

## Report of the Section on *Climate Change Effects on Marine Ecosystems*

The meeting of the Section on *Climate Change Effects on Marine Ecosystems* (S-CCME) was held from 14:00 to 18:00 h on October 18, 2014 in Yeosu, Korea. S-CCME Co-Chairman, Dr. Suam Kim, welcomed all participants (*S-CCME Endnote 1*). Each of the workshop attendees introduced himself/herself and Dr. Kim reviewed the agenda (*S-CCME Endnote 2*). One presenter was absent (Dr. Matthew Baker, representing the North Pacific Research Board, under agenda item Arctic Opportunities), and this agenda item was deleted. No other changes/additions were offered and the agenda was adopted.

### AGENDA ITEM 3

#### Activity report for 2014

##### *Review of S-CCME and highlights of PICES FUTURE OSM*

Dr. Kim reviewed S-CCME's objectives, membership, and 2014 calendar. Summaries were provided for the April 2014 FUTURE Open Science Meeting's (Kohala Coast, USA, April 15–18, 2014) Theme Session S7 on "[Strategies for ecosystem management in a changing climate](#)" (Convenors: Manual Barange, Anne Hollowed, Suam Kim) and Workshop W3 on "[Climate change and ecosystem-based management of living marine resources: Appraising and advancing key modelling tools](#)" (Convenors: Timothy Essington, Anne Hollowed, Myron Peck). PICES-2014 Workshop W1 on "*Dynamics of pelagic fish in the North Pacific under climate change*" (co-sponsored by ISC) and Topic Session S7 on "*Recent assessments of climate change impacts on marine ecosystems*" was also reviewed.

Dr. Cisco Werner provided a review of Workshop W4 on "[Ecosystem projection model inter-comparison and assessment of climate change impacts on global fish and fisheries](#)" held at the April 2014 FUTURE Open Science Meeting. With the rationale that a global network of models is needed for a world-wide synthesis of climate change effects on marine ecosystems and the global food supply, W4 reviewed the current state of climate and ecosystem models for particular regions of the world's oceans and there was a discussion of inter- and intra-region comparisons.

Dr. Kim reviewed the results of Workshop W1 "*Dynamics of pelagic fish in the North Pacific under climate change*" held in Yeosu. With the goal of establishing a joint ISC-PICES cooperative science plan to enhance understanding of pelagic ecosystems and advance fishery stock assessment models, participants of W1 recommended the formation of a one-year Study Group to: improve the understanding of the science activities of each organization; identify collaborations within PICES scientific committees and expert groups that will complement the proposed Study Group and be consistent with FUTURE; identify areas of common interest; and, develop a framework for cooperation between ISC and PICES that lists categories of joint activities and the rationale for each, including the benefits to each organization from the joint activity.

##### *Arctic opportunities*

Dr. Kenneth Drinkwater reviewed activities associated with Arctic systems. He introduced the U.S.-Norwegian NUCCME (Norway-U.S. Climate Change and Marine Ecosystems) collaborative activity. The [NUCCME Workshop](#) was the third in a series of studies held in Ulvik, Norway, May 5–9, 2014, in conjunction with the CLIFFIMA network (*CLimate Impact on Fish, Fishery Industry and Management in the Nordic Seas*). S-CCME members Drs. Drinkwater, Svein Sundby, and Kirstin Holsman attended. It was funded by the Research Council of Norway and focused on the impacts of climate change. A pre-proposal has been submitted for a Nordic Center of Excellence under the call for *Responsible Development of the Arctic: Opportunities and Challenges – Pathways to Action*. Dr. Drinkwater received funding to develop a multi-investigator project entitled "[Arctic Integrated Research on Climate Effects in Marine Regions](#)" (AIM) which will focus on fish resources and the Arctic's underlying marine ecosystem. ESSAS, under the lead of Dr. Sei-ichi Saitoh (Japan), and including scientists from Japan, the U.S. and Norway, submitted a proposal to the

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Belmont Forum entitled “*Resilience and adaptive capacity of Arctic marine systems under a changing climate*”. Among the activities are to synthesize information on: how Arctic fish populations and their prey may respond and adapt to multiple environmental stressors, comparing and contrasting the impacts in the Atlantic and Pacific sectors of the Arctic, and the resilience and adaptive capacity of fish, fisheries, other living resources, resource-dependent communities, and management institutions to future climate change.

### *Highlights of ICES 2014*

Dr. Jake Rice provided a brief [summary](#) of S-CCME SICCOM Open Science Meeting. At this session, four presentations highlighted key findings of the IPCC in respect to past and future climate change, changes in the oceans (including the Polar Oceans), impacts on marine ecosystems, and consequences for fisheries and ecosystem management.

### AGENDA ITEM 4

#### **Planned activities for 2015**

Dr. Werner reviewed the ongoing plans of joint work between S-CCME and FISH-MIP/ISI-MIP. Using a standard selection of GCMs (General Climate Models) and RCPs (Representative Concentration Pathways) the next steps include: comparison output of a range of global fisheries and ecosystem models; comparison output of a range of regional fisheries and ecosystem models within AND across regions; comparison of output of global and regional models in selected focus regions; engagement in inter-sectoral comparison activities within the ISI-MIP framework. At the March 23–27, 2015, Climate Change Conference in Brazil, FISH-MIP and S-CCME will meet for further discussion of next steps. One inter-sessional workshop [The ICES/PICES Workshop on Modelling Effects of Climate Change on Fish and Fisheries (WKSICCME\_Project), chaired by C. Werner (USA), K. Holsman (USA), M. Kawamiya (JPN), T. Kristiansen (NO), M. Peck (DE), and A. Hollowed (USA)] is planned to be held in Princeton, NJ, USA, in August 2015 [later changed to Seattle, WA].

Dr. Jacquelynn King presented a summary of some of the sessions in the upcoming [3<sup>rd</sup> International Symposium on the “Effects of climate change on the world’s oceans”](#) (co-sponsored by PICES, ICES, and IOC) to be held March 23–27, 2015 in Santos, Brazil and emphasized their focus on societal needs. S-CCME’s proposal for a workshop was not accepted.

Dr. Drinkwater mentioned the ESSAS ASM will be held in Seattle, Washington, on June 15–17, 2015 in conjunction with a new University of Washington program entitled ‘The Future of Ice’. There will be 2–2.5 day symposium on *The Role of Sea Ice* with sessions on sea ice and its effects on the marine environments of the Arctic and Subarctic, paleo considerations, glacial ice and impacts on humans and coastal communities.

A proposed Topic Session on “*Past, present, and future climate in the North Pacific Ocean: Updates of our understanding since IPCC AR5*” (co-sponsored by WG 27, WG 29 and S-CCME) was submitted for PICES-2015 (*S-CCME Endnote 3*).

The formation of ISC-PICES Joint Study Group will be proposed at PICES-2014.

### AGENDA ITEM 5

#### **Publications**

Dr. Kim reviewed the information on the publications resulting 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), below. Publications resulting from the FUTURE OSM will be considered for a Special Issue in *Progress in Oceanography* – papers are due at the end of October 2014.

*Papers from St. Petersburg workshop:*

- Bell *et al.* In press - Disentangling the effects of climate, abundance and size on the distribution of marine fish: an example based on four stocks from the Northeast U.S. Shelf, *ICES JMS*.
- Jones *et al.* In press - Multi-model ensemble projections of climate change effects on global marine biodiversity, *ICES JMS*.
- Lynch *et al.* In press - Projected ocean warming poses a challenge to anadromous river herring populations, *ICES JMS*
- Gislason *et al.* In press - Long-term changes in abundance of *Calanus finmarchicus* south and north of Iceland in relation to environmental conditions and regional diversity in spring 1990–2013, *ICES JMS*

*Some related recent publication from ICES*

- An AMO special volume in the *Journal of Marine Systems* (JMS) was published in May 2014 with 10 papers covering driving mechanisms, physical oceanographic responses and impacts on ecosystems.
- The NESSAR (Norwegian IPY project) Special Issue in *JMS* was published in February 2014 with 13 papers describing studies conducted on the physics and biology of Arctic Fronts.

*Synthesis of S-CCME research 2012–2014 by the four co-chairmen*

Kim, S., A.B. Hollowed, M. Barange, and B.R. MacKenzie. In revision. Recent developments to coordinate northern hemisphere research on climate change impacts on marine ecosystems through ICES and PICES. *Oceanography*.

## AGENDA ITEM 6

**Other business**

S-CCME presentations will be made at this (PICES-2014) meeting to FIS by Dr. King, to BIO by Dr. Rice and to POC by Dr. Shin-ichi Ito.

Dr. Kim announced he will step down this year as S-CCME Co-Chairman and that Dr. Ito will take his place. Dr. Kim was thanked for his years of service and leadership and Dr. Ito was congratulated for taking on the position as Co-Chairman.

***S-CCME Endnote 1*****S-CCME participation list**Members

Kenneth Drinkwater (Norway/ICES)  
 Shin-ichi Ito (Japan/PICES)  
 Sukgeun Jung (Korea/PICES)  
 Suam Kim (Korea, Co-Chairman/PICES)  
 Jacquelynne R. King (Canada)  
 Franz Mueter (USA/PICES)  
 Cisco Werner (USA/PICES)  
 Yury Zuenko (Russia/PICES)

Observers

Nina Bednarsek (USA)  
 Steven Bograd (USA)  
 Holger Brix (Germany)  
 Kenneth Denman (Canada)  
 Richard Feely (USA)  
 Hiroshi Kuroda (Japan)  
 Daisuke Hasegawa (Japan)  
 Shoshiro Minobe (Japan)  
 Jake Rice (Canada)  
 Laura Richards (PICES)  
 William Sydeman (USA)  
 Hiromichi Ueno (Japan)  
 Elena Ustinova (Russia)

*S-CCME Endnote 2*

**S-CCME meeting agenda**

1. Welcome, introductions, opening remarks
  2. Changes to, adoption of, agenda and appointment of rapporteur
  3. Activity report for 2014
    - Review of S-CCME and Highlights of PICES FUTURE OSM – W4, W3, S7
      - S7: (Presenter S. Kim)
      - W3, W4: (Presenter C. Werner)
      - W-1, PICES-2014 (Presenter S. Kim)
    - Arctic opportunities
      - (Presenter – K. Drinkwater): US-Norway Joint Research Meeting May 5-9, 2014:
      - (Presenter - M. Baker) NPRB:  
<http://www.nprb.org/news/detail/development-and-initiation-of-nprb-arctic-program>
      - (Presenter – K. Drinkwater): funding for development of a Nordic Centre of Excellence (NCoE) project in the Arctic
    - Highlights of ICES 2014
      - S-CCME SICCOM Open Science Meeting (Presenter J. Rice)
      - ICES/PICES Joint Session Theme Session Q Physical and biological consequences of North Atlantic circulation patterns. (Presenter: K. Drinkwater)
  4. Planned activities for 2015
    - Plans for 2015 and Open Discussion – PICES 2015 Topic Session Late proposals?
      - (Presenter J. King) 3<sup>rd</sup> Symposium on “*Effects of climate change on the world’s oceans*”, Brazil;
      - (S.I. Ito) Fish-MIP:S-CCME connections: Target delivery of quantitative estimates of implications of climate change on the abundance and distribution of major marine fish species in northern hemisphere by 2019 (4<sup>th</sup> Effects of Climate Change on the World’s Oceans meeting);
      - (S.I. Ito) Joint Resolution for Workshop in August 2015 in USA – approved by ICES;
      - Any other session proposals?
  5. Publications
    - Papers from St. Petersburg meeting:
    - Synthesis of S-CCME research 2012-2014;
    - Special Issue for FUTURE OSM: Special Issue in *Progress in Oceanography*.
  6. Other business
    - Leadership changes, and designation of presenters to FIS, BIO and POC
- Closing

*S-CCME Endnote 3***Proposal for a 1-day POC/BIO/TCODE Topic Session on “*Past, present, and future climate in the North Pacific Ocean: Updates of our understanding since IPCC AR5*” at PICES-2015**

Co-Convenors: Chan Joo Jang (Korea), Ho-Jeong Shin (Korea), Zhenya Song (China), Sukgeun Jung (Korea), Anne Hollowed (USA), Kyung-Il Chang (Korea), Angelica Peña (Canada), Shin-ichi Ito (Japan)

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