

Report of Science Board

Science Board met in Qingdao, China, from 12:30 to 15:45 on October 18, 2015. 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 18:45 on October 23 and a one-day meeting was held from 9:00 to 18:00 on October 24.



Committee/Program Chairs comprising Science Board (left to right): Hiroaki Saito (Science Board Chair-elect; FUTURE SSC), Steven Bograd (FUTURE SSC), Chuanlin Huo (MEQ), Toru Suzuki (TCODE), Harold (Hal) Batchelder (Deputy Executive Secretary), Jennifer Boldt (MONITOR), Elizabeth (Libby) Logerwell (FIS), Angelica Peña (BIO), Igor Shevchenko (representing Russia), Kyung-Il Chang (POC), and Thomas Therriault (Science Board Chair)

Sunday, October 18, 2015

AGENDA ITEM 2

Procedures for Science Board Symposium and Session awards

Science Board Chairman, Dr. Thomas Therriault reviewed the procedures for evaluating oral presentations and posters. There were no objections from Committee Chairs on the sessions assigned to their Committees for judging. Dr. Therriault delegated Drs. Angelica Peña and Kyung-Il Chang to each write half of the session talk summaries from the Science Board Symposium and requested the summaries to be finished by mid-November.

AGENDA ITEM 3

Review template for Committee reports

Dr. Harold (Hal) Batchelder reviewed the “high priority” template that was circulated to Science Board in August. On-line Topic Session and workshop submissions for PICES-2016 would be open until midnight Monday to be discussed and ranked by the Committees at their Tuesday business meeting. The Committee Chairs were instructed to fill out the template with information gathered at their meeting and send it to the Deputy Executive Secretary by Thursday noon for compilation.

AGENDA ITEM 4

Current and potential strategic collaborations relations with international organizations

Organization representatives, Drs. Gerard DiNaro and Chi-Lu Sun (ISC), Fangli Qiao (SCOR, POGO), Yi Xu (IMBER), Valery Detemmerman (CLIVAR), Loh-Lee Low (NPAFC), Mathew Baker (NPRB), Peter Kershaw (GESAMP), and Vladimir Ryabinin (IOC; Oct. 24) attended the Science Board meeting.

Dr. Gerard DiNardo (Plenary Chairman, ISC) remarked on increasing ISC-PICES collaboration as evidenced by the establishment of the joint ISC-PICES Study Group for *Scientific Cooperation of ISC and PICES* to develop a framework for enhanced cooperation between the two organizations (see Agenda Item 6). ISC's goal is to work with PICES at a higher strategic level to try to understand in greater detail pelagic ecosystem structure and variability of the North Pacific, especially for stock assessment research. Scientific topics of joint interest include oceanographic conditions and distribution of pelagic fish productivity (through POC, FIS, BIO, TCODE, S-CCME), the effects of climate change on their distribution and productivity (through POC, FIS, S-CCME, NPESR), and environmental interactions with fishers and fisheries (through S-HD, S-CCME). Procedures to implement these goals include Annual Meeting topic sessions/workshops, symposia, and proposal for a joint PICES-ISC Working Group on *Oceanographic Conditions and the Distribution and Productivity of Highly Migratory Fish*. The new WG will deal with stock assessments as well as forecasting the highly migratory aspect of pelagic fish. Recommendations from Science Board at this meeting will be presented in a Plenary at ISC's interim meeting in December 2015.

Dr. Valery Detemmerman (Executive Director, International CLIVAR Project Office) spoke about CLIVAR and PICES sharing many common interests and discussed the on-going cooperation between the two organizations, such as topic session/workshop sponsorship at PICES Annual Meetings. However, CLIVAR desired a more formal collaboration, especially in the sociological aspects of the Pacific Ocean. CLIVAR proposed to have representation in POC and *vice versa*, was interested in joining relevant PICES expert groups, and was keen to do informal brainstorming, *i.e.*, *ad hoc* meetings, with PICES on other areas of collaboration. CLIVAR is developing a new Science Plan which will be reviewed and discussed at the 2016 CLIVAR Open Science Conference (September 19–23, 2016, Qingdao) and PICES was invited to participate.

Dr. Loh-Lee Low (Chairman, Committee on Scientific Research and Statistics, NPAFC) presented on PICES/NPAFC collaboration in the International Year of the Salmon (IYS). The theme of the IYS is "*Salmon and people in a changing world*" and will focus on the relationship between salmon and people and their joint future, and will address the knowledge gaps that exist in understanding of the future of salmon in a rapidly changing world. IYS is envisioned to be a 7-year program with a second scoping session planned for March 15–17, 2016 in Vancouver, Canada. The session will define the process for funding and identify potential partners from government, universities, non-governmental organizations and private industry to develop a business plan. NPAFC requested PICES to provide (1) an indication of support in principle for the IYS, (2) two representatives (one on the business side and one on the science side) to help in the development of the business plan and refinement of the science objects to the March meeting, (3) a single point of contact to engage in developing the terms of reference for collaboration among the key partners and planning the scoping meeting.

Action: Secretariat to work with Science Board to identify PICES representatives and key contact for NPAFC scoping meeting.

Dr. Mathew Baker (Science Director, Long-term Monitoring Program, NPRB) provided a brief background of NPRB whose mandate is to understand the North Pacific ecosystems to enable effect management and sustainable use of marine resources. One of its main goals is to foster cooperation with other entities such as PICES in conducting research and management in the North Pacific and Dr. Baker cited past activities that PICES and NPRB have collaborated on (symposia co-sponsorship, publications, *i.e.*, NPESR (2005, PICES Special Publication 1), and capacity building initiatives). Dr. Baker proposed future collaborations such as coordinating with PICES' Committees, expert groups (*i.e.*, S-HD, AP-NPCOOS) and FUTURE, meeting inter-

sessionally or annually, serving as a repository of data and communicating best practices on data quality assurance and quality control, providing metadata compilation, and fostering Integrated Ecosystem Research Programs (especially the new Arctic IERP). NPRB is entertaining proposals to look at modelling of ocean-atmosphere-ice dynamics as well as other physical processes to determine how they influence ecosystem structure and function in the Arctic.

Action: Secretariat to work with NPRB on how to move forward on collaboration.

Dr. Peter Kershaw (Chairman of the GESAMP Pool of Experts) announced that GESAMP's objectives in 2015 were to (1) contribute to PICES-2015 workshops (W2, "*Identifying major threats to marine biodiversity and ecosystems in the North Pacific*"; W4, "*Marine environment emergencies: Detection, monitoring, response, and impacts*"; W5, "*Monitoring and assessment of environmental radioactivity in the North Pacific*") and to MEQ and its expert groups, Working Group on *Assessment of Marine Environmental Quality of Radiation around the North Pacific* (WG 30) and Working Group on "*Emerging Topics in Marine Pollution*" (WG 31), (2) discuss mechanisms for identifying emerging issues of mutual concern and potential action, (3) identify potential use of GESAMP products for PICES activities, e.g., NPESR and (4) encourage greater participation of PICES scientists in GESAMP activities, especially from the Western Pacific. Dr. Kershaw invited participation of PICES scientists as full GESAMP members and/or as GESAMP working group participants in GESAMP-related activities such as the Transboundary Waters Assessment Programme, Working Group on Atmospheric Input of Chemicals in the Ocean (WG 38), Working Group on Global Trends in pollution of Coastal Ecosystems (WG 39), or Working Group on Sources, fate and effects of microplastics in the Marine Environment (WG 40). Participation would be as individual scientists and not as scientists representing PICES.

ICES

ICES was unable to send a representative. Dr. Therriault presented on behalf of ICES, briefly providing an update on ICES scientific focus and planned activities, including research and advice on the Arctic and on aquaculture. A SCICOM/ACOM Strategic Initiative on the Human Dimension in Integrated Ecosystem Assessments (SIHD) has been established and ICES sees potential collaboration with PICES through the Section on *Human Dimensions*. ICES has endorsed the establishment of the potential joint PICES/ICES Working Group on *Climate Change and Biologically-driven Ocean Carbon Sequestration*.

IOC

Dr. Vladimir Ryabinin (Executive Secretary, IOC) gave a brief background of IOC explaining that it was created under the auspices of UNESCO to promote international cooperation and coordinate programs in ocean research, services, education and capacity building to generate knowledge about the nature and resources of the ocean and its coastal areas. In science, IOC is focusing on the preparation of a Global Ocean Science Report on data gathered from its Member States, blue carbon issues, marine pollution (e.g., microplastics), harmful algal blooms, and on contributing on a new IPCC Special Report on the Ocean. IOC GOOS and joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) are examples of multilateral efforts for ocean monitoring, observations, and services. The IOC has been the coordinator of a Pacific Tsunami Warning System established in 1965. It is very involved in integrated management such as that of the coastal zone, in marine spatial planning, production of marine atlases, LMEs, Transboundary Water and World Ocean Assessments. IOC hopes to co-sponsor the next Symposium on "*Effects of climate change on the world's oceans*" tentatively scheduled for 2019, with PICES. IOC is involved with the Conservation and Sustainable Use of Marine Biodiversity Beyond Areas of Natural Jurisdiction (BBNJ) and its relations with RFMOs, and is especially interested in the work Working Group on Biodiversity Conservation (WG 32) is doing. S-HAB contributes to the Global HAB Status Report and developed by IOC-IPHAB, and the IP encourages S-HAB to become an *ex officio* member.

IOC views PICES' science with interest and is keen on furthering its collaboration with PICES as events progress.

Science Board reviewed and agreed with the list of organizations and programs the Secretariat maintains collaboration with/intends to add.

Action: Dr. Therriault to work with the Secretariat to develop a tier system of collaboration with the organizations.

Friday, October 23, 2013

AGENDA ITEM 5

Review proposed changes in Rules of Procedure

The following changes to the PICES Rules of Procedure were recommended by Science Board (*SB Endnote 3*).

Scientific Program (Rule 16) – wording was changed to remove Science Board as the Scientific Steering Committee of the FUTURE program and to establish FUTURE as the Scientific Steering Committee. The FUTURE SSC will be allowed to establish temporary expert groups relevant to its work.

Section/Advisory Panel (Rule 13)

A Section or Advisory Panel will be reviewed regularly by its parent Committee(s) at least every 5 years, and more often if needed. The Advisory Panel on *Marine Birds and Mammals* will be disbanded and reclassified as a Section on *Marine Birds and Mammals*. (Terms of reference for the new Section were presented; see *AP-MBM Endnote 4* in AP-MBM annual meeting report) The Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* continues to function as an Advisory Panel, undertaking the study of marginal seas through cruises.

Scientific Leadership (Rule 17) – Co-Chairmen of Sections will serve a 3-year term, subject to re-election for one more term. Science Board was undecided how to identify and remove inactive members: formally (through Governing Council) or informally (through Sections and working through the Secretariat).

Science Board confirmed that:

- Dr. Vera L. Trainer will continue her chairmanship of S-HAB for 2 more years, until PICES-2017; Dr. Douding Lu will begin the first term of his chairmanship, until PICES-2018;
- Dr. James Christian will rotate off S-CC at PICES-2016; Dr. Tsuneo Ono will continue the first term of his chairmanship, until PICES-2017;
- Dr. Anne B. Hollowed will rotate off S-CCME at PICES-2016; Dr. Shin-ichi Ito will continue the first term of his chairmanship, until PICES-2017;
- Drs. Rolf Ream and Yutaka Watanuki will begin the first term of their chairmanship of S-MBM at PICES-2015 until PICES-2018.

Action: Science Board to discuss S-HD chairmanship duration at ISB-2016.

Technical Committees (Rule 14) – will formally be allowed to establish expert groups to facilitate the work of the Technical Committee.

Friday, October 23, 2015

AGENDA ITEM 6

Review strategic collaboration frameworks

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

Dr. Huo (SG-SCOOP Co-Chairman) reported that the framework was now finalized after comments from PICES and NOWPAP SG members were implemented.

Recommendation: Science Board approves SG-SCOOP framework report for publication, pending technical editing.

Joint ISC-PICES Study Group for *Scientific Cooperation of ISC and PICES* (SG-SCISC)

Dr. Jacquelynne King (SG-SCISC Co-Chairman) reported that the SG was approved at PICES-2014 began its work shortly after its establishment in April 2015. Science Board approved the PICES-ISC framework with no modifications. SG-SCISC recommended PICES form a joint PICES-ISC Working Group on *Oceanographic Conditions and the Distribution and Productivity of Highly Migratory Fish* under the FIS parent committee (FIS Endnote 3 in FIS annual meeting report). Potential PICES members from China and Russia still needed to be identified, and POC was helping to identify a potential Co-Chair. Dr. King suggested that POC might consider being a parent since potential member Dr. Stephan Gauthier's focus is on ocean acoustics and its use in determining the distribution of pelagic organisms. Dr. King proposed a 1½-day workshop for PICES-2016 on "*Methods relating oceanographic conditions to the distribution of highly migratory species*" to kickoff the WG. If the WG is accepted by SB/GC, Dr. King would remove herself as workshop convenor.

Recommendation: Science Board approves SG-SCISC framework report for publication, pending technical editing, and proposal for a new working group.

AGENDA ITEM 7

Mid-year Reports from expert groups reporting to Science Board

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

Dr. Mitsutaku Makino (S-HD Co-Chairman) reported that PICES-2015 was its fifth meeting, and requested that several inactive members be removed. Sub-teams (Well-Being, Economy, NPESR) created by S-HD to deal with its terms of reference are in place and a workplan for each team will be in place for PICES-2016. An additional sub-team on Community to develop an inventory of potential recipients and their communication requirements will begin its work in the near future. Topic Sessions proposed by S-HD for PICES-2016 were "*Coastal ecosystem services and human well-being*" and "*Social and economic assessment of migrated species fisheries*", the latter potentially co-sponsored by FIS. S-HD requested that Dr. Minling Pan be added to the joint PICES/ISC Working Group on *Ocean Conditions and the Distribution and Productivity of Highly Migratory Fish*, pending Science Board's recommendation and Governing Council' approval.

Action:

- Secretariat to discuss inactive members with Governing Council;
- Dr. Makino to identify a specific names or disciplines for S-HD for Science Board to recommend to Governing Council.

Dr. Makino discussed the MarWeB (Marine Ecosystem Health and Human Well-Being) project funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA). The goal of the project is to identify the relationships between sustainable human communities and productive marine ecosystems in the North Pacific, under the concept of fishery social-ecological systems, and the project is in its fourth of a 5-year project. Dr. Makino requested funds to hold a 2½-day inter-sessional Project Science Team meeting to review progress and to discuss plans and final products for its final year in

SB-2015

FY2016, as there was an unexpected shortfall from the initial planned budget from MAFF. Travel support was requested for Dr. Grant Murray to present major MarWeB findings at the ICES-led Symposium (MSEAS 2016) on “*Understanding marine socio-ecological systems*” (May 30–June 3, 2016, Brest, France).

Recommendation: Science Board recommends funding for a MarWeB inter-sessional meeting and travel support for a speaker to attend the MSEAS symposium.

Study Group on *North Pacific Ecosystem Status Report* (SG-NPESR3)

SG-NPESR3 Chairman, Dr. Phillip Mundy, reviewed the SG terms of reference. TORs #1 and 2 have been completed. The Study Group will continue for a second year (concluding at PICES-2016) due to the complexity of its work. Dr. Mundy requested an additional term of reference, “The Study Group will report to ISB-2016 on options for biogeographical classification of data submitted to NPESR-3, including a recommendation on a preferred approach” be added to the existing ones.

Recommendation: Science Board recommends SG-NPESR3 additional TOR.

Dr. Mundy presented an Implementation Plan showing the direction and tasks to be undertaken to launch NPESR3. He earlier presented the Plan at all the Committee meetings either at their overture or main meeting . Travel support is requested for SG members to attend an inter-sessional workshop on NPESR time series to be scheduled for June 2016 either in Sidney, Canada, Honolulu, USA or Jeju, Korea. An expert group will be proposed to Science Board to conduct the synthesis of ETSOs provided by the Standing Committees, preferably by April or May, but no later than ISB-2016. A separate Editorial Board will be formed, composed of volunteers from the Standing Committees. It will edit the ETSO data gathered from the Committees as Word documents, asci, jpegs, *etc.*, and will work closely with the NPESR expert group. Science Board expressed concern of another NPESR expert group being established before the present one had completed its terms of reference. Science Board instructed SG-NPESR3 begin immediately to draft the TORs for a new expert group so they can be reviewed at ISB-2016. In the meantime, the Editorial Board will begin editing collected data.

Action: SG-NPESR3 to draft TORs January/February so they can be reviewed at ISB-2016.

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

SG-SEES Chairman, Dr. Emanuele Di Lorenzo, reported that PICES has done a good job in covering all the dimensions (climate system, human system, marine ecosystem) in FUTURE (the social science aspect was presented in his [invited talk](#) at the Science Board Symposium at PICES-2016). There now needs to be an exchange of trans-disciplinary dialogue to process these to the next level for incorporation into the next PICES program’s science and implementation plans. Dr. Di Lorenzo suggested creating an informal open “SEES club”, a low-cost alternative to forming another expert group. Science Board and Governing Council will determine appropriate stakeholders (*i.e.*, managers) who will be invited to PICES-2016 to identify and discuss issues and concerns across disciplines with PICES scientists at an evening meeting, followed by dinner. Science Board will review the final report of SG-SEES and approve it by correspondence.

Action:

- SG-SEES to submit its final report to the Secretariat;
- Science Board and Governing Council to identify stakeholders to participate in an open SEES club;
- Dr. Di Lorenzo to compose a SEES club invitation letter to stakeholders.

Study Group on *Biodiversity Conservation* (SG-BC)

SG-BC Chair, Dr. Janelle Curtis, was not present to present the final report of the Study Group.

Action: SG-BC to circulate its report after PICES-2015 for review and approval (by correspondence) by Science Board.

AGENDA ITEM 8

Update on PICES 25th Anniversary year

Anniversary Planning Committee (APC) Chairman, Dr. John Stein, reported on planning progress for the 2016 Annual Meeting. The APC suggested PICES-2016 focus more on the future of PICES with only about 20% of the Meeting devoted to looking at past achievements. Other suggestions included:

- Encourage early career scientists as keynote speakers for Plenary Sessions;
- Begin each day with a Plenary
- Invite a delegate from Mexico to present an invited talk
- Devote special sessions to key scientific areas
- Hold TED-like talks on interesting topics to be videoed and posted
- Have 2 or 3 dynamic speakers for evening outreach sessions
- Produce a lecture series, by video, for distribution
- Engage another large ocean conference that will take place in San Diego
- Invite local high profile guests from Mexico, NOAA, Scripps to present invited talks
- Provide tours of NOAA research vessel
- Promote the “Journey with PICES” book.

AGENDA ITEM 9

Election of Science Board Chair-elect

Dr. Batchelder conducted the election. Science Board unanimously endorsed Dr. Hiroaki Saito as Chairman-elect of Science Board.

Saturday, October 24, 2015

AGENDA ITEM 10

Reports from Scientific and Technical Committees plus high priority requests

Main high priority items for each Committee are provided below, and in Science Board recommendations. More detailed summaries are given in individual Annual Meeting Committee reports.

Biological Oceanography Committee (BIO)

The Advisory Panel on *Marine Birds and Mammals* (AP-MBM) submitted its final report on spatial ecology to BIO for review and approval. AP-MBM submitted new terms of reference to be formed as a Section and BIO supported the establishment. The Working Group on *Biodiversity of Biogenic Habitats* (WG 32) held its first meeting at PICES-2015 and reviewed its terms of reference, identified research questions to address and a workplan for the next year. WG 32 proposed a 2-day Workshop on “*Distributions of habitat-forming coral and sponge assemblages in the North Pacific Ocean and factors influencing their distributions*” at PICES-2016. WG 32 requested the addition of two new members (Dr. Jaebong Lee, Korea and Dr. John Guinotte, USA). Working Group on *Regional Climate Modeling* (WG 29) will submit its final report to BIO and plans for its next phase (proposal for a Working Group on “*Bio-physical Predictions and Projections*”) before ISB-2016.

Dr. Se-Jong Ju (Korea) was elected as the Vice-Chair of BIO, replacing Dr. Atsushi Tsuda (Japan). BIO supports the establishment of a Joint PICES/ICES Working Group on *Climate Change and Biologically-driven Ocean Carbon Sequestration* and Study Group on *Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems* (deferred at PICES-2014 until Working Group on *Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28) was closer to completing its terms of reference). In response to BIO’s request, the Committee has received ETSOs from Canada, Russia and the United States, so far, as contributions to the next North Pacific Ecosystem Status Report.

For PICES-2016, BIO gave highest rank for potential sponsorship to Topic Sessions on:

- “Early life history stages as indicators and predictors of climate variability and ecosystem change”,
- “Understanding our changing oceans through species distributions and habitat models based on remotely sensed data”,
- “Causes and consequences of 25 years of variability in ocean conditions on the ecosystems of the eastern North Pacific”,

and Workshops on:

- “Acidification of the North Pacific Ocean: A basin-wide assessment”,
- “Mesoscale and submesoscale processes in the North Pacific: History and new challenges”,
- “Distributions of habitat-forming coral and sponge assemblages in the North Pacific Ocean and factors influencing their distributions”,
- “Consumption of North Pacific forage species by marine birds and mammals”.

For the 2016 ICES ASC, BIO recommended PICES sponsorship of the ICES workshop on “*Seasonal-to-decadal prediction of marine systems: Opportunities, approaches and applications*”. BIO recommended PICES affiliate membership for the SCOR Working Group proposal P1 on *Towards a Global Comparison of Zooplankton Production: Measurement, Methodologies and Applications*.

Action: Secretariat to request Governing Council to appoint Drs. Jaebong Lee and John Guinotte as members to WG 32.

Fishery Science Committee (FIS)

FIS Chair, Dr. Elizabeth Logerwell, announced that Drs. Tetsuichiro Funamoto and Masahito Hirota were new FIS members, representing Japan, and replacing Drs. Akihiko Yatsu and Motomitsu Takahashi.

FIS supports the establishment of a Study Group on *Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems (CERP)* and Joint PICES/ICES Working Group on *Climate Change and Biologically-driven Ocean Carbon Sequestration (WG 33)*.

For PICES-2016, FIS gave highest rank for potential sponsorship to Topic Sessions proposals on:

- “Species adaptation to climate change”,
- “Early life history stages as indicators and predictors of climate variability and ecosystem change”,
- “Climate variability, climate change and the reproductive ecology of marine populations”,
- “Resilience, transitions and adaptation in marine ecosystems under a changing climate”,

and Workshop proposals on:

- “Phase 1: Modeling effects of climate change on fish and fisheries”,
- “Methods relating oceanographic conditions to the distribution of highly migratory species”,
- “Acidification of the North Pacific Ocean: A basin-wide assessment”.

Theme session proposals for PICES co-sponsorship at the 2016 ICES ASC, in order of ranking:

1. Proposal 10, *Seasonal-to-Decadal Prediction of Marine Systems: Opportunities, Approaches and Applications* (S-CCME ranked it second);
2. Proposal 8, *The inshore challenge – management of recreational and commercial fisheries accounting for social benefits, economic value, and biological sustainability* (S-CCME ranked it ninth);
3. Proposal 11, *What is a good pelagic habitat?* (S-CCME ranked it first).

FIS deferred to the other Committees to nominate one or more SCOR proposals for PICES affiliate status, as none had any direct links to FIS.

Dr. Logerwell represented PICES at the 3rd meeting of Scientific Experts on Fish Stocks in the Central Arctic Ocean, April 14–16, 2015, in Seattle, USA. Participants at the meeting acknowledged that there was some role for PICES in follow-up activities. There are components dealing with the Arctic that look FUTURE-relevant.

Four papers stemming from the PICES/ICES Workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” (May 22–24, 2013, St. Petersburg, Russia) were

published in a regular issue of the *ICES Journal of Marine Science*. Dr. Shishiro Minobe presented results of research on the effects of climate change on salmon ocean habitat initiated during the Workshop (W2) on “*Linkages between the winter distribution of Pacific salmon and their marine ecosystems and how this might be altered with climate change*”, co-sponsored by NPAFC, at PICES-2016, and in Theme Session 2 on “*Climate change impacts on salmonid production and their marine ecosystems*” at the NPAFC International Symposium on “*Pacific salmon and steelhead production in a changing climate: Past, present, and future*” (May 17–19, 2015, Kobe, Japan) and POC/BIO/TCODE Topic Session (S7) on “*Past, present, and future climate in the North Pacific Ocean: Updates of our understanding since IPCC AR5*” at PICES-2015, and a paper will be submitted to *Nature-Climate Change* in 2016.

Marine Environmental Quality Committee (MEQ)

MEQ Chair, Mr. Chuanlin Huo, announced that MEQ member, Dr. Janelle Curtis (Canada), stepped down and was replaced by Dr. Peter Ross (Canada). Dr. Shigeru Itakura (Japan) stepped down as Co-Chair of S-HAB and Dr. Douding Lu (China) was elected unanimously by S-HAB members to replace him.

For PICES-2016, MEQ gave highest ranking for potential sponsorship to Topic Sessions on:

- “*Source, transport and fate of hydrocarbons in the marine environment*”,
- “*Understanding the changing coastal ocean: advances and challenges in multi-parameter observations*”,
- “*New stage of ocean acidification studies: responses of oceanic ecosystem including fisheries resources*”
- “*The effect of marine debris caused by the Great Tsunami of 2011*”

and Workshops on:

- “*Conditions promoting extreme Pseudo-nitzschia events in the eastern Pacific but not the western Pacific*”,
- “*Methods relating oceanographic conditions to the distribution of highly migratory species*”,
- “*Mesoscale and submesoscale processes in the North Pacific: History and new challenges*”,
- “*Distribution and risk analysis of radionuclides in the North Pacific*”.

MEQ ranked SCOR working group proposals, in order of priority: P1, *Towards a Global Comparison of Zooplankton Production: Measurement, Methodologies and Applications*; P4, *Changing Ocean Biological Systems (COBS): how will biota respond to a changing ocean?* and P9, *International Quality Controlled Ocean Database: Subsurface temperature profiles* for PICES affiliate status.

The Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28) will submit its final report to MEQ in spring 2016. WG 28 and MEQ supports the establishment of a Study Group on *Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems*. Working Group on *Assessment of Marine Environmental Quality of Radiation around the North Pacific* (WG 30) is drafting a paper on the activity level and impact of artificial radionuclides in the North Pacific to improve the understanding of how human activities influence the marine environment. A journal is still to be determined.

Mr. Huo will attend the 20th NOWPAP intergovernmental meeting October 28–30, 2015 in Beijing and will discuss NOWPAP-PICES collaboration at the meeting. Mr. Huo will represent PICES at the NOWPAP CEARAC Focal Points Meeting in spring 2016 in Toyama, Japan, and requested funds for travel. Drs. Takafumi Yoshida and Xiaodong Zhong represented NOWPAP at the SG-SCOOP and MEQ meetings to talks about collaborations with PICES, and NOWPAP co-sponsored the 1-day MEQ Topic Session on “*Indicators of emerging pollution issues in the North Pacific Ocean*”, the 1½-day MEQ Workshop on “*Contrasting conditions for success of fish-killing flagellates in the western and eastern Pacific*”, 1-day Workshop on “*Marine Environment Emergencies: Detection, monitoring, response, and impacts*” (co-sponsored with ICES), and 1-day Workshop on “*Identifying major threats to marine biodiversity and ecosystems in the North Pacific*” at PICES-2015. Dr. Peter Kershaw represented GESAMP at the WG 30, WG 31 and MEQ meetings to discuss GESAMP–PICES collaborations.

Physical Oceanography and Climate Committee (POC)

POC Chair, Dr. Kyung-Il Chang, presented brief highlights from the Committee. POC supported the establishment of the Study Group on *Climate and Ecosystem Predictability* (SG-CEP); Study Group on *Ecosystem Reference Points as a Common Currency across PICES Social-Ecological Systems* and recommended Dr. Yury Zuenko (Russia) be appointed to the SG; joint PICES/ICES Working Group on *Climate Change and Biologically-driven Ocean Carbon Sequestration* (WG 33); joint PICES/ISC Working Group on *Ocean Conditions and the Distribution and Productivity of Highly Migratory Fish* (WG 34).

The Section on *Carbon and Climate* (S-CC) is focusing on producing a basin-wide ocean acidification assessment (Outlook) and provided an interim report at PICES-2015. To support this activity POC ranked the Workshop on “*Acidification of the North Pacific Ocean: a basin-wide assessment*”, and Topic Session on “*New stage of ocean acidification studies: responses of oceanic ecosystem including fisheries resources*” high for POC sponsorship at PICES-2016. S-CC will produce a PICES Scientific Report on the assessment late 2016 or in 2017, with highlights summarized in a peer-reviewed journal. POC also ranked the proposed Topic Session on “*Advances in understanding and modelling of physical processes in the North Pacific in the past 25 years of PICES and future directions*” and Workshop on “*Mesoscale and submesoscale processes in the North Pacific: History and new challenges*” as high.

The Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* (AP-CREAMS) Nagoya University (Japan) is proposing a University-led training course on “*Freshwater discharge and the coastal environment*” as a joint activity with the UNESCO International Hydrological Programme (IHP) and PICES late November–early December 2016. POC requested travel funds 1 lecturer and 5 early career scientists to attend the 2-week course. A revision of the Supplementary Chapter of the North Pacific Ecosystem Status Report 2003–2008 has been completed and is ready for review by POC, MONITOR and Dr. Phillip Mundy. The preparation of “*Oceanography of the Yellow and East China Sea*” is continuing.

For the 2016 ICES ASC, POC recommended PICES co-sponsorship of theme session proposal 10 on “*Seasonal-to-decadal prediction of marine systems: Opportunities, approaches and applications*”.

POC recommended Dr. Michael Jacox (University of California Santa Cruz, USA; Best Presentation for a POC-sponsored topic session at PICES-2014) as member of the SSC for the PICES/ICES Early Career Scientists Conference in 2017 in Busan, Korea.

POC requested high level support of \$15,000 for invited speakers to attend the CLIVAR Open Science Conference September 15–23, 2016, in Qingdao, China. Participation will allow CLIVAR and PICES to discuss areas of mutual interest with the goal of forming a joint expert group.

POC requested travel support for Dr. Lisa Miller to attend a SCOR WG 40 (BEPSII) meeting March 16–18, 2016, in Paris, France. [Travel for Dr. Miller as affiliate member is automatically considered in the Secretariat’s yearly travel budget, so is not listed in travel request recommendations, below.] POC ranked P2, *SEAmount Faunal vulnerability to impacts of Ocean Acidification and Mining* and P9, *International Quality Controlled Ocean Database: Subsurface temperature profiles* for PICES affiliate status.

Dr. Heedong Jeong represented NEAR-GOOS and Dr. Jianping Xu represented Argo at the POC meeting to discuss collaborations with PICES. KIOST has offered to host the inter-sessional NPESR3 workshop (date TBD) in Jeju, Korea.

Technical Committee on Monitoring (MONITOR)

MONITOR Chair, Dr. Jennifer Boldt, reported on activities of the North Pacific Continuous Plankton Recorder program. Two CPR-related papers were published in 2015 in peer-reviewed journals with Dr. Sonia Batten, SAHFOS *ex officio* member of MONITOR, and MONITOR Co-Chair, Dr. Sanae Chiba, as co-authors.

Another paper co-authored by Dr. Batten has been accepted and one is under review (see MONITOR report for more details). There are no immediate concerns for funding the CPR program, with the NPRB, Exxon Valdez Oil Spill Trustee Council, JAMSTEC, and tentatively, DFO, providing support until 2016. Dr. George Graham, SAHFOS representative, gave an overview of the development of new plankton identification methods, which are being used in conjunction with the traditional taxonomic identification by light microscope, and potential developments of the CPR Survey as a cost effective platform for integrative monitoring at the MONITOR meeting. He stressed that more interaction with earth observing systems is needed.

For PICES-2016, MONITOR gave highest ranking for potential sponsorship to Topic Sessions on:

- “*Causes and consequences of 25 years of variability in ocean conditions on the ecosystems of the eastern North Pacific*”,
- “*Understanding our changing oceans through species distributions and habitat models based on remotely sensed data*”
- “*Understanding the changing coastal ocean: Advances and challenges in multi-parameter observations*”; and Workshops on:
 - “*Acidification of the North Pacific Ocean: a basin-wide assessment*”,
 - “*Delivering quality multi-parameter data from the coastal ocean*”,
 - “*Mesoscale and submesoscale processes in the North Pacific: History and new challenges*”,
 - “*Distribution and risk analysis of radionuclides in the North Pacific*”.

2016 ICES ASC, MONITOR recommended PICES co-sponsorship of proposal 19, “*When is enough – enough? Methods for optimising, evaluating and prioritising of marine data collection*” and proposal 1, “*Fisher Collected Aquatic Data*”.

The three top ranked SCOR proposals for PICES affiliate status were P1, *Towards a Global Comparison of Zooplankton Production: Measurement, Methodologies and Applications*; P4, *Changing Ocean Biological Systems (COBS): how will biota respond to a changing ocean?* and P2, *SEAmount faunal vulnerability to impacts of ocean acidification and mining*.

MONITOR members, Drs. Jack Barth, Sung Yong Kim, In-Seong Han, Lisa Eisner, Sanae Chiba and Sonia Batten (*ex officio*) will review their assigned chapters of the revised Supplementary Chapter of the North Pacific Ecosystem Status Report 2003–2008. Dr. Boldt will review the whole report. The reviewers will submit their comments by November 20, 2015 to Dr. Boldt who will compile the reviews and submit recommendations to Science Board (and reviews to the authors) by December 4. Dr. Boldt requested the Secretariat make an electronic copy of the chapter available for download. MONITOR recommended the deadline for AP-CREAMS’s completion of the EAST-II report on “*Oceanography of the Yellow and East China Sea*” be extended to the end of 2016 as this is a valuable report for which more time is required. (For other AP-CREAMS highlights, see POC’s report above.)

Action: Secretariat to provide electronic copy of Chapter by end of PICES-2015 to reviewers.

The Advisory Panel on *North Pacific Coastal Ocean Observing Systems* (AP-NPCOOS) held a 1-day Workshop (W6) on “*Best practices for and scientific progress from North Pacific Coastal Ocean Observing Systems*” at PICES-2015. Following the workshop, the AP will form a small group to look at ferry box systems for each PICES member country and will provide a recommendation on ecosystem EOVs for NPESR. The AP also plans to hold training workshops annually that would rotate around the member countries (the first is planned for 2017) and to develop a QA/QC flow diagram for sensors and data acquisition. MONITOR recommends that PICES extend its area of interest to include Arctic shelves, which would be in alignment with the second part of Governing Council decision 2014/S/2.

Dr. Vyacheslav Lobanov volunteered to sit on the Editorial Board of SG-NPESR’s ETSO Review Board.

MONITOR identified a need to increase collaboration with NEAR-GOOS (as Science Board had identified NP CPR data (which is contributing project of GACS) to derive EOVs to support MONITOR in its role as a forum for coordination and development of inter-regional and international components of the North Pacific Ocean Observing Systems; see ISB-2014 report) and suggested a PICES representative attend a NEAR-GOOS meeting December 8–9, 2015 in Tokyo, Japan. Since Dr. Lobanov is involved in NEAR-GOOS, he could attend at no cost and give a presentation on PICES activities to promote collaboration. [At the Science Board meeting Dr. Toru Suzuki volunteered represent MONITOR.] It was recommended that in future, PICES send a MONITOR member to attend NEAR-GOOS meetings. The GOOS Biology and Ecosystems Panel held its first (online) July 15, 2015. Drs. David Checkley, Chiba and Batten are members of the Panel.

Dr. Song Yung Kim is interested in participating in a proposed working group on mesoscale and submesoscale processes that would be kicked off if the proposed Workshop on “*Mesoscale and submesoscale processes in the North Pacific*” for PICES-2016 is recommended by Science Board.

Technical Committee on Data Exchange (TCODE)

TCODE Chair, Dr. Toru Suzuki, reported that Dr. Daisuke Ambe (Japan) and Mr. Peter Chandler (Canada) were appointed as new members of TCODE, and it is anticipated that Dr. Wenhai Lu, representing China, will be appointed soon.

For PICES-2016, TCODE gave equally highest ranking to proposed Topic Sessions on:

- “*Early life history stages as indicators and predictors of climate variability and ecosystem change*”;
- “*Recent progress in deep-sea research and conservation: Lessons from various parts of the globe*”;
- “*New stage of ocean acidification studies: responses of oceanic ecosystem including fisheries resources*”;
- “*The effect of marine debris caused by the Great Tsunami of 2011*”;
- “*Resilience, transitions and adaptation in marine ecosystems under a changing climate*” and “*The response of marine ecosystems to natural and anthropogenic forcing*” (suggested to be merged);
- “*Causes and consequences of 25 years of variability in ocean conditions on the ecosystems*”;
- “*Understanding the changing coastal ocean: advances and challenges in multi-parameter*”

and Workshop proposals on:

- “*Acidification of the North Pacific Ocean: A basin-wide assessment*”;
- “*Delivering quality multi-parameter data from the coastal ocean*”;
- “*Distribution and risk analysis of radionuclides in the North Pacific*”

TCODE supported SG-NPESR3’s proposal to hold an inter-session workshop for time series evaluation and synthesis. TCODE identified Dr. Tony Koslow or Mr. Peter Chandler to serve on Editorial Board of NPESR. Dr. Suzuki noted that Poster S1-P17 on “*The International Group for Marine Ecological Time Series (IGMETS): Assessing global oceanic changes through joint time series analysis*” presented by Dr. Andrew R.S. Ross could be a potential source for ETOSs.

Theme session proposals for PICES co-sponsorship at the 2016 ICES ASC, in order of ranking:

1. Proposal 10, *Seasonal-to-decadal prediction of marine systems: Opportunities, approaches and applications*;
2. proposal 19, “*When is enough – enough? Methods for optimising, evaluating and prioritising of marine data collection*”;
3. Proposal 7, *Integrated Ecosystem Assessment, how does it work, what is it good for, who is it for, and where is it going?*;
4. Proposal 18, *Long-term phytoplankton trends in the ICES area: regional distribution, bloom dynamics and response to environmental drivers.*

The three top ranked SCOR proposals for PICES affiliate status were P9, *International Quality Controlled Ocean Database: Subsurface temperature profiles*, P4, *Changing Ocean Biological Systems (COBS): how will biota respond to a changing ocean?* and P1, *Towards a Global Comparison of Zooplankton Production: Measurement, Methodologies and Applications.*

Prof. Yutaka Michida, Co-Chair of IOC/IODE, discussed potential collaboration with IODE and IOC-WESTPAC, and encourages PICES to join IODE network as an associate data unit (ADU). TCODE is developing a PICES data exchange policy that will assist in applying for ADU status. Mr. Xiaodong Zhong, Deputy Coordinator of NOWPAP, reported cooperative activities and future plan with PICES.

PICES-2016 and Science Board recommendations

The theme for PICES-2016 is “25 Years of PICES: Celebrating the Past, Imagining the Future” in celebration of PICES’ 25th anniversary. The Annual Meeting will be held from November 1–13, 2016, in San Diego, USA. The following topic sessions and workshops were recommended by Science Board (final descriptions can be found in *SB Endnote 4*):

³/₄-day Science Board Symposium

25 Years of PICES: Celebrating the past, imagining the future

³/₄-day BIO/TCODE/FIS Topic Session

Early life history stages as indicators and predictors of climate variability and ecosystem change

³/₄-day BIO/MONITOR/MEQ Topic Session

Understanding our changing oceans through species distributions and habitat models based on remotely sensed data

³/₄-day FIS Topic Session

Climate variability, climate change and the reproductive ecology of marine populations

¹/₂-day FIS/TCODE Topic Session

Resilience, transitions and adaptation in marine ecosystems under a changing climate (co-sponsored by ESSAS)

³/₄-day MEQ Topic Session

Source, transport and fate of hydrocarbons in the marine environment

³/₄-day MoE/MEQ/TCODE Topic Session

The effect of marine debris caused by the Great Tsunami of 2011

³/₄-day POC Topic Session

Advances in understanding and modelling of physical processes in the North Pacific in the past 25 years of PICES and future directions

³/₄-day POC/TCODE/MEQ Topic Session

New stage of ocean acidification studies: responses of oceanic ecosystem including fisheries resources

³/₄-day POC/MEQ/MONITOR/BIO Topic Session

What factors make or break trophic linkages?

¹/₂-day FUTURE Topic Session

The response of marine ecosystems to natural and anthropogenic forcing: past, present, and future

³/₄-day MONITOR/BIO/TCODE Topic Session

Causes and consequences of 25 years of variability in ocean conditions on the ecosystems of the eastern North Pacific

SB-2015

¾-day MONITOR/TCODE Topic Session

Understanding the changing coastal ocean: advances and challenges in multi-parameter observations

1-day Workshop

Acidification of the North Pacific Ocean: A basin-wide assessment

1-day Workshop

Conditions promoting extreme Pseudo-nitzschia events in the eastern Pacific but not the western Pacific

2-day Workshop

Distributions of habitat-forming coral and sponge assemblages in the North Pacific Ocean and factors influencing their distributions

1-day Workshop

Methods relating oceanographic conditions to the distribution of highly migratory species

1-day Workshop

Phase I: Modeling effects of climate change on fish and fisheries [later renamed Modeling effects of climate change on fish and fisheries](co-sponsored by ICES)

1-day Workshop

Consumption of North Pacific forage species by marine birds and mammals

1-day Workshop

Delivering quality multi-parameter data from the coastal ocean

1-day Workshop

Mesoscale and submesoscale processes in the North Pacific: History and new challenges

1-day Workshop

The role of the northern Bering Sea in modulating the Arctic environments: Towards international interdisciplinary efforts

1-day Workshop

Distribution and risk analysis of radionuclides in the North Pacific

The following are business meeting requests for PICES-2016:

- 3-hour overture meeting, ½-day meeting preceding a joint meeting with FUTURE SSC meeting, and a 1-day meeting of Science Board;
- 1-day FUTURE SSC meeting;
- 2-hour overture meetings and ½-day meetings of Standing Committees;
- 2-hour overture meeting and ½-day meeting of the Science Board Section on *Human Dimensions of Marine Systems* (S-HD);
- 1-day meeting of the Section on *Marine Birds and Mammals* (S-MBM);
- 1-day meeting of the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (S-HAB);
- ½-day meeting of the Section on *Carbon and Climate* (S-CC);
- ½-day meeting of the joint PICES/ICES Section on *Climate Change Effects on Marine Ecosystems* (S-CCME);
- 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);
- 1-day meeting of the Working Group on Working Group on *Biodiversity of Biogenic Habitats* (WG 32);

- 2-day meeting of the joint PICES/ICES Working Group on *Climate Change and Biologically-driven Ocean Carbon Sequestration* (WG 33);
- 1½-day meeting of the joint PICES/ISC Working Group on *Oceanographic Conditions and the Distribution and Productivity of Highly Migratory Fish* (WG 34);
- 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);
- 1-day meeting of the Study Group on *North Pacific Ecosystem Status Report* (SG-NPESR);
- 1-day meeting of the Study Group on *Climate and Ecosystem Predictability* (SG-CEP);
- 1-day meeting of the Study Group on *Ecosystem Reference Points as a Common Currency across PICES Member Countries* (SG-CERP);
- 1-day meeting of the Project Science Team for the PICES/MAFF project on “*Marine ecosystem health and human well-being*” (MarWeb);
- 1-day meeting of the Project Science Team for the PICES/MoE project on “*Effects of marine debris caused by the Great Tsunami of 2011*”.

Other Science Board recommendations

Proposed new expert groups

- Study Group on *Climate and Ecosystem Predictability* (SG-CEP);
- Study Group on *Common Ecosystem Reference Points across PICES Member Countries* (SG-CERP);
- Joint PICES/ICES Working Group on *Climate Change and Biologically-driven Ocean Carbon Sequestration* (WG 33);
- Joint PICES/ISC Working Group on *Oceanographic Conditions and the Distribution and Productivity of Highly Migratory Fish* (WG 34);
- Section on *Marine Birds and Mammals* (S-MBM).

Expert groups to be disbanded upon completion of their final reports

- Advisory Panel on *Marine Birds and Mammals* (AP-MBM) [completion of final report does not apply];
- Study Group on *Socio-Ecological-Environmental Systems* (SG-SEES);
- Joint PICES-NOWPAP Study Group on *Scientific Cooperation in the North Pacific Ocean* (SG-SCOOP);
- Study Group for *Scientific Cooperation of ISC and PICES* (SG-SCISC);
- Working Group on *North Pacific Climate Variability and Change* (WG 27);
- Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28);
- Working Group on *Regional Climate Modeling* (WG 29).

Amendments to existing expert groups

- Additional term of reference to be added for SG-NPESR3:
“5. Report to ISB-2016 on options for biogeographical classification of data submitted to NPESR-3, including a recommendation on a preferred approach.”

Changes in Committee Chairmanship/Vice-Chairmanship (as result of elections)

- Dr. Hiroaki Saito (Japan) was elected Chairman-elect of Science Board;
- Dr. Se-Jong Ju (Korea) elected as the Vice-Chairman of the Biological Oceanography Committee to replace Dr. Atsushi Tsuda (Japan);
- Dr. Douding Lu (China) elected as the Co-Chairman of S-HAB to replace Dr. Shigeru Itakura (Japan).

Changes/additions in expert groups

- Mr. Hyun Yeong Kim (Korea) and Dr. Chounki Kim (Korea) to be added as members of Section on *Human Dimensions of Marine Systems* (S-HD);
- Drs. Jaebong Lee (Korea) and John Guinotte (USA) be added as members of Working Group on *Biodiversity of Biogenic Habitats* (WG 32).

Joint ICES/PICES theme sessions at the ICES 2016 Annual Science Conference, September 19–23, 2016, Riga, Latvia

- *Seasonal-to-decadal prediction of marine systems: Opportunities, approaches and applications* (Theme Session I);
- *“When is enough – enough?” Methods for optimising, evaluating and prioritising of marine data collection* (Theme Session O).

Inter-sessional symposia/sessions/workshops/meetings

- 2-day inter-sessional meeting of the FUTURE Scientific Steering Committee (March 8–10, 2016, San Diego, USA);
- 2½-day inter-sessional Science Board meeting (May 30–June 1, 2016, Hangzhou, China);
- 1-day joint PICES/ICES S-CCME workshop on economic modelling of the effects of climate change on fish and fisheries (in conjunction with the MSEAS Symposium, May 30–June 3, 2016, Brest, France);
- 2½-day inter-sessional Science Board meeting, May 30–June 1, 2016, Hangzhou, China;
- 2½-day meeting of the Project Science Team for the PICES/MAFF *“Marine ecosystem health and human well-being”* (MarWeB) project (June 22–24, 2016, Victoria, Canada);
- 3-day inter-sessional SG-NPESR3 workshop for time-series evaluation and synthesis (June 2016, Sidney, Canada).

Capacity building

- Pacific Ecology and Evolution Conference (PEEC 2016) February 26–28, 2016, Bamfield, Canada;
- IMBER ClimEco5 Summer School on *“Towards more resilient oceans: Predicting and projecting future changes in the ocean and their impacts on human societies”* co-sponsored by PICES (August 10–17, 2016, Natal, Brazil);
- Nagoya University-led training course on *“Freshwater discharge and the coastal environment”* co-sponsored by PICES (November/December 2016, Nagoya University, Japan).

Priority items with funding implications

Inter-sessional events

- 1 S-HAB member to attend IOC/IPHAB Global HAB Status Report meeting (March 8–10, 2016, Oban, Scotland);
- 1 PICES scientist to attend NPAFC International Year of the Salmon second scoping meeting (March 15–17, 2016, Vancouver, Canada);
- 1 PICES representative to attend a NOWPAP CEARAC Focal Points Meeting (April 7–8, 2016, Toyama, Japan);
- 2 S-CCME invited speakers and 1 S-HD speaker to attend ICES Science Symposium on *“Understanding marine socio-ecological systems: including the human dimensions in Integrated Ecosystem Assessments”* (May 30–June 3, 2016, Brest, France);
- 1 S-HAB member to attend meeting on Best Practices for HAB research meeting (xx, 2016, xx);
- 2 early career scientists to attend IMBER ClimEco5 Summer School (August 10–17, 2016, Natal, Brazil);
- 1 S-CCME member to attend joint ICES/PICES S-CCME meeting during ICES 2016 Annual Science Conference (September 19–23, 2016, Riga, Latvia);
- 2 PICES convenors/invited speakers to attend ICES 2016 Annual Science Conference for 2 joint ICES/PICES theme sessions (September 19–23, 2016, Riga, Latvia);
- 2–5 invited speakers to attend CLIVAR Open Science Conference (September 15–23, 2016, Qingdao, China);
- 1 lecturer and 5 early career scientists to attend a CREAMS-proposed training course on *“Freshwater discharge and the coastal environment”* (November/December 2016, Nagoya University, Japan);
- Support for early career scientists to attend the Pacific Ecology and Evolution Conference (PEEC 2016) February 26–28, 2016, Bamfield, Canada.

Publications

Special issues in primary journals (2016–2017)

- Special issue of Progress in Oceanography based on selected papers from the PICES-2012 Topic Session on “Advances in understanding the North Pacific Subtropical Frontal Zone ecosystem” (Guest Editors: T. Ichii, S. McKinnell and M. Seki) to be published in late 2015 or early 2016.(Approved at PICES-2013);
- Paper stemming from the PICES-2014 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 2016.(Approved at PICES-2014);
- Review paper on “The legal and regulatory foundations of fisheries management in PICES member countries” (Lead authors: K. Criddle) to be submitted to a peer-reviewed journal in 2016 (Approved at PICES-2014);

PICES Scientific Report series (2016–2017)

- Report on “Spatial ecology of marine top predators in the North Pacific” by the Advisory Panel on Marine Birds and Mammals (Editors: R. Ream, W. Sydeman, R. Suryan and Y. Watanuki);
- Final Report of the Working Group 26 on Jellyfish Blooms around the North Pacific Rim: Causes and Consequences (Editors: R. Brodeur and S-I. Uye);
- Final Report of the Working Group 27 on North Pacific Climate Variability and Change (Editors: E. Di Lorenzo, M. Foreman and S. Minobe);
- 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);
- Final Report of the Working Group 29 on Regional Climate Modeling (Editors: C-J. Jang and E. Curchitser);
- 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; approved at PICES-2013);
- Final Report of the Study Group on Socio-Ecological-Environmental Systems (Editor: Emanuele Di Lorenzo);
- Final Report of the Study Group on Biodiversity Conservation (Editor: Janelle Curtis);
- Final Report of the Study Group for Scientific Cooperation of ISC and PICES (electronic only);
- Final Report of the joint PICES-NOWPAP Study Group on Scientific Cooperation in the North Pacific Ocean (electronic only);
- Supplementary chapter for the second North Pacific Ecosystem Status Report developed by the Advisory Panel for a CREAMS/PICES Program in East Asian Marginal Seas .

AGENDA ITEM 11

Report from FUTURE SSC

Dr. Steven Bograd, Co-Chair of the FUTURE SSC, reported that the FUTURE Mini-Symposium had high attendance with lots of audience participation but suggested the meeting could improved for next year by leaving more time left for general discussion. Expert group activity reports will be synthesized by the SSC for FUTURE products early in 2016 and sent to Science Board Chair for review and forwarding to Governing Council for prioritization from a national standpoint. Governing Council feedback will be expected for discussion at ISB-2016.

FUTURE SSC requested travel funds for 4–6 invited speakers for the FUTURE-endorsed Session proposal on “*The response of marine ecosystems to natural and anthropogenic forcing: Past, present and future*” at PICES-2016. If needed, additional money will be drawn from the High Priority Projects Fund to cover additional speakers. Science Board agreed that this was a high-priority session and should be moved to plenary. The SSC requested a full day for its business meeting at PICES-2016 and two days for an inter-session meeting prior to ISB-2016.

Action:

- SSC to identify high priority FUTURE products for Governing Council by early new year;
- Co-Chairs to update FUTURE Implementation Plan for ISB-2016;
- Secretariat to provide a mechanism (WebEx, skype, WeChat, other?) for communication between the SSC Co-Chairs.

AGENDA ITEM 12

Status of venue for PICES-2016

The Annual Meeting will take place in San Diego, USA, at the San Diego Convention Center. Based on the structure of the meeting (see Agenda Item 13), the Secretariat will determine meeting design based on room capacity and layout.

AGENDA ITEM 13

Schedule for PICES-2016 and inter-sessional workshops

Science Board reviewed and revised a proposed Anniversary Meeting schedule prepared by Dr. Therriault and the Secretariat. The difference from the standard meeting structure is as follows:

- Monday: Starting at 9:00 h, Plenary will continue all day with all talks to be 30 minutes, for a total of 9 talks (compared to a usual mix of 20- and 30-minute talks);
- Tuesday: Starting at 8:30 h, 3 plenary talks will be given, ending at 10:00h; 4 parallel sessions will take place for the remainder of day, for a total of 68 20-minute talks (compared to usual 3-parallel sessions with 63 talks). Day 1 of Poster Session Reception will start at 19:00;
- Wednesday: Starting at 8:30 h, the proposed schedule was revised to replace an Early Career Scientist day* and 2 parallel sessions with 3 parallel sessions, for a total of 33 talks. The afternoon will be dedicated to business meetings (no changes in Wednesday structure compared to standard years);
- Thursday: Starting at 8:30 h, structure will be the same as for Tuesday; Day 2 of Poster Session Reception will start at 19:00 h.
- Friday: Starting at 9:00 h; 6 30-minute plenary talks will be given, ending at 12:30 h (compared to usual 27 talks during 3 parallel sessions); the Closing Session will be from 12:45 to 13:45, followed by Day 2 of the Science Board meeting (all talks 30 minutes).

In total, PICES-2016 will consist of 145 talks (18 plenary) compared to 195 talks during standard Annual Meetings. The reduction in number of talks from a standard year will allow for more posters to be presented, and these will be on display from Monday morning to Thursday evening with Tuesday and Thursday evenings dedicated to a Poster Session Reception. Since the usual time slots dedicated to Committee contributed Paper Sessions will be replaced by topic sessions or plenaries, these papers sessions will be made posters.

* Science Board chose not to have a day dedicated to early career scientists (ECS) because of costs. Instead, convenors will be asked to reserve slots in each session for ECS (*i.e.*, roughly 30–40% slots dedicated to ECS).

For schedule of inter-sessional workshops, see Agenda Item 10 (*Inter-sessional meetings*).

AGENDA ITEM 14

Venue and dates for ISB-2016

The next inter-sessional Science Board meeting will be held in spring in Hangzhou, China, and will be for 2–3 days. A workshop to tie in with has not been identified but there is a possibility it could be with a NPESR3 workshop tentatively scheduled for June.

Recommendation: Inter-sessional Science Board meetings should be an annual requirement unless Science Board states otherwise.

AGENDA ITEM 15

Updating PICES Strategic Plan

The Study Group on *Revising the Strategic Plan* (SG-RSP) has produced a first draft of the Strategic Plan which will be further refined for comment by Science Board at ISB-2016.

AGENDA ITEM 16

Update on PICES-sponsored Conferences/Symposia

Science Board recommended co-sponsoring the following by providing:

- \$1,500 for early career scientists to attend the Pacific Ecology and Evolution Conference (PEEC 2016; February 26–28, 2016, Bamfield, Canada) (see also Agenda Item 10 (Capacity building));
- Funds for a S-HD member to present at the ICES Symposium on “*Understanding marine socio-ecological systems: Including the human dimension in Integrated Ecosystem Assessments*” (May 30–June 3, 2016, Brest, France) (see also Agenda Item 10 (Priority items with funding implications));
- Travel support for 2–5 invited speakers to attend CLIVAR Open Science Conference (September 15–23, 2016, Qingdao, China) (see also Agenda Item 10 (Priority items with funding implications)).

AGENDA ITEM 17

Update on capacity building/plan for PICES summer schools*PICES/ICES Early Career Scientists Conference*

A third PICES/ICES ECS Conference will be hosted by the Korea Institute of Maritime and Fisheries Technology (KIMFT), May 29–June 2, 2017, Busan, Korea. A local ECS SSC member (Dr. Tae-Wook Kim, KIOST) is in place but PICES and ICES still need to nominate members by November. POC recommended Dr. Michael Jacox (USA). FIS was not comfortable putting a name forward. The Committee protested that the instructions, process and criteria were not clear, and there was no time to canvass Early Career Scientists to gather information and to gauge interest. FIS suggested that in future Science Board formalizes and clarifies the process and communicates it to the Committees in a timely fashion. Dr. Batchelder will contact proposed PICES-nominated members once he has received names from the other Committee/FUTURE chairs.

Action: BIO, FIS, FUTURE, MONITOR to provide ECS nomination to Dr. Batchelder by November.

PICES-sponsored Summer School

The Advisory Panel on *North Pacific Coastal Ocean Observing Systems* (AP-NPCOOS) suggested PICES hold an annual coastal observing summer school that would rotate among PICES member countries, starting in 2017, but no formal proposal was made.

Summer Schools sponsored by PICES

Science Board agreed to sponsor 2 early career scientists from PICES member countries to attend the IMBER ClimEco5 Summer School (August 10–17, 2016, Natal, Brazil) (see Agenda Item 10 (Priority items with funding implications)).

AGENDA 18

Status of PICES publications

Design templates for a PICES brochure and updated PICES logo were circulated at the meeting for review. The majority of Science Board selected the wide wave theme design for the brochure and endorses the logo with the PICES acronym curved inside the sphere. Dr. Huo indicated that once the outreach brochure summarizing the proceedings of the Workshop on Economic Impacts of Harmful Algal Blooms on Fisheries and Aquaculture (PICES Scientific Report No. 47) is completed, it will be translated into Chinese. There are

no funding implications. PICES will produce a brochure (by spring 2016) announcing the 2017 Early Career Scientist Conference.

AGENDA 19

Other business

None

SB Endnote 1

Science Board participation list

Members

Steven Bograd (FUTURE SSC)
Jennifer Boldt (MONITOR)
Kyung-Il Chang (POC)
Chuanlin Huo (MEQ)
Elizabeth Logerwell (FIS)
Angelica Peña (BIO)
Hiroaki Saito (Science Board Vice-Chair; FUTURE SSC)
Igor Shevchenko (representing Russia)
Toru Suzuki (TCODE)
Thomas Therriault (Science Board Chair)

Representatives

Mitsutaku Makino (S-HD; Oct. 23)
Valery Detemmerman (CLIVAR; Oct. 18)
Emanuele Di Lorenzo (SG-SEES; Oct. 23)
Jacquelynne King (PICES/ISC SG-SCISC; Oct. 23)
Loh-Lee Low (NPAFC; Oct. 18)
Peter Kershaw (GESAMP; Oct. 18)
Phillip Mundy (SG-NPESR3; Oct. 23)
Mathew Baker (NPRB; Oct. 18)
Gerard DiNardo (ISC; Oct. 18)
Fangli Qiao (SCOR, POGO; Oct. 18)
Chi-lu Sun (ISC; Oct. 18)
Yi Xu (IMBER; Oct. 18)
Vladimir Ryabinin (IOC; Oct. 24)

PICES

Harold (Hal) Batchelder
Robin Brown (Oct. 18, 23)
Laura Richards (Oct. 18)
Alexander Bychkov (Oct. 18)

SB Endnote 2

Science Board meeting agenda

Sunday, October 18, 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 Review template for Committee reports to Science Board (Therriault, Batchelder)
- 4 Current and potential strategic collaborations with international organizations (Therriault, invited guests)
- 5 Review proposed changes in Rules of Procedure (All)

Friday, October 23, 2015 (14:00 – 18:00)

- 6 Review strategic collaboration frameworks
- 7 Mid-year Reports from expert groups reporting to Science Board (Therriault)
- 8 Update on PICES 25th Anniversary year (APC Chairman)
- 9 Election of Science Board Chair-elect (Therriault)

Saturday, October 24, 2015 (09:00 – 18:00)

- 10 Reports from Scientific and Technical Committees plus high priority requests (Committee Chairs)
- 11 Report from FUTURE SSC (Saito/Bograd)
- 12 Status of venue for PICES-2016, San Diego, USA (Secretariat)
- 13 Schedule for PICES-2016 and Inter-sessional Workshops (All)
- 14 Venue and dates for ISB-2016 (Therriault/Secretariat)
- 15 Updating PICES Strategic Plan (Therriault)
- 16 Update on PICES-sponsored Conferences/Symposia (All)
- 17 Update on capacity building/plan for PICES summer schools (Batchelder)
- 18 Status of PICES publications (Batchelder)
- 19 Other business

SB Endnote 3

Changes to the Rules of Procedure

Scientific Programs – Rule 16

- i. A Scientific Program is established by the Science Board, with the approval of the Council, to address major scientific questions of general interest to the Organization. A Scientific Program will typically place significant demands on the Organization for periods of up to a decade. The Program:
 - (i) shall have an organizational structure recommended by the Science Board to complete the work;
 - (ii) may include a Scientific Steering Committee reporting to the Science Board. Such a Scientific Steering Committee may, with the endorsement of the Science Board and approval by the Council, establish temporary expert groups to consider in greater detail, topics of importance to the Scientific Program to warrant continuing attention, but only when sufficient expertise or capacity is lacking with the existing structure of Scientific Committees and other expert group;
 - (iii) shall be supported by resources determined by the Organization;
 - (iv) will be disbanded at the discretion of the Science Board
- ii. Scientific Leadership – Rule 17:
 - (iv) for Sections, Co-Chairmen are selected from the membership by the Science Board for approval by the Council to serve for a term of three years, and shall be eligible for re-election for one consecutive term;
- iii. Scientific Committees –Rule 13(iii) - Sections:
 - (d) shall be responsible to and reviewed regularly (at least once every five years) by the parent Scientific Committee and members confirmed by the Contracting Parties at each review
- iv. Technical Committee – Rule 14:

Technical Committees are established by the Science Board, with the approval of the Council, as ongoing groups responsible to the Science Board to facilitate the technical and operational activities required to support the Organization’s general scientific aims. A Technical Committee:

 - (i) shall consist of not more than three members appointed by each Contracting Party;
 - (ii) may, with the endorsement of the Science Board and approval of the Council, include ex-officio members;
 - (iii) shall establish one Chairman according to Rule 17;
 - (iv) may, with endorsement of the Science Board and approval by the Council, establish ad hoc groups (Advisory Panel, Working Group) to facilitate the work of the Technical Committee.

*SB Endnote 4***Approved Topic Sessions and Workshops for PICES-2016****S1: Science Board Symposium: *25 Years of PICES: Celebrating the past, imagining the future***

Duration: ¾-day

Convenors: Thomas Therriault (SB), Angelica Peña (BIO), Elizabeth Logerwell (FIS), Chuanlin Huo (MEQ), Jennifer Boldt (MONITOR), Kyung-Il Chang (POC), Toru Suzuki (TCODE), Steven Bograd (FUTURE), Hiroaki Saito (SB, FUTURE), Igor Schevchenko (Russia)

Invited speakers: Philip Munday (Australia), Essam Yassin Mohammed (UK)

In its 25 years of existence PICES has achieved remarkable success in furthering our understanding of the North Pacific's natural and socioeconomic systems. Dedicated and tireless efforts of the many natural and social scientists from all its member countries have enabled us to understand basin-scale phenomena that we did not know about 25 years ago, such as regime shifts and their ecosystem impacts—from biogeochemistry, through phytoplankton production, to higher trophic levels including fisheries and coastal communities. Building on these foundational results, we now embark on the next 25 years of PICES that should lead to better observations, improved understanding of mechanisms of change, and ultimately better predictions of status and trends in North Pacific ecosystems. Forecasting the effects of natural and anthropogenic change, especially climate change, will allow adaptation based on the ecological, societal, and economic resilience of our coasts and oceans. Increasing resilience is a key societal challenge and will only be possible with increased scientific knowledge of the North Pacific and intergovernmental collaborations like those developed within PICES.

The founders of PICES saw the vastness of the North Pacific Ocean not as something that separates us, but rather as a factor that unites us. They knew that to unravel the inner workings of the North Pacific, PICES member countries would need to work together. To recognize the leadership that set us on this path, we encourage contributions on how present day problems are being addressed with the science and tools that we developed over the past 25 years. Looking forward, we encourage visionary papers on what challenges might be expected over the next 25 years. The list of past and future topics of interest in PICES is long, and includes basin- and regional-scale issues such as coastal ecosystem stressors (eutrophication, hypoxia, pollution, ocean acidification), loss or changes of marine biodiversity, changing productivity and species distributions in response to climate change, developing outlooks or forecasts of future ocean ecosystems, and examining climate change impacts on ocean ecosystems and human society.

S2 *Early life history stages as indicators and predictors of climate variability and ecosystem change*

Sponsoring Committees: BIO/TCODE/FIS

Duration: ¾-day

Convenors: Richard Brodeur (USA), Tony Koslow (USA), Ian Perry (Canada), Moto Takahashi (Japan)

Invited speakers: Nicholas Bond (USA), Emanuele Di Lorenzo (USA)

As management strategies become more ecosystem-based and climate-driven, there is a need for more information on the influence of oceanographic variability and climate change in regulating fisheries resources and on marine communities more generally. Ichthyoplankton abundance provides proxies for adult spawning stock biomass, so insight into changing fish communities can be obtained from ichthyoplankton time series. The early life stages of fish and invertebrates may also be critical in determining year class success and subsequent recruitment to fisheries. This session will examine changes in the abundance, distribution, and ecological relationships of early life stages (eggs to juveniles) of fish and invertebrate taxa in relation to climate. Studies that use these stages as indicators of ecosystem stress or long-term variability in relation to the ocean environment are encouraged, as are studies that use them as an indicator of future adult recruitment. Examples of the uses of ichthyoplankton or juvenile surveys in ocean observation programs and ecosystem assessment or management of stocks and in forecasting future trends in fisheries and fish communities are

highly encouraged. The conveners especially seek presentations that examine the role early life stages may play in assessing ecosystem structure and dynamics and the vulnerability of ecosystems to climate change.

S3 *Source, transport and fate of hydrocarbons in the marine environment*

Sponsoring Committee: MEQ

Co-sponsored by GESAMP

Duration: ¾-day

Convenors: Geraldo Gold-Bouchot (GESAMP), Hideaki Maki (Japan), Peter S. Ross (Canada), Staci Simonich (USA)

Invited speakers: Kenneth Lee (Australia)

This session will focus on the behaviour, fate and effects of hydrocarbons in the marine environment. While it is expected that some examples of oil spills (catastrophic release of hydrocarbons) will be examined, most discussions will focus on chronic, low level releases from multiple sources that are far more evasive and widespread (e.g., ballast discharges, fuel release, harbour contamination). Following two successful sets of activities at PICES 2014 and 2015 ('Microplastics' and 'Indicators of ocean pollution'), the WG 31 (Emerging Topics Marine Pollution; ETMP) proposes to organize, convene and facilitate the third in its planned series of Special Sessions. The topic for 2016 is to comprehensively address the science of 'Source, transport and fate of hydrocarbons in the marine environment'. This is timely for PICES as it follows up on the 2015 workshop on short term response workshop ("Marine Environment Emergencies: Detection, monitoring and response"). This topic is also timely since oil and gas exploration, development and transport is taking place to varying degrees around the North Pacific Ocean. Thousands of different hydrocarbon compounds are found in fuels, each with different physical and chemical properties. The resulting complex interactions between these compounds and components of the marine environment highlight the importance of a multidisciplinary and up-to-date sharing of knowledge. This knowledge will provide insight into the consequent risks to biota, the design of monitoring programs, the choice of analytical methods, and management responses following leaks or spills. This Special Topic Session will feature invited speakers from several national organizations. A Special Issue in a scientific journal will arise from the presentations on "Source, transport and fate of hydrocarbons in the North Pacific Ocean". Presenters and others will be invited to submit a manuscript on the topic, with the goal of the resulting compendium being to become a useful reference work for scientists and managers.

S4 *Climate variability, climate change and the reproductive ecology of marine populations*

Sponsoring Committee: FIS

Duration: ¾-day

Convenors: John Field (USA), Sukgeun Jung (Korea), Sandi Neidetcher (USA), Michio Yoneda (Japan)

Invited speakers: Olav Kjesbu (Norway)

Ongoing efforts to understand the consequences of both climate variability and climate change on marine populations have focused on indirect metrics of productivity, primarily recruitment, growth, distribution. The question of how the reproductive ecology, particularly reproductive output, of marine fishes, invertebrates, mammals and other organisms may be altered by a changing climate is difficult to address. Fully understanding all aspects of the reproductive ecology of populations when developing and parameterizing stock assessment and other population models is key to accurately assessing reproductive output and potential, as those in turn relate to productivity and both static and dynamic views of carrying capacity. The appreciation for the significance of age and size dependent factors that relate to reproductive potential continues grow, particularly for many long lived and slow growing species for which factors such as size dependent fecundity, skipped spawning, multiple brooding and other maternal effects continuing to contribute to a greater appreciation for the need to understand reproductive complexity. Higher turnover species, particularly indeterminate spawners, are presumably more sensitive still to climate variability and change. Future climate change, with expected impacts on means, modes of variability, and the phenology of ocean conditions, will interact with the effects of fishing to alter reproductive potential in complex and unanticipated ways. This

Symposium will seek contributions that focus on the mechanisms and consequences of environmental variability and potential change on the reproductive potential of marine fishes, or model and simulation studies that evaluate the likely or plausible consequences of such changing ocean conditions, with the ultimate goal to understand possible future changes to the carrying capacity and productivity of marine populations.

S5 *Understanding our changing oceans through species distributions and habitat models based on remotely sensed data*

Sponsoring Committees: BIO/MONITOR/MEQ

Duration: ¾-day

Convenors: Patrick O'Hara (Canada), Elliott Hazen (USA), Sei-Ichi Saitoh (Japan), Yutaka Watanuki (Japan)

Invited speakers: Robert Suryan (USA)

Determining marine animal distributions directly through at-sea observations or tracking is costly and logistically challenging. Moreover, even with limitless time and resources, information is limited because many species disperse over long distances including trans-hemispheric migrants. Species Distribution Models (SDMs) provide a tool to estimate present distributions and to project into the future (assuming species-environment relationships remain strong), but these models require substantial environmental data to accurately predict distribution and change. Increasingly, SDM approaches rely on remotely-sensed satellite data as indices of environmental conditions, particularly as proxies for primary and possibly secondary productivity. Satellite datasets are inexpensive to use, widely served, well-documented (*i.e.*, scientifically defensible), and globally synoptic, allowing for easy spatio-temporal comparisons. However, satellite-borne sensors measure characteristics of the ocean at the surface while marine organisms respond to spatial and temporal features of the ocean at depth, which may require more complex approaches. In this session, we will investigate the opportunities and challenges of using satellite-based habitat models and ways we can advance SDMs for a better understanding our changing oceans and for improving management. In particular, we solicit papers exploring the benefits and tradeoffs of using satellite-borne data to detect mechanisms of distributional and range shifts. This session will provide the PICES community and the FUTURE program with a better sense of the quality of fisheries, seabird, and marine mammal SDM under development in relation to climate change in the North Pacific.

S6 *What factors make or break trophic linkages?*

Sponsoring Committees: BIO/MONITOR/TCODE

Duration: ¾-day

Convenors: Elliott L. Hazen (USA), Jameal Samhuri (USA), Shin-Ichi Ito (Japan), Jennifer Boldt (Canada)

Invited speakers: Kenneth Rose (USA)

Mechanistic linkages from physics to phytoplankton to zooplankton to fish remain central to understanding climate forcing on marine ecosystems. Thus, it will be useful to understand how ecosystem linkages and species distribution are influenced by ocean features and how these linkages translate through the food web. Specifically, what information can be gained from moving beyond a single linkage (*e.g.*, phytoplankton to zooplankton) towards a comparison across trophic levels in three very different North Pacific ecosystems. Examples of such factors may include but are not limited to broad scale anomalies (*e.g.*, the blob, ENSO events, Kuroshio / Oyashio dynamics), temporal mismatches among physical processes, prey, and predators (match / mismatch hypothesis), and population fluctuations (*e.g.*, lipid poor vs. lipid rich zooplankton). We have suggested (but are not limited to) three study areas, the California Current, the Kuroshio Current, and the Bering Sea to examine linkages from physics to phytoplankton, phytoplankton to zooplankton, zooplankton to fish, birds and mammals, and fish to birds and mammals. By looking at multiple ecosystems and trends and anomalies across multiple trophic linkages, we can better understand how climate variability and anthropogenic forcing may cascade through these marine ecosystems. We propose a topic session that will involve participation from multiple PICES committees and will focus on physical forcing and trophic linkages from physics to top predators. Specifically, we request presentations on topics that (a) examine how changes in physical oceanography lead to long term trends or anomalous responses in primary production, zooplankton,

fish, and top predators, (b) examine how trophic relationships may respond to physical forcing and changes in species abundance and spatial distribution, and (c) test for threshold responses (non-linearity) across trophic levels to changes in physical oceanography and the population dynamics of other species (competitors, prey, and predators).

S7 *New stage of ocean acidification studies: responses of oceanic ecosystem including fisheries resources*

Sponsoring Committees: POC/TCODE/MEQ

Co-sponsored by ICES

Duration: ¾-day

Convenors: Tsuneo Ono (Japan), Jun Kita (Japan), Debby Ianson (Canada)

Invited speakers: TBD

Considering over 20 years of progress on ocean acidification studies, our knowledge on biological responses in response to acidified ocean environments has accumulated to some extent. WGII report of IPCC AR5 illustrates a sensitivity matrix of ocean life to acidification among a wide range of species and $p\text{CO}_2$ levels, showing our present terminus of this scientific topic. However, our progress simultaneously awakes various new questions, such as the response of biology to temporally-varied $p\text{CO}_2$, inter-species interactions under acidified environments, and biological adaptation. Also, we have gradually come to realize the existence of ocean acidification by eutrophication, as well as by anthropogenic CO_2 , in coastal regions. Emergence of these new questions reveals that we are now moving into a new stage of understanding on the ocean acidification problem, in which we may be able to make more realistic and quantitative predictions about future biological/ecological responses to an acidified ocean, and socio-economic response of humans to changes in ocean conditions. In this session we recruit diverse studies on biological/ecological responses to ocean acidification, including fisheries resources, both in coastal and open ocean environments. We particularly welcome reports from advanced issues on this field, including the response of biology subjected to temporally-varied $p\text{CO}_2$, inter-species interaction under acidified environment, and biological adaptation.

S8 *The effect of marine debris caused by the Great Tsunami of 2011*

Sponsoring Committees: MoE/MEQ/TCODE

Co-sponsored by MoE ADRIFT project

Duration: ¾-day

Convenors: Cathryn Clarke Murray (Canada), Nancy Wallace (USA), Hideaki Maki (Japan), Thomas Therriault (Canada)

Invited speakers: James Carlton (USA)

The Great Tsunami of 2011 washed an estimated five million tons of debris into the Pacific Ocean. The Government of Japan estimates that 70% of that debris sank close to shore, leaving 1.5 million tons floating in the North Pacific with the potential to arrive on North American and Hawaiian coastlines. While shorelines worldwide already endure marine debris from terrestrial and aquatic sources there may be additional impacts from the increase in abundance and differing debris types associated with the tsunami. Aside from the impacts of additional marine debris itself, there is the possibility of debris carrying coastal Japanese species to new habitats. An event of this magnitude offers unique opportunities to investigate the transport of non-native species, oceanographic processes and impacts of marine debris in general. With Working Group 21 on Non-indigenous Aquatic Species completed in 2012 and Working Group 31 on Emerging Topics in Marine Pollution formed in 2013, PICES members are well-placed to contribute to research on the potential impacts of Japanese tsunami marine debris. Funded by the Ministry of Environment of Japan, research on the effect of tsunami marine debris is ongoing under the PICES project ADRIFT (Assessing the Debris-Related Impact of Tsunami). Session presentations may cover the surveillance and monitoring of tsunami-generated marine debris, modeling the movement of marine debris in the North Pacific, the social impacts of tsunami debris and the risk from potentially invasive species to coastal ecosystems. The convenors especially seek presentations that address the impacts of tsunami debris on coastal communities and ecosystems.

S9 *Resilience, transitions and adaptation in marine ecosystems under a changing climate*

Sponsoring Committees: FIS/TCODE

Duration: ½-day

Convenors: Franz Mueter (USA), Ken Drinkwater (Norway), Sei-Ichi Saitoh (Japan), Emanuele Di Lorenzo (USA)

Invited speakers: Benjamin Planque (Norway)

Marine ecosystems respond to climate variability and anthropogenic forcing at a variety of spatial and temporal scales. While there is a growing literature on the capacity of social-ecological systems to cope with climate change, the resilience of physical and ecological marine systems to climate change remains poorly understood. In the context of ongoing climate change, resilience refers to the capacity of a system to absorb disturbances and to reorganize so as to maintain its essential structure, function, identity and feedbacks. This concept presumes the existence of alternative stable states or regimes that are separated by reversible transitions. The concept also presumes the possibility of thresholds or tipping points that may be irreversible and are associated with the loss of essential structure and function. In an ecological context, tipping points occur if key organisms are no longer able to adapt to changes in their environment. This session explores the concept of resilience (sometimes also called stability) in both physical ocean systems and in the associated ecological systems from plankton through fish. We invite theoretical studies and applied case studies that help refine our understanding of resilience in a marine ecosystem context, provide practical approaches to measuring resilience, define “essential structure and function” of marine ecosystems, identify thresholds beyond which essential structure and function may be lost, examine ways in which resilience of marine ecological systems can be enhanced, and explore the phenotypic and evolutionary adaptive capacity of marine organisms to deal with gradual changes and transitions. Our hope is that this session will ultimately contribute to the development of more plausible scenarios for future physical and biological changes in marine ecosystems, which are needed to facilitate climate change adaptation in socio-economic systems that depend on marine resources.

S10 *The response of marine ecosystems to natural and anthropogenic forcing: past, present, and future*

Sponsoring Committee: FUTURE

Duration: ½-day

Convenors: Steven Bograd (USA), Hiroaki Saito (Japan), Jacquelynne King (Canada), Sukyung Kang (Korea)

Invited speakers: TBD

Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems’ (FUTURE) is an integrative Scientific Program undertaken by the member nations and affiliates of PICES to understand how marine ecosystems in the North Pacific respond to climate change and human activities, to forecast ecosystem status based on a contemporary understanding of how nature functions, and to communicate new insights to its members, governments, stakeholders and the public. One of the principal aims of FUTURE is to improve our understanding of how marine ecosystems respond to natural and anthropogenic forcing, and how marine ecosystems will change in the future. In this session, we will (a) review our state of knowledge on how climate variability and change affect the processes underlying ecosystem structure and function, (b) identify critical gaps in our understanding, and (c) provide an assessment of our capacity to forecast climate-driven marine ecosystem changes. Advances in the understanding of climate impacts on marine ecosystems, and a broad dissemination of this information, is essential for preserving a healthy and sustainable North Pacific for FUTURE generations.

S11 *Advances in understanding and modelling of physical processes in the North Pacific in the past 25 years of PICES and future directions*

Sponsoring Committees: POC

Duration: ¾-day

Convenors: Shin-ichi Ito (Japan), Kyung-Il Chang (Korea), Steven Bograd (USA)

Invited speakers: Jerome Fiechter (USA)

Since its birth in 1992, the Physical Oceanography and Climate Committee (POC) have promoted and coordinated physical and chemical oceanography, atmospheric science, and interdisciplinary research in the northern North Pacific. Impacts of climate variability and physical dynamics in coastal, shelf and open ocean areas are considered with emphasis on processes that are related to living marine resources and environmental quality. POC addressed the following topics in order to achieve the goals of PICES through its expert groups: ocean circulation, the Okhotsk Sea and the Oyashio region, modelling physical processes, carbon cycling, connection between ocean variability and climate change, exchange between continental shelf waters and the nearby ocean, and future climate projections in regional-basis. POC can continue to contribute to PICES and PICES scientists by deepening our understanding of physical and chemical processes in ocean and climate in the North Pacific and also by providing leadership in identifying key issues associated with a central issue of PICES, understanding and projecting the long-term variability of the North Pacific ecosystems. The session will review the advancement of processes that POC has identified and consider new challenges that POC should target to improve understanding of marine ecosystems in the North Pacific.

S12 *Causes and consequences of 25 years of variability in ocean conditions on the ecosystems of the eastern North Pacific*

Sponsoring Committees: MONITOR/BIO/TCODE

Duration: ¾-day

Convenors: William Peterson (USA) Jack Barth (USA), Sanae Chiba (Japan), Yury Zuenko (Russia)

Invited speakers: Emanuele Di Lorenzo (USA), Arthur Miller (USA)

Climate change is upon us in terms of both slow chronic change and increased physical and ecosystem variability. Slow increases in SST, ice melting, sea level, hypoxia, ocean acidification and northward shifts in species are cause for concern, however for many scientists, climate variability at the seasonal-to-interannual time scale is of greater interest. This is especially true for the North Pacific where PICES scientists have been leaders in showing how increased variability in physical forcing at the basin scale (*e.g.*, the PDO, NPGO and ENSO) affects productivity of marine ecosystems. Indeed, recognition of the impact of physical forcing at the basin scale on local ecosystems was among the earlier focal points of PICES research and clearly opened our eyes to the need to look at the physical forcing across the entire basin, not just local drivers of ecosystem variability. In the 25 years since PICES was established, many unusual oceanographic events have occurred in the throughout North Pacific that have affected the physics, plankton and fisheries: change in the PDO from 20-30 year cycles to the 5-10 year cycles seen at present, the extended “warm ocean” period of 1993-1998 that resulted in the listing of many salmon species as threatened or endangered, the really big El Niño events of 1997-98 and 2015-16, the 2002 sub-Arctic intrusion, the smaller 2003-2005 and 2009-10 El Niño events, the cold North Pacific in 2008, and of course the warm Blob in 2014. We seek papers that analyze and synthesize regional variations in recent climate variability and ecosystem response in coastal waters off Asia as well as the Sea of Okhotsk, Bering Sea, and the major current systems: Kuroshio, Oyashio, North Pacific and California Currents.

S13 *Understanding the changing coastal ocean: advances and challenges in multi-parameter observations*

Sponsoring Committees: MONITOR/TCODE

Duration: ¾-day

Convenors: Vyacheslav Lobanov (Russia), Matthew Baker (USA), Sung Yong Kim (Korea), John Barth (USA), Daisuke Ambe (Japan)

Invited speakers: TBD

Major changes in coastal ocean ecosystems occur across the North Pacific and its marginal seas on a variety of time scales, from weeks to years. Examples include warming events associated with low (*e.g.*, El Niño) and high latitude (“warm blob”) forcing, and coastal hypoxia influenced by both natural and anthropogenic forcing. These major changes involve physical, chemical, and biological processes and their interaction. Sustained, high-quality, multi-parameter coastal observations are required to discern changes from normal seasonal patterns and to detect long-term trends. We invite contributions that address the role of coastal ocean

observations in advancing our understanding of these major physical-biological changes in North Pacific coastal oceans. These may include techniques for sustaining multi-sensor time series and the use of new measurement platforms, as well as new measurements and understanding of regional interactions and coastal-deep ocean interactions at various areas of PICES region. Subsequent discussion will facilitate an exchange on how major regional phenomena (e.g., ENSO, anomalous warming) are expressed at localized scales, best practices and new approaches in observational techniques, and regional comparisons.

W1 *Acidification of the North Pacific Ocean: A basin-wide assessment*

Duration: 1-day

Convenors: James Christian (Canada), Tsuneo Ono (Japan)

Invited speakers: TBD

Ocean acidification has been proceeding for a century, at an accelerating rate, and its impacts are beginning to be felt in many corners of the North Pacific. This workshop will bring together scientists from all of the PICES countries to synthesize our observations and projections of acidification processes and impacts in our respective countries' waters and adjacent international waters. This workshop is the culmination of a two-year long process of collation of relevant information, and synthesis of data collected in each of the countries of the North Pacific basin. The workshop proceedings will form the basis for subsequent assessments, with improved understanding of which ocean regions are most vulnerable to acidification impacts, and how additional resources might best be deployed to predict or detect changes likely to produce significant impacts.

W2 *Conditions promoting extreme Pseudo-nitzschia events in the eastern Pacific but not the western Pacific*

Duration: 1-day

Convenors: Vera Trainer (USA), Polina A. Kameneva (Russia)

Invited speakers: TBD

There is clear evidence of contrasting occurrence and impacts of the toxin-producing diatom, *Pseudo-nitzschia*, between the western and eastern Pacific. In 2015, a massive bloom spanning from California to Alaska, had major impacts on the shellfish industry economic viability and on wildlife health. In contrast, *Pseudo-nitzschia* are not highly toxic and do not cause economic losses in the western Pacific. These data provide a unique opportunity for east-west Pacific comparisons to identify and rank those environmental factors that promote harmful algal bloom (HAB) success at different times. The recent PICES-funded workshop on HABs and Climate Change emphasized the importance of studying such extreme events to enhance our understanding of climate impacts. This workshop will focus on *Pseudo-nitzschia*, a diatom that historically has had massive economic impacts in the eastern PICES member countries, with low or no impacts in the western Pacific. 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 in the morning, and develop an outline for manuscript preparation in the afternoon, including writing assignments and submission deadlines. The manuscript will be targeted for an appropriate peer-reviewed journal.

W3 *Distributions of habitat-forming coral and sponge assemblages in the North Pacific Ocean and factors influencing their distributions*

Duration: 2-day

Convenors: Kwang-Sik Choi (Korea), Janelle Curtis (Canada), Masashi Kiyota (Japan), Chris Rooper (USA)

Invited speakers: TBD

Changes in the marine environment influence global and regional distribution patterns of marine organisms including corals and sponges in shallow, mesophotic, and deepwater ecosystems. The biogenic habitats formed by these organisms support a broad range of biodiversity, and provide critical habitats for some socio-

economically important fishes and invertebrates that attract commercial fishing and other anthropogenic activities. The aim of this workshop is to improve our understanding of factors influencing the distributions of corals and sponges in the North Pacific Ocean, improve habitat models predicting their distribution, and predict how their distributions are likely to shift in response to natural and anthropogenic forcing, including climate change. In preparation for the workshop, WG 32 members and collaborators will compile new data on corals and glass sponges in the North Pacific Ocean as well as existing environmental data to improve model prediction and interpretation based on a multi-model approach. Specifically, deep-sea coral habitat suitability models developed using records from all ocean basins will be improved with the addition of coral location data from the North Pacific Ocean. New habitat suitability models will be developed for deep-sea sponges and multi-model comparisons will be made for both coral and sponge taxa. Workshop participants will be invited to discuss, compare, and evaluate the influence of predictor variable data, and different modelling approaches on results. This process will help identify potential ecological and physiological mechanisms influencing their distributions and provide insight into the potential for changes in their distribution under different climate change scenarios. A novel contribution anticipated from this workshop will be the first habitat predictions for glass sponges (Hexactinellida) at a basin-wide scale in the North Pacific Ocean. Workshop participants will synthesize lessons to be learned from the modelling exercise, future tasks to further improve predictive accuracy, and possible applications for supporting marine spatial planning processes.

W4 *Acidification of the North Pacific Ocean: A basin-wide assessment*

Duration: 1-day

Co-sponsored by ISC

Convenors: Gerard DiNardo (USA), Chi-lu Sun (Chinese Taipei)

Invited speakers: TBD

This workshop will be convened by the proposed Joint PICES-ISC Working Group on Oceanographic Conditions and the Distribution and Productivity of Highly Migratory Fish, as identified in the Working Group's Terms of Reference (first workshop-PICES 2016 Annual Meeting in USA). The distribution and productivity of many commercial pelagic fish populations in the North Pacific are determined by large-scale oceanographic processes and climate variability. One hypothesis is that highly migratory pelagic species, such as albacore (*Thunnus alalungus*), have environmental thresholds and preferences that drive their distribution and productivity. This workshop will focus on statistical modeling approaches that link spatially explicit environmental data (e.g., satellite derived SST) to distributional fish data (e.g., commercial catch per unit effort data, CPUE) for highly migratory species. Group discussion will help facilitate identification by the Joint Working Group of a suitable methodology to use to develop habitat models of albacore and to provide possible scenarios for future fishery CPUE 'hot spots'. Papers that deal with common difficulties in relating spatially explicit data to fish distributional data (e.g., zero-inflated data, mismatch between spatial or temporal resolution of oceanographic to distributional datasets), are also encouraged.

W5 *Phase 1: Modeling effects of climate change on fish and fisheries [later renamed Modeling effects of climate change on fish and fisheries]*

Duration: 1-day

Co-sponsored by ICES

Convenors: Anne B. Hollowed (USA), Shin-ichi Ito (Japan)

Invited speakers: TBD

S-CCME convened a workshop in August 2015 to discuss the details needed to establish an international effort to project the response of fish and fisheries to different climate change scenarios and fisheries management strategies. Several regional modeling teams were identified that would form the core of the S-CCME projection modeling research effort. S-CCME members were tasked with working with modelers within each of the modeling nodes to initiate projections in 2016. This workshop will provide an opportunity for S-CCME investigators and collaborating modelers in each of the regional nodes to meet to discuss the current status of their regional integrated modeling teams. Specific goals of this workshop are to: a) identify analytical

approaches that are being used in each of the regional nodes; b) review methods for comparing projections derived from different suites of single species climate enhanced projection models, multispecies climate enhanced projection models, full food web (*e.g.*, EcoSIM), and dynamic spatially explicit ecosystem models; and c) preliminary inspection of the implications of future climate change on commercially important marine fish stocks in the northern hemisphere. Results will provide a critical opportunity for S-CCME scientists to coordinate their regional modeling efforts. S-CCME members plan to use the scenarios derived from the regional modeling teams to provide climate-informed options for mitigation of, and management of harvested resources under a changing climate. The format will allow for breakout groups for intra-disciplinary discussions and plenary interdisciplinary research. Projected outcomes of these scenarios using population dynamics models of different approaches and complexity will allow analysts to compare and report on the relationship between model complexity, efficiency, and the computational costs of increased ecological realism in models. Expected products include a meeting report.

W6 *Consumption of North Pacific forage species by marine birds and mammals*

Duration: 1-day

Convenors: Andrew Trites (Canada), Elliott Hazen (USA), Tsutomu Tamura (Japan), Yutaka Watanuki (Japan)

Invited speakers: TBD

Marine birds and mammals (MBMs) are known to consume substantial amounts of prey species, and can impact their abundance and sometimes induce trophic cascades. Therefore, MBMs can have large impacts on forage fish populations, the broader ecosystem, and can compete with other top-predators and fisheries. Quantifying the effects of MBMs on marine ecosystem requires detailed knowledge of diets and abundance of prey species consumed. Such data are also needed to examine the influence of climate variability and change on trophic linkages in the North Pacific, as well as to understand how changes in prey quantity, quality, composition and distribution affect the abundance and distribution of marine birds and mammals. Our proposed workshop is a key priority of S-MBM's new program (2015-2019) to assess the climate and trophic ecology of marine birds and mammals. We will invite modelers (movement and energetics of animals) and holders of dietary and distribution data for approximately ten of the most intensively studied species of seabirds and marine mammals in the North Pacific to 1) give succinct reviews and overviews of modelling techniques and the temporal and spatial data sets held by their agencies or collaborators (during the morning). Breakout groups in the afternoon will enable affirmation of species and regions of interest, discuss limitations of the data sets, identify alternative sources of data and information, and discuss synergies among the diet data and the movement and bioenergetic models. The conveners will meet the following morning to prepare the workshop report. Holding this workshop is an important first step in compiling and integrating the dietary and movement datasets we are seeking, and ensuring that the models that will be developed through the S-MBM are well thought through and have a high probability of success.

W7 *Delivering quality multi-parameter data from the coastal ocean*

Duration: 1-day

Convenors: Akash Sastri (Canada), Chuanxi Xing (China)

Invited speakers: TBD

This workshop is a priority for the PICES Advisory Panel on North Pacific Coastal Ocean Observing Systems (AP-NPCOOS). We propose a 1-day workshop of talks and discussion toward the goal of developing 'best practices' for ensuring high-quality sensor observations in coastal marine ecosystems in the North Pacific. The coastal ocean is a region with important fisheries and other ecosystem benefits, while at the same time being subject to human pressures. In order to assess coastal marine ecosystem status and changes, including any long-term trends, high-quality observations of a variety of physical, chemical and biological variables must be made and sustained. Sensor-based observations are critical to coastal observation programs and are used as part of ship-based sampling programs, fixed-point platforms (*i.e.*, long-term mooring and cabled deployments),

mobile platforms (*i.e.*, gliders, ferries), and are necessary to ground-truth remote sensing observations (*i.e.*, turbidity, chlorophyll and CDOM). The quality of these observations depends on sensor choice, pre-deployment sensor preparation and calibration, platform and sensor deployment, post-deployment sensor calibration and data processing and dissemination. We invite contributions that deal with all aspects of delivering high-quality data from the coastal ocean, in particular techniques for measuring biogeochemical parameters (oxygen, nutrients, chlorophyll) and mitigating biofouling and sensor drift.

W8 *Mesoscale and submesoscale processes in the North Pacific: History and new challenges*

Duration: 1-day

Convenors: Kyung-Il Chang (Korea), Hiromichi Ueno (Japan), Annalisa Bracco (USA)

Invited speakers: TBD

Oceanic mesoscale flow fields like eddies, upwelling, and fronts at spatial scales of ~10–100 km have been extensively studied for their dynamics and various contributions to marine ecosystems. Motions on the submesoscale (~1 km) and their impacts on the marine ecosystem, however, are less well known. Submesoscale features are often found along the periphery of mesoscale eddies and involve larger vertical fluxes than those associated with mesoscale eddies which then have substantial effects on the phytoplankton productivity. Submesoscale processes also interact with mesoscale processes. Understanding the fundamental physics of these processes, their influence on lateral and vertical fluxes, and how they influence the functioning of the marine ecosystem is necessary in order to assess likely changes and shifts to the system under a changing climate. Faced with these important issues, however, observational skills, theoretical understandings, and modeling techniques are still immature. This workshop provides a forum to discuss the physics and biology of the ocean at the meso- and sub-mesoscales based on observations and modeling and to clarify our challenges in the next decades. Ideas and conclusions from this workshop may be incorporated into a new PICES working group.

W9 *The role of the northern Bering Sea in modulating the Arctic environments: Towards international interdisciplinary efforts*

Duration: 1-day

Convenors: Lisa Eisner (USA), Matthew Baker (USA), Kirill Kivva (Russia)

Invited speakers: TBD

Despite the fact that the Bering Sea is outside the Arctic Ocean, in many ways it behaves as an Arctic sea. The northern Bering Sea influences the state of the southern Chukchi Sea ecosystem as well as the functioning of many other Arctic regions, including the central Arctic. The Pacific Arctic Region has received great attention during the past few years:

- **R**U**S**sian-American Long-term Census of the Arctic (RUSALCA) annual cruises and publications
- Adaptation Actions for the Changing Arctic AMAP Report part C (in preparation)
- The Pacific Arctic Region synthesis (Grebmeier and Maslowski, Eds., 2014).

Yet, the scientific efforts in the Northern Bering – Southern Chukchi Sea region are conducted mostly at the national level, and would benefit from joint multinational coordination.

The goal of this workshop is to bring together researchers representing multiple national and international institutions and multiple scientific disciplines (*e.g.*, oceanography, plankton, fisheries) to share data, share knowledge, build collaborations and conduct outreach. We invite scientists interested in 1) physical oceanography and chemical fluxes, 2) plankton distribution and ecology, 3) fisheries and ecosystem dynamics, and 4) modeling efforts across the northern Bering Sea region. Talks will be followed by discussion periods. Depending on the success of the proposed workshop, and the interests of the participants, a PICES Study Group may be established to work on data sharing and coordination at the international level at future meetings (*e.g.*, a 2nd workshop is anticipated for the fall 2017 Annual Meeting in Vladivostok, Russia).

Workshop products

Potential participants are encouraged to provide metadata describing past and present research efforts and to submit applicable Ecological Time Series Observations (ETSOs) presented or discussed during the workshop to the North Pacific Ecosystem Status Report. Results from this workshop will also be presented at the Alaska Marine Science Symposium in Anchorage AK, January 2017, and summarized in an article in the PICES Press semi-annual newsletter.

W10 *Distribution and risk analysis of radionuclides in the North Pacific*

Duration: 1-day

Convenors: Yusheng Zhang (China), Kathryn A. Higley (USA)

Invited speakers: TBD

The Fukushima Dai-ichi Nuclear Power Plant (FDNPP) accident resulted in a large pulse of radioactive contaminants being released into the North Pacific. While radiation is recognized as a potential stressor in environmental systems, this workshop will consider the data collected to date to determine if the radionuclides released have had significant impacts on ecosystems within the North Pacific. Participants will present and discuss radionuclide transport and fate, and any observed impacts from the FDNPP radionuclides on the marine ecosystem in the North Pacific. Participants will be encouraged to exchange information on new techniques and methodologies for monitoring environmental radioactivity and assessing the effects of radionuclides. Discussions on information gaps and research priorities in monitoring and assessment will also be conducted. The workshop organizers will invite other relevant international organizations (such as SCOR, ICRP/IAEA) as co-sponsors and invited speakers to share their reports on research and progress with regard to the monitoring and assessment on the marine environmental radioactivity in the North Pacific.