pacific Climate Variability and Change* (Editors: E. Di Lorenzo, M. Foreman and S. Minobe) to be published in late 2015 or early 2016;
- Final Report of the Working Group 28 on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (Editors: I. Perry and M. Takahashi) to be published in late 2015 or early 2016;
- Final Report of the Working Group 29 on *Regional Climate Modeling* (Editors: C-J. Jang and E. Curchitser) to be published in late 2015 or early 2016;
- Report on "*Oceanography of the Yellow and East China Seas (EAST-II region)*" by the Advisory Panel for a CREAMS/PICES Program in East Asian Marginal Seas (Editors: J. Ishizaka, T. Matsuno, J. Zhang, J-H. Lee, S. Kim, D. Xu, Y. Fei, S.-M. Liu and V. Lobanov) to be published in late 2015 or early 2016.

Other

- Outreach brochure based on the Proceedings of the Workshop on Economic Impacts of Harmful Algal Blooms on Fisheries and Aquaculture (PICES Scientific Report No. 47).

Brief highlights of Committee activities and plans are provided below. High priority items from Committees are listed under relevant categories above. Detailed reports of each Committee can be found in the 2014 Annual Report.

BIO

BIO Committee Chair, Dr. Angelica Peña, reported the lack of participants at the BIO business meetings in which China and the US were not represented. Membership for these countries, including Canada and Russia, also needed to be increased in order for the Committee to carry out its work.

BIO supported the establishment of a Working Group on *Biodiversity and Deep-water Biogenic Habitats* and recommended that proposed member, Dr. Janelle Curtis, become a member of BIO, which would add another

member to BIO and also better align the WG with BIO. BIO supported the establishment of a Study Group on "Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems" but only after the Working Group (WG 28) on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* had completed its Terms of Reference.

BIO agreed with the FUTURE Evaluation Report that there needed to be better communication and coordination among expert groups within FUTURE, but there needed to be clarification that not all expert groups needed to align with the program. BIO supported the establishment of a Study Group on the *North Pacific Ecosystem Status Report*.

- The Section on *Climate Change Effects on Marine Ecosystems* (S-CCME) requested a BIO member to join the Section to increase collaboration but no immediate volunteer has been forthcoming.
- Canada and Korea have responded to WG 26's (Working Group on *Jellyfish Blooms around the North Pacific Rim*) request for country reports although there is no word from China. The WG aims to complete its final report early 2015.
- The Advisory Panel on *Marine Birds and Mammals* (AP-MBM) submitted its progress report and plans for the next 3 years to BIO as part of its routine 3-year review. BIO is generally satisfied with the report but wants to see the Advisory Panel's final report on spatial ecology and ecology prior to ISB-2015.

Recommendation: BIO recommends Dr. Curtis (Canada), and a Russian and US member to be appointed to the BIO Committee.

Action: Secretariat to contact national delegates regarding additional membership to BIO, and BIO member to S-CCME.

FIS

FIS Chair, Dr. Elizabeth Logerwell, reported that FIS supported the proposal for a Study Group on "*Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems*", with backing from BIO and POC, but deferred to Science Board on whether or not to wait until the Working Group (WG 28) on *Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* was closer to completing its Terms of Reference. FIS supported the concept to establish a Working Group on *Biodiversity and Deep-water Biogenic Habitats* but deferred to Science Board on the timing for its formation. FIS supported the establishment of a joint PICES/ISC Study Group on *Dynamics of Pelagic Fish to Climate/Environmental Variability*.

FIS agreed to sponsor the high priority activities in order of priority: (1) S-CCME workshop organized by/under the International Conference on "*Our common future under climate change*" (July 7–10, 2015, Paris, France), (2) NPAFC Symposium on "*Pacific salmon and steelhead production in a changing climate: Past, present, and future*" (May 17–19, 2015, Kobe, Japan, (3) 2½-day PICES/ICES workshop on "*Modelling the effects of climate change on fish and fisheries*" (August 2015, Princeton, USA), (4) FIS member to attend the ESSAS Annual Science Meeting (June 15-17, 2015, Seattle, USA).

MEQ

MEQ Chair, Dr. Chualin Huo, announced that the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (S-HAB) had prepared its progress report and revised its Terms of Reference for review by MEQ. The Committee approved the revisions and agreed to extend the Section for another 3 years (2015–2017).
MEQ abstained from voting on the establishment of a PICES/ISC Study Group on *Dynamics of Pelagic Fish to Climate/Environmental Variability* and Study Group on *Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems.* MEQ supported the establishment of *Biodiversity and Deep-water Biogenic Habitats* but declined to act as a parent of this group, as MEQ is now more narrowly focused on pollution issues.

POC

POC Chair, Dr. Kyung-Il, announced that AP-CREAMS submitted its 3-year report to POC (and MONITOR) as a requirement for another 3-year extension to 2019. AP-CREAMS' proposed publication on "*Oceanography of the Yellow Sea and East China Sea*" in a PICES Scientific Report series (endorsed at PICES-2013) is in progress, but the AP requested the deadline for submission be extended to PICES-2015. POC supported AP-CREAMS extension until 2019 and publication deadline extension. The terms of Working Group on *North Pacific Climate Variability and Change* (WG 27) and Working Group on *Regional Climate Modeling* (WG 29) will be completed in 2015. POC proposed to hold an inter-sessional workshop on "*Identifying key physical processes driving the ecosystems in the North Pacific focusing on phenomena unresolvable in current global climate models*" (May, 2015, Busan, Korea), in conjunction with ISB-2015, to develop a proposal for a new working group. POC supports the establishment of a FUTURE SSC and recommended Drs. Steven Bograd and Emanuele Di Lorenzo as potential SSC members. POC supported the establishment of a Study Group on the *North Pacific Ecosystem Status Report* and recommended Drs. James Christian and Steven Bograd as potential members.

MONITOR

MONTOR Chair, Dr. Jennifer Boldt, reported that AP-CPR requested permission to disband and transfer one of its Terms of Reference to MONITOR. MONITOR appointed Dr. Sonia Batten, representing SAHFOS, as *ex-officio* member of MONITOR. AP-CREAMS presented its report on past and future activities for MONITOR to evaluate for another 3-year extension, until 2019. Dr. Jack Barth co-convened a MONITOR Workshop (W4) titled "*Networking ocean observatories around the North Pacific*" at PICES-2014. The outcome of the workshop was a proposal to establish an Advisory Panel for *Developing Best Practices and Common Data Protocols for Coastal Ocean Observing Systems* (AP-COOS). MONITOR discussed and recommended the proposal of a mechanism (*e.g*., Study Group), with a limited life span, to discuss how to produce and deliver the next version of the North Pacific Ecosystem Status Report.

TCODE

TCODE Chair, Dr. Toru Suzuki, reported on TCODE's progress in applying to become an IODE Associate Data Unit. At present, PICES has no data center or data sharing policy. Dr. Igor Shevchenko and Mr. Robin Brown will develop a PICES data exchange policy before submitting an application to IODE.

Dr. Jack Barth, member of MONITOR, and Dr. S. Kim Juniper, Ocean Network Canada, presented a draft proposal to establish an Advisory Panel on *Coastal Ocean Observing Systems* [later renamed as Advisory Panel on *North Pacific Coastal Ocean Observing Systems* (AP-NPCOOS)] under the direction of TCODE and MONITOR, with Dr. Tony Koslow serving as a TCODE member and potentially co-chairman.

AGENDA ITEM 12
Venue and date for ISB-2015

The inter-sessional Science Board meeting will be held in Busan, Korea, from May 18–20, 2015. The meeting will include one day to discuss the results of the FUTURE SSC meeting (to be held March 1–3, 2015, La Jolla, USA). A 2-day workshop on "*Identifying key physical processes driving the ecosystems in the North Pacific focusing on phenomena unresolvable in current global climate models*" could be held in conjunction (May 16–17, 2015) with ISB-2015 [this workshop did not take place].

AGENDA ITEM 13
Theme and venue for PICES-2016

The US government agreed to host PICES-2016 in San Diego. Theme of the meeting is still undetermined.

Action: Science Board to finalize the theme for PICES-2016 at ISB-2015.

AGENDA ITEM 14
Report on MOE project on tsunami debris and NIS

Update – is an ongoing 3-year project set to end March 2017
A 3-day meeting of the Project Science Team for the PICES/MoE project on "*Effects of marine debris caused by the Great Tsunami of 2011*" is planned for March 16–18, 2015, in Honolulu, USA.

AGENDA ITEM 15
Update on ECS Conference 2017

Korea expressed its willingness to host the Early Career Scientist Conference in 2017 and is expected to confirm dates and venue by mid-December 2014 so the conference organizers, Dr. Batchelder (PICES) and Dr. Adi Kellermann (ICES) can begin arrangements.

AGENDA ITEM 16
Outstanding implementation issues

Science Board reviewed publications where implementation issues remained in regard to Governing Council decisions from PICES-2013. The Secretariat will communicate with the lead editor on the report of the 2012 GLOBEC/PICES/ICES Workshop on "*Forecasting ecosystem indicators with process-based models*". Headway is being made in obtaining some missing country reports for the final report of Working Group 26 on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences*.

Action: Dr. Batchelder to follow up on these.

AGENDA ITEM 17
Wooster and POMA award processes

The number of submissions for the Wooster and POMA awards continues to be low, so it was suggested that a better mechanism, whether by email, web reminder or other means, needed to be sent to the PICES scientific community to ensure a good pool of submissions. Science Board needed to decide whether or not to make the POMA a bi-yearly award or to encourage more nominations. Dr. Therriault also stressed that Science Board needed to consider additional or better mechanisms for evaluating and ranking the awards.

Action: Committee Chairs to (1) discuss with their members the best way to approach the POMA issue, (2) to consider better mechanisms for evaluating and ranking awards, and (3) provide suggestions for more efficient ways to broadcast for nominations, to be discussed at ISB-2015.

AGENDA ITEM 18
Status of PICES publications

No comments by Science Board.

AGENDA ITEM 19
PICES 25th anniversary planning

Little time was spent on this item. Science Board Chairman requested members to have ideas to complete the description for the theme "*25 years of PICES: Celebrating the past, imagining the future*" and on the structure of the meeting.

Action: Science Board to finalize the theme description and structure of 2016 Annual Meeting at ISB-2015.

AGENDA ITEM 20
Other business

There was no other business. The meeting ended at 18:45.

SB Endnote 1

Science Board participation list

Members

Steven Bograd (AP-AICE)
Jennifer Boldt (MONITOR)
Kyung-Il Chang (POC)
Chuanlin Huo (MEQ)
Elizabeth Logerwell (FIS)
Phillip Mundy (AP-SOFE)
Angelica Peña (BIO)
Hiroaki Saito (Science Board Vice-Chairman, AP-COVE)
Igor Shevchenko (representing Russia)
Toru Suzuki (TCODE)
Thomas Therriault (Science Board Chairman)

PICES

Harold (Hal) Batchelder
Alexander Bychkov (Oct. 19)
Laura Richards (Oct. 24)

Representatives

Janelle Curtis (SG-BC, Oct. 24)
Kenneth Drinkwater (ICES, Oct. 19)
Jae-Hak Lee (POGO; Oct. 19)
Yutaka Michida (IOC/WESTPAC, Oct. 19)
Hans Pörtner (IPCC, Oct. 19)
Jake Rice (FUTURE Evaluation Team; Oct. 24)
Sinjae Yoo (IMBER, Oct. 19)

SB Endnote 2

Science Board meeting agenda

Sunday, October 19, 2014 (12:30 – 14:00)

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

Friday, October 24, 2014 (14:00 – 18:00)

3. Relations with specific international programs/organizations (continued)
4. FUTURE Evaluation Team recommendations and next steps (Therriault)
5. Next phase of NPESR (Mundy)
6. Reports from expert groups under Science Board

Saturday, October 25, 2014 (09:00 – 18:00)

6. Reports from expert groups under Science Board (continued)
7. The 3rd Climate Change Symposium in 2015, Brazil (Secretariat)
8. Status of PICES-sponsored conferences/workshops/symposia (Therriault/Batchelder)
9. Capacity building/summer schools (Therriault/Batchelder)
10. PICES-2015, Qingdao, China theme and description, draft schedule of scientific sessions and workshops (All)
11. Reports from Scientific and Technical Committees plus high priority requests (Committee Chairs)
12. Venue and dates for ISB-2015 (Batchelder)
13. Theme (and venue and dates) for PICES-2016 (Secretariat)
14. Report on MOE project on tsunami debris and NIS (Therriault)
15. Update on ECS Conference 2017 (Batchelder)
16. Outstanding implementation issues: GC decisions from PICES-2013 and SB recommendations from ISB-2014 (Therriault)
17. Wooster and POMA award processes (Therriault)
18. Status of PICES publications (Secretariat)
19. PICES 25th anniversary planning (Secretariat)
20. Other business

SB Endnote 3

Proposal to establish a Study Group on the *North Pacific Ecosystem Status Report*
With terms of reference revised from ISB-2014

Purpose: To aid the development and assist the implementation of the next generation NPESR from the starting point of the advice provided by SOFE AP at PICES 2013.

Terms of Reference

1. Develop the report into an implementation plan for the NPESR, IP-NPESR, by PICES Qingdao 2015 that
   a. address outstanding concerns of standing committees in consultation with Chairs.
   b. address comments of independent peer reviewers
2. Report on progress to ISB 2015
3. Present IP-NPESR at first session SB 2015
4. Convene NPESR Workshop Interim PICES Meeting 2016 to review candidate time series and methods of production.
5. Present report on the status NPESR to plenary session PICES 2016

Confirmed membership:
James Christian (Canada)
Vyacheslav Lobanov (Russia)
Phillip Mundy (USA)
China TBD
Japan TBD
Korea TBD

SB Endnote 4

Approved PICES-2015 Topic Session and Workshop descriptions

S1: Science Board Symposium: Change and Sustainability of the North Pacific

Duration: 1 day
Convenors: ALL SCIENCE BOARD MEMBERS
Invited speakers: TBD

Since its establishment, PICES has provided leadership in developing a better understanding of the structure, function and changes of North Pacific marine ecosystems. The integrative scientific programs of PICES, and other special activities such as periodic Ecosystem Status Reports, have advanced our knowledge of coupled physical-biogeochemical-ecological processes of the North Pacific. The *Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems* (FUTURE) program is focusing on acquiring better insight into the combined consequences of climate change and anthropogenic pressures on marine ecosystems, ecosystem services and marine dependent social systems. Climate change research remains important to ocean scientists and governments within PICES. However, the direct and indirect interactions of human activities on coastal and open ocean ecosystems and the services they provide to society are also of great concern in the North Pacific area. A sustainable North Pacific ecosystem is desired by both the public and governments. This vision seeks a balance between resource protection and resource utilization, and a balance between pressing needs at local and regional scales and climate-driven issues at basin and global ocean scales. The nature of the Science Board symposium theme allows for scientific sessions to include topics on climate change, ocean acidification, coastal eutrophication, aquaculture, fishing, pollution, coastal development and planning, sustainability, resilience, vulnerability, cumulative impacts of multiple stressors, and the tradeoffs/conflicts inherent in multiple-use ocean activities, and mechanisms to resolve these. Presentations on the above topics and the relationship and compatibility of marine resource development, eco-environment sustainability, protection and restoration are welcomed for this session.

S2 *The 2014/15 El Niño and anomalous warming of the North Pacific: What happened?*

Sponsoring Committees: BIO/MONITOR/TCODE
Duration: 1 day
Convenors: William Peterson (USA), Lisa Eisner (USA), Tony Koslow (USA)
Invited speakers: Emanuele Di Lorenzo (USA)

Major El Niño events in 1982/83 and 1997/98 had massive impacts on the ecosystems of the North Pacific Ocean. In spring 2014, computer models were predicting another major El Niño for 2014/15. However, it now appears that the event is weakening (but who knows what the future holds). Despite this, it is perhaps more noteworthy that the entire Pacific north of ~35°N is anomalously warm with SSTs in the Gulf of Alaska that are >3σ above the long-term mean. This warming event appears to be unprecedented, with strong signals in the Gulf of Alaska and Bering Sea, and across the Pacific to Japan, as well as in the Oyashio, the Sea of Okhotsk and coastal waters surrounding Russia, Japan and Korea. Anomalous warming is also seen in the Arctic Ocean, Baffin Bay, the Labrador Sea and much of the far north Atlantic. Key questions to address in this session include what are the atmospheric conditions leading to wide-spread warming, what are the consequences for local weather, and, what are the consequences to ecosystem structure and fisheries? The purpose of this session is to encourage researchers to present evidence of anomalous behaviour in the ecosystems of the North Pacific. We are interested in descriptions of anomalous behaviour in the physical environment, the chemistry of the oceans and the biological impacts of the physical anomalies. The session will be a success if investigators with related stories are brought together to write joint papers describing the evolution and impacts of both the 2014/15 El Niño event as well as anomalous warming of the North Pacific (and perhaps the North Atlantic and adjacent seas).

S3 *Change and sustainability of fisheries: Lessons from eastern-western cultures for global food security* [later renamed "*Eastern-western approaches to fisheries: Resource utilization and ecosystem impacts*"]

Sponsoring Committee: FIS
Duration: 1 day
Convenors: Shijie Zhou (Australia), Gordon H. Kruse (USA), Xianshi Jin (China), Mitsutaku Makino (Japan), Jacquelynne King (Canada), Marie-Joëlle Rochet (France)
Invited speakers: Marie-Joëlle Rochet (France/ICES), Shijie Zhou (Australia)
Co-sponsor: ICES

FUTURE endeavors to develop a better understanding of the combined consequences of climate change and anthropogenic pressures on marine ecosystems, ecosystem services and marine-dependent social systems. Although climate change has garnered much deserved attention so far, the direct and indirect interactions of human society on marine ecosystems and the services they provide are also of great concern. Fisheries are major contributors to global food security, while also posing threats to some ecosystem services. Rising demand for seafood and increasing concerns about the ecosystem effects of fishing create a fisheries management dilemma. Improved understanding about how human activities alter marine ecosystem structure and function is central to exploring options to procure food security in the future. In North America, emphasis is placed on conservative catch limits for fisheries that are highly selective for large-sizes of certain species. In Asia, a wide spectrum of fish species and sizes enter seafood markets, but less emphasis is placed on constraining catches. Both approaches affect ecosystem structure and functioning. By comparing approaches, can East and West learn from each other? Although questions about how to increase fisheries production while reducing environment impacts are not new, new ideas have entered the debate. For example, "balanced exploitation" advocates sustainable removal levels that strive to maintain natural balance among species, stocks, sexes, and sizes, thus preserving biodiversity. Yet, fisheries are commercial enterprises that must supply consumers with seafood at a profit. Also, fishing represents a diversity of lifestyles that span small-scale, artisanal fishers to large multinational corporations. This topic session provides a forum to compare and contrast alternative fishing strategies for sustainable global food security. Presentations are sought on the effects of fishing on ecosystem structure and function, cultural practices and institutional programs to reduce bycatch and discards, better utilization of fishery resources, diversification of seafood products and markets, economic considerations, and many facets of human dimensions. Seafood industry representatives from Eastern and Western cultures will be invited to contribute their perspectives.

S4 *Indicators of emerging pollution issues in the North Pacific Ocean*

Sponsoring Committee: MEQ
Duration: 1 day
Convenors: Olga Lukyanova (Russia) Won Joon Shim (Korea) Peter S. Ross (Canada)
Invited speakers: Tomohiko Isobe (Japan), Hyo-Bang Moon (NOWPAP, Korea), Vladimir Shulkin (NOWPAP, Russia), Hideshige Takada (NOWPAP, Japan)
Co-sponsor: NOWPAP

This session led by the Working Group on *Emerging Topics in Marine Pollution* (WG-ETMP) anticipates wide-ranging interest from a number of disciplines. The session aims to attract presentations on the use of sediments, shellfish, fish, seabirds, and marine mammals as indicators of marine pollution. Novel approaches and study designs will be discussed, with the aim of providing managers, regulators and scientists with timely feedback on emerging pollution threats. Depending on the study design and sample matrix, it is expected that pollutants to be discussed will include hydrocarbons, organochlorine pesticides, flame retardant chemicals, metals, pharmaceuticals, microplastics and other contaminants. Presentations that provide insight into the identification of contaminants of emerging concern, the ranking of priority pollutants from multiple sources, and the assessment of the relative importance of pollutants among other natural and anthropogenic stressors are encouraged. Presenters will be invited to contribute to a special issue of a scientific journal.

S5 *Ocean circulation of the Western Pacific and its response to climate change*

Duration: 1 day
Convenors: Wei Zexun (China), Wang Dongxiao (China)
Invited speakers: Xiaopei Lin (China)
Co-sponsor: CLIVAR

The ocean circulation system of the Western Pacific is complex. The Mindanao Current and the Kuroshio originate from the North Equatorial Current, and the Indonesia Throughflow connects the Pacific and Indian Ocean. The region is characterized by the strongest atmospheric convection and greatest frequency of typhoons anywhere in the world. The ocean circulation of the Western Pacific carries heat from low latitude to high latitude areas where it is released to the atmosphere, adjusting the global air temperature. Meanwhile, processes in this region play a key role in the formation and evolution of the Western Pacific Warm Pool, and have an important effect on the global climate system. The ocean circulation and Warm Pool in the Western Pacific play an important role in regulating the ENSO cycle, the East Asian Monsoon and Subtropical High, and have a significant effect on the marine environment and regional climate in East Asian marginal seas. This session will focus on the North Equatorial Current bifurcation, Mindanao Current, the Indonesian Throughflow, and the Kuroshio and its interaction with the coastal circulation, and will focus on their response to climate change, feedback process and its mechanism.

S6 *Ocean Acidification Observation Network for the North Pacific and adjacent areas of the Arctic Ocean*

Sponsoring Committees: POC/BIO/MONITOR/TCODE
Duration: 1 day
Convenors: Li-Qi Chen, (China), Fei Chai (USA), Kitack Lee (Korea), Toru Suzuki (Japan)
Invited speakers: Richard Bellerby (Norway)
Co-sponsors:
Publication: paper abstracts, PICES scientific report

Ocean acidification (OA) in the 21st century has reached levels not seen for 55 million years. The average surface pH of the world ocean has decreased by 0.1 since the industrial revolution and is projected to decrease 0.3 to 0.4 pH by the end of this century, an up to 2.5 times increase in ocean acidity. Due to its cold water temperature, low alkalinity and rapid loss of sea-ice, the subarctic Pacific Ocean and adjacent Arctic Ocean have absorbed large amounts of atmospheric CO_2 and have changed the $CaCO_3$ system so that aragonite unsaturated states have appeared or will appear soon on a large scale. OA in the subarctic Pacific Ocean will greatly change the marine chemical environment with far-reaching effect on marine ecosystems. This session will include a review of observations and research on OA and will consider the potential for development of an OA observation network. Main discussion issues are 1) advances in investigations and research in OA in the North Pacific and adjacent areas of the Arctic Ocean, 2) the role of the North Pacific and the Pacific Arctic regions in GOA-ON (Global Ocean Acidification Observation Networks) and AMAP-AOA (Arctic Monitoring and Assessment Program-Arctic Ocean Acidification) and 3) the exchange of data and involvement of early career scientists interested in OA.

S7 *Past, present, and future climate in the North Pacific Ocean: Updates of our understanding since IPCC AR5*

Sponsoring Committee: POC/BIO/TCODE
Duration: 1 day
Convenors: Chan Joo Jang (Korea), Ho-Jeong Shin (Korea), Fangli Qiao (China), Sukgeun Jung (Korea), Anne Hollowed (USA), Kyung-Il Chang (Korea), Angelica Peña (Canada), Shin-ichi Ito (Japan)
Invited speakers: Jacquelynne R. King (Canada), Yongqiang Yu (China), Masahiro Watanabe (Japan)

Climate has been changing and is highly likely to have been influenced by human activities. These changes, which have greatly affected the Earth's environment, have been manifested in oceanic ecosystems. Social demands for information on future projections are increasing the need to adapt to and mitigate climate change. The objective of this session is to update our understanding since IPCC AR5 on the past, present and future climate for the North Pacific Ocean and its marine ecosystems, focusing particularly on climatic change in ecosystem-relevant upper ocean and atmospheric variables. Climate change and its impact have been widely investigated using global climate models, while adaptation and mitigation issues have been studied using mostly regional climate models. While this session invites papers on various topics related to both climate simulations and observations, we also encourage presentations on the development and results of regional climate models (RCMs) and Earth System Models (ESMs), and assessment of hindcast simulations and their application to the projection of future climate or marine ecosystems using coupled general circulation models (CGCMs) in the North Pacific Ocean. Future projections of the North Pacific Ocean and its ecosystems, as obtained from global climate models (including CMIP5 standard experiment data for comparison with RCM results) will also be an important contribution to this session.

S8 *Marine ecosystem services and economics of marine living resources*

Sponsoring Committee: FIS
Duration: 1 day
Convenors: Shang Chen (China), Minling Pan (USA), Ian Perry (Canada), Keith Criddle (USA), Mitsutaku Makino (Japan)
Invited speakers:
Co-sponsor: ICES

Marine ecosystem services (MES) are benefits people obtain from the seas and oceans. Marine ecosystems provide ecological products and services, such as seafood, regulation of climate, reduction of storm disasters, waste purification, recreation and leisure, and biodiversity maintenance. Assessing the value of MES has become an emerging and somewhat challenging subject in the scientific world and is receiving increasing attention from politicians. The United Nations' Millennium Ecosystem Assessment reports published in 2005 focused on discovering changes in global ecosystem status and services. The ongoing World Ocean Assessment program has an urgent need for knowledge on MES. The United Nations Environmental Programme formed the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in 2012. The IPBES aims to develop and use knowledge on ecosystem services and biodiversity to improve national, regional, and global ecosystem management. The goals of this session are: (1) to provide marine scientists, economists, and ecologists with a venue to exchange results from research on MES, on the economics of marine ecological resources, and on the contribution of the marine environment to the marine and coastal economy, and (2) to provide scientists around the North Pacific a chance to discuss collaboration on scientific projects.

S9 *Experiences and lessons learned in managing shared/transboundary stock fisheries*

Sponsoring Committee: FIS
Duration: 1 day
Convenors: Shang Chen (China), Minling Pan (USA), Keith Criddle (USA), Mitsutaku Makino (Japan)
Invited speakers: Robert Blasiak (Japan), Kanae Tokunaga (Japan)

The fisheries management for a shared/transboundary stock—a stock that straddles jurisdictional boundaries—is a complex balancing act that will become even more challenging as the distribution of stocks shift in response to climate change. Some of these stocks may only involve users with different interests within a single jurisdiction. Other stocks may involve users from different jurisdictions within a nation, or users from many nations. Achieving conservation objectives for shared/transboundary stocks will require adoption of management regimes that consider biological, economic, and social criteria and elicit effective cooperation among groups. The objective of this session is to gather empirical studies involved with shared/transboundary

stock management and to discuss the experiences, challenges, lessons learned, and decision-making processes that lead to successful management.

S10 *The human dimensions of harmful algal blooms*

Sponsoring Committee: SB
Duration: ½ day
Convenors: Mark Wells (USA), Mitsutaku Makino (Japan)
Invited speakers: TBD

Harmful algal blooms (HABs) comprise a spectrum of ecological, economic, and human health impacts. High biomass phytoplankton blooms in coastal and shelf waters, most often stemming from anthropogenic inputs of macronutrients, can massively shift ecosystem structure away from the support of higher trophic levels, lead to hypoxia and associated ecological impacts in deep waters, and thereby dramatically affect the human dimension. Smaller biomass blooms of toxic cells can selectively impair ecosystem components, decimate aquaculture industry success, or substantially impact human health. In some instances there are clear effects from direct human activity on HAB development; in others the oceanographic conditions regulate the success of harmful species. Despite the obvious relationship between HABs and human wellness, there has been little formalized linkage between ecological and human wellness research. This topic session is aimed at initiating this linkage by stimulating the cross-thinking needed to better assess human-HAB interactions. Presentations are invited on the distributions and character of HAB events, particularly for PICES member countries and their national interests, and the potential social-economic consequences of these societally-defined (harmful) algal bloom events. This session will provide the foundation for more coordinated efforts between the HAB and Human Dimension Sections to generate inputs useful to Ecosystem Based Management activities, and to guide goals for the FUTURE program.

W1 *Contrasting conditions for success of harmful raphidophyte species in the western and eastern Pacific – A comparative ecosystem approach* [later renamed as "*Contrasting conditions for success of fish-killing flagellates in the western and eastern Pacific — A comparative ecosystem approach*"]

Duration: 1½ day
Convenors: Douding Lu (China), Charles Trick (Canada)
Invited speakers: Changkyu Lee (Korea), Charles Trick (Canada)

There is clear evidence of contrasting occurrence and impacts of fish-killing raphidophytes between the western and eastern Pacific in the comprehensive dataset (2000–2012) assembled during the PICES-2012 workshop on contrasting HABs in PICES member countries. These data provide a unique opportunity for east–west Pacific comparisons to identify and rank those environmental factors that promote HAB success at different times. This workshop will focus on the fish killing raphidophytes *Heterosigma akashiwo*, *Cochlodinium* and *Chattonella* species and ribotypes—organisms that historically have had massive economic impacts in western PICES member countries, as well as increasingly prevalent impacts in eastern Pacific coastal waters. The workshop foundation will be an extension of the current dataset to the 1990s and earlier where available, with PICES participants pre-submitting available data on: HAB species presence, maximum abundance, toxicity, optimal conditions for growth, time of year, temperature range, salinity range, water clarity, nutrients, wind, river flow (flooding), and upwelling indices. Workshop participants will evaluate the trends and patterns in these data to develop hypotheses for development into outlook products on day 1, and develop a detailed outline for manuscript preparation on day 2, including writing assignments and submission deadlines. The manuscript will be targeted for an appropriate peer-reviewed journal.

W2 *Identifying major threats to marine biodiversity and ecosystems in the North Pacific*

Duration: 1 day
Convenor: Takafumi Yoshida, NOWPAP CEARAC, Chris Rooper (USA)
Invited speakers: TBD
Co-sponsor: NOWPAP

Marine ecosystems in the North Pacific are influenced by multiple emerging threats, such as rising sea temperature, harmful algal blooms, marine invasive species, hypoxia and eutrophication. These multiple threats can act synergistically, but perhaps differently, from region to region to change ecosystem structure, function and dynamics. In order to enhance conservation and sustainable use of marine ecosystems in the North Pacific region, it is essential to identify critical threats to them. This will require consultation across PICES and NOWPAP member countries to collect extensive information covering potential main threats. Recently, PICES' Working Group 21 reported on the status of non-indigenous aquatic species in the North Pacific region. That report is complemented by additional studies to identify and characterize ecosystem responses to multiple stressors through Working Group 28. CEARAC, one of the four Regional Activity Centres of NOWPAP, recently launched a project to assess the impact of major threats to marine biodiversity in the western North Pacific. A goal of this activity is to select appropriate indicators for marine biodiversity conservation and develop marine environment assessment methodology for the future. This workshop will discuss common assessment indicators to understand the status of major pressures/stressors/threats to marine biodiversity and to identify future collaborations between PICES and NOWPAP. The workshop will contribute to understanding of marine ecosystems in the North Pacific by selecting candidate indicators for investigating their status in the North Pacific. The output from the workshop will also contribute to FUTURE activities.

W3 *Linking climate change and anthropogenic impacts to higher trophic levels via primary producers*

Duration: 1 day
Convenor: Joji Ishizaka (Japan), Angelica Peña (Canada), Sinjae Yoo (Korea)
Invited speakers: TBD

The North Pacific and its marginal seas encompass diverse environments under different influences of climate change and anthropogenic impacts. As a result, these ecosystems exhibit a wide range of characteristics. For example, the primary productivity of North Pacific ecosystems ranges from an extreme oligotrophic to hyper-eutrophic state. Various nutrient limitation conditions can be found as exemplified by the subarctic region, one of the major HNLC regions in the world ocean. While ecosystem regime shifts were first identified in the North Pacific, the change in the primary producer level has not been thoroughly compared and studied in relation to regime shifts. In this workshop, we will review the current understanding of the long-term dynamics and distributional differences of primary producers in the North Pacific. We will also review the factors that determine the primary productivity in different ecosystems of the North Pacific. Differential responses by functional groups will be discussed. Finally, gaps will be identified in using primary producers as a linking element in end-to-end modeling, which is an important component of the FUTURE program.

W4 *Marine Environment Emergencies: Detection, monitoring, response, and impacts*

Duration: 1 day
Convenors: Ziwei Yao (China), Peter Ross (Canada), Won Joon Shim (Korea), Olga Lukyanova (Russia), Seong-Gil Kang (Korea/NOWPAP)
Invited speakers: Sakari Kuikka (Finland/ICES)
Co-sponsor: ICES

In recent years, the importance of marine environmental emergency issues has been illustrated by oil and chemical spills, as well as by a major nuclear power plant accident. Globalization of markets has led to rapid growth of maritime transport in the North Pacific, which has become more vulnerable to ship-source incidents,

including oil and hazardous and noxious substances (HNS) spills. Oil and HNS spills may be hazardous to human health, harm living resources and marine life, and can damage amenities or interfere with other legitimate uses of the sea. In 2003, the NOWPAP Regional Oil and HNS Spill Contingency Plan (RCP) provided technical and operational guidelines for regional cooperation in responding to oil and HNS spills. Marine environmental emergency issues and their strategies become an increasingly important topic for PICES member countries. However, accepted scientific and monitoring methods to document the ecological impacts of such emergencies, and post-accident recovery of the environment, are lacking. In order to better understand the interaction between the marine ecosystem and human pressures, and to formulate sustainable marine development strategies more effectively, an applied information sharing workshop for PICES is timely. The workshop on marine environmental emergencies has three objectives. The first is to summarize important examples of North Pacific marine environmental emergencies from the perspective of different nations, and to discuss the different approaches taken by PICES member countries. The second is to develop response strategies and capacities of PICES members in light of environmental emergencies. The third is to develop joint strategies to improve responsiveness and effectiveness of current national approaches to manage and mitigate such emergencies in the PICES region. The workshop will address the following three aspects: (1) oil and chemical spills and their damage on the marine environment, (2) detection methods for oil and chemical spills and (3) spill response, monitoring and mitigation strategies at the interface of science and management. Case studies will be used to illustrate this workshop and will serve to focus efforts to design a response and monitoring framework for implementation in the event of a major environmental emergency.

W5 *Monitoring and assessment of environmental radioactivity in the North Pacific*

Duration: 1 day
Convenors: Yusheng Zhang (China), Kathryn A. Higley (USA)
Invited speakers: TBD
Co-sponsor:

The Marine Environmental Quality Committee's area of responsibility is to promote and coordinate marine environmental quality and interdisciplinary research in the North Pacific. This workshop has two objectives. First, to review and discuss the information gaps and deficiencies in monitoring and assessment of the environmental quality of radioactivity and its impact on marine ecosystems in the North Pacific, especially since the "3•11" Fukushima Nuclear Accident. Second, to exchange information on new techniques and methodologies for monitoring and assessment of the environmental quality of radioactivity, and to discuss developing trends and research priorities. The main topics of the workshop include: (1) the current situation of environmental quality of radioactivity and its effect on marine ecosystems in the North Pacific, (2) new techniques for the analysis of radionuclides in the marine environment and (3) assessment of the radiological risk to non-human species. The workshop will invite experts in relevant fields, and welcomes reports on research and progress in the above topics with regard to the monitoring and assessment on the marine environmental quality of radioactivity in the North Pacific.

W6 *Best Practices for and scientific progress from North Pacific Coastal Ocean Observing Systems*

Duration: 1 day
Convenors: Sung Yong Kim (Korea), Jack Barth (USA), Tony Koslow (USA)
Invited speakers: David M. Checkley, Jr. (USA), Daji Huang (China)

The collection of time series of high-quality physical, chemical and biological data from coastal ocean observatories is critical to the PICES science mission. Coastal ocean observing data are important for documenting changes in coastal ocean ecosystems and for driving numerical circulation and biogeochemical models. There is broad agreement that the 'operators' of coastal observing systems around the North Pacific would benefit from developing best practices – basically sharing experiences on what works and what does not work. At the same time, there have been significant advances in scientific understanding using coastal ocean observing systems. In recent years and in the near future, there has been a big increase in the number of permanent coastal ocean observing systems around the North Pacific. These observatories include shore-based

instrumentation, very shallow installations near the coast and in semi-enclosed bays, as well as observatories that span from the coast to full ocean depth. We seek contributions that illustrate the growing number of coastal ocean observatories across the PICES member countries. Examples of topics to be considered for 'best practices' for coastal ocean observing systems include:

- Observing platforms (cabled nodes, autonomous vehicles, moorings, profilers, shore-based instruments, *etc*.),
- Sensors and sensor calibration, including physical, optical, biogeochemical, bioacoustics sensors,
- Data quality control,
- User interfaces to data and information products, with user interfaces varying, depending on their intended audience, *e.g*., observatory operators, scientists, ocean users,
- Data delivery to users, in particular, to numerical modelers
- Data archiving.

SB Endnote 5

Proposal to establish a FUTURE Scientific Steering Committee

Science Board recommends the FUTURE Advisory Panels (AICE, COVE, SOFE) be disbanded and replaced with a FUTURE Scientific Steering Committee to be composed of two co-chairmen and 12 members (two from each member country).

Recommended members:
Hiroaki Saito (Co-Chairman, Japan)
Steven Bograd (Co-Chairman, USA)
Jacquelynne King (FIS, Canada)
TBD (Canada)
Fangli Qiao (POC, China)
TBD (China)
Sanae Chiba (MONITOR, Japan)
Mitsutaku Makino (S-HD, Japan)
Won Joon Shim (MEQ, Korea)
TBD (Korea)
Oleg Katugin (biology, Russia)
Vyacheslav Lobanov (POC, MONITOR, Russia)
One member from among Emanuele Di Lorenzo (SG-SEES, S-HD, USA), Tony Koslow (TCODE, USA), Lisa Eisner (biology, USA)

SB Endnote 6

Proposal to establish a Working Group on *Biodiversity of Biogenic Habitats* (WG 32)

Proposed Parents: BIO, FIS, MEQ

Terms of Reference

Year 1

- Compile data on the distribution of coral and sponge taxa, and associated fish and invertebrate assemblages in the North Pacific within National Exclusive Economic Zones (EEZs) and facilitate their submission to appropriate biodiversity databases (e.g., Ocean Biogeographic Information System (OBIS));
- Compile data on key variables (temperature, velocity, ocean acidification, slope, aspect) hypothesized to influence coral and sponge distribution and diversity and catalogue sources of multibeam/swathe bathymetry data for distribution modeling within National EEZs;
- Hold a WG meeting, in conjunction with PICES Annual Meeting.

Year 2
- Review modeling approaches to predict the potential distributions of species and habitat suitability for corals and sponges (e.g., MaxEnt, Boosted Regression Trees, or high resolution bathymetry-based models) within National EEZs;
- Identify environmental and ecological predictors of patterns in the distribution and biodiversity of coral, sponge and associated taxa within National EEZs;
- Convene a session on biogenic habitat distribution and diversity at PICES Annual Meeting;
- Hold a WG meeting, in conjunction with PICES Annual Meeting.

Year 3
- Review and propose potential indicators for assessing and monitoring diversity of biogenic habitats;
- Review and document associations between commercially important fish and invertebrate species and biogenic habitats;
- Prepare scientific reports for dissemination of results;
- Hold a WG meeting, in association with PICES Annual Meeting.

Potential membership

Co-Chairs:
Janelle Curtis (Fisheries and Oceans Canada, MEQ): species distribution models
Masashi Kiyota (Fisheries Agency, Japan): coral surveys; species distribution models

Canada
Anya Dunham (Fisheries and Oceans Canada, FIS): invertebrate ecology, sponges
Jessica Finney (Fisheries and Oceans Canada: species distribution models, corals
Anders Knudby (Simon Fraser University): species distribution models of corals
Ellen Kenchington (Fisheries and Oceans Canada, ICES): coral/sponge modelling

China
Hui Huang (South China Sea Institute of Oceanology, Chinese Academy of Sciences); corals

Korea
Ki-Seong Hyeong (KIOST: Deep-sea and Seabed resources): deepsea geology
Seok-Gwan Choi (Fisheries Resources Management Division): marine ecosystems

Russia
Tatyana Dautova (Institute of Marine Biology, Far East Division): coral taxonomy
Yuri Ya. Latypov (Far East Marine Science Institute): corals/biodiversity

USA
Chris Rooper (NOAA, US): distribution modelling, deepwater surveys, biogenic habitats
Curt Whitmire (NOAA, US): spatial analysis, deepwater surveys
Robert Stone (NOAA, US): coral and sponge ecology, coral and sponge taxonomy
Timothy Shank (Woods Hole Oceanographic Institution, US)
Christopher Kelley (Hawaii Undersea Research Laboratory, University of Hawaii, US)

SB Endnote 7

Proposal to establish a joint PICES/ISC Study Group on Sc*ientific Cooperation in the North Pacific Ocean*
[later renamed as Study Group for *Scientific Cooperation of ISC and PICES*]

Acronym: SG-SCISC

Parent Committee: SB

Description: The purpose of a joint ISC-PICES Study Group on Scientific Cooperation in the North Pacific is to develop a framework of enhanced collaboration between the two organizations to achieve a greater understanding of pelagic ecosystem structure and variability, and its effect on the dynamics and production of Pacific pelagic fish populations, leading to the advancement of stock assessment research. The Study Group will review each organization's scientific needs and identify where similar key questions or scientific issues might be explored jointly by both organizations specified as follows.

Terms of Reference:
1) Review existing and planned scientific activities of each organization
2) Develop a list potential areas of cooperation
3) Convene a meeting/workshop for the following purposes:
   a) improve understanding of the science activities of each organization
   b) review scientific topics from TOR (1) to identify areas of common interest
   c) develop a framework for cooperation between ISC and PICES that lists categories of joint activities and the rationale for each, including the benefits to each organization from the joint activity, and identify priorities for joint activities within categories
   d) recommend processes for implementing TOR (3c)
   e) recommend approaches to develop a strategic plan for cooperation and mechanisms to periodically update that plan
4) The Co-Chairpersons will prepare a final Study Group report for distribution by the ISC-PICES Secretariats by fall 2015.

Membership:
Gerard DiNardo (U.S., ISC Chair),
John Holmes (Canada, ISC Albacore Working Group Chair),
Steve Teo (U.S., ISC Working Group Member),
H. Honda (Japan, ISC Working Group Member),
Steve Bograd (U.S., AP-AICE Chair, SB, POC, WG 27),
Harold Batchelder (PICES Secretariat),
Jackie King, Jaebong Lee (FIS Rep),
Thomas Therriault (Science Board).