2024 Report of the Section on *Climate Change Effects on Marine Ecosystems*

Co-Chairs: Dr. Kirstin Holsman (USA), Dr. Xiujuan Shan (China), Dr. Kathy Mills (ICES/SICCME, USA), Dr. Alan Baudron (Scotland, ICES/SICCME)

The 2024 annual meeting of the Section on Climate Change Effects on Marine Ecosystems (S-CCME) was held virtually on Oct. 17, 2024, a second hybrid in-person meeting was held on October 26, 2024, in Honolulu, USA, in conjunction with the 2024 PICES Annual Meeting. Both meetings were chaired by Drs. Kirstin Holsman (USA) and Xiujuan Shan (China). Approximately 30 participants attended, including representatives from Canada, China, Japan, Korea, Russia, the United States, and ICES (*S-CCME Endnote 1*).

AGENDA ITEM 1

b. Adoption of agenda

The agenda was adopted by all members (*S-CCME Endnote 2*).

c. Business items

Dr. Holsman opened the meeting with a welcome, reviewed the meeting agenda and brief introductions were made to help orient new members and observers to the group. Three new members were appointed to S-CCME in 2024, Philina English (Canada), Dr. Heejoong Kang (S-Korea, WG-53), Dr. Seokjin Yoon (Korea), and Dr. Minje Cho (Korea). The group welcomed the new members and thanked past members. At the in-person meeting the group also nominated Dr. Vivitskaia Tulloch, Canada as a new member and Dr. Dongwha Sohn as a new co-chair to replace Dr. Shan. The group thanked Dr. Shan for her excellent multi-year leadership of S-CCME.

d. S-CCME Phase IV (2021–2025) Implementation Plan overview

Dr. Holsman provided an overview of recent accomplishments under Phase IV (2021–2025) of the S-CCME Implementation Plan, noting strong progress on collaborative synthesis, model intercomparisons, and integration of S-CCME science into international programs including the UN Decade of Ocean Science for Sustainable Development (UNDOS).

e. Discussion: potential joint sessions or workshops for 2025

S-CCME members discussed potential workshops or sessions to propose for the upcoming 2025 Annual Science meeting. Drafts were shared with members for feedback and endorsement.

f. Upcoming meetings and workshops PICES

Dr. Holsman provided a brief overview of upcoming workshops and sessions at the upcoming meetings for ICES and PICES.

g. Requests/proposals to our parent committees and then SB, which includes:

Science Board requests were discussed and formal proposals were submitted for 2025 annual meeting workshops and sessions. Members also noted a request for Science Board ongoing support for maintaining coordination with ICES through annual workshops, strengthening UN Decade collaborations, and supporting final synthesis efforts under Phase IV.

AGENDA ITEM 2

S-CCME Activities and Events of Interest in 2023-2024

The agenda was adopted as presented. Dr. Holsman reviewed the objectives of the meeting, emphasizing coordination across ICES–PICES communities and the integration of S-CCME activities into the broader context of UNDOS programs. She summarized ongoing progress on coupled modeling, ensemble projections, and vulnerability assessments of marine ecosystems under climate change. Dr. Shan provided additional remarks highlighting the growing engagement of Asian partners and the importance of cross-regional collaboration in advancing the S-CCME Implementation Plan.

AGENDA ITEM 3

Updates on S-CCME relevant activities and events

Members also discussed S-CCME's expanding role within the UN Decade of Ocean Science programs and projects. The Section continued active engagement with programs including SMARTNET, SUPREME, AP-UNDOS, ONCE, and BECI. These collaborations enhance data sharing, modeling coordination, and capacity building to support global climate–ecosystem projections. Participants reviewed recent scientific achievements and ongoing synthesis efforts. The meeting reviewed major scientific achievements from 2024. Highlights included:

- Co-convening of PICES 2024 Topic Sessions S2 and S11 addressing climate-driven ecosystem variability and adaptation.
- Participation in the BECI Workshop on Ensemble Modeling and Decision Support (October 26, 2024), focusing on multi-model integration and uncertainty assessment.
- Contributions to the ICES ASC 2024 Theme Session, with joint participation from ICES and PICES researchers.
- Advancements in coupled bio-physical-social modeling, linking climate drivers to ecosystem services and community impacts.
- Strengthened engagement of Early Career Ocean Professionals (ECOPs) across ICES and PICES events.
- Integration of modeling efforts across UNDOS programs to support global climate–ecosystem synthesis.
- Continued data-sharing and open-science practices across ICES and PICES modeling communities.

Drs. Kathy Mills and Alan Baudron presented updates on ICES–SICCME activities. They reported progress on aligning ICES and PICES climate research priorities through joint sessions, shared ToRs, and synthesis initiatives. In 2024, S-CCME and SICCME collaborated in organizing an ICES ASC Theme Session on 'Climate Impacts and Adaptation Responses in Marine Fishery Systems,' which included over 30 oral and poster presentations. Discussion at the S-CCME business meeting emphasized maintaining strong coordination between ICES Expert Groups and PICES Science Panels.

S-CCME continued to prioritize ECOP engagement through participation in meetings, workshops, and collaborative projects. In 2024, ECOPs from Korea, Canada, and the USA presented research during PICES sessions and participated in the BECI workshop. The Section also explored opportunities to develop training modules and mentorship activities in collaboration with UNDOS initiatives to enhance interdisciplinary capacity.
Looking ahead, S-CCME will continue implementation of Phase IV through 2025 while preparing for Phase V planning. The Section agreed to develop a draft Phase V Terms of Reference for discussion in 2025.

Planned activities for 2025 include:

- Organizing final Phase IV synthesis workshops and joint ICES–PICES sessions.
- Advancing integrated modeling and uncertainty communication frameworks.
- Publishing synthesis outputs linking CMIP6 projections to ecosystem vulnerability assessments.
- Continuing collaboration with UNDOS programs and supporting ECOP engagement.
- Establishing a communications and data management strategy for long-term coordination.

AGENDA ITEM 4

National Reports and Updates

Member country representatives presented updates on research activities relevant to S-CCME goals:

- Canada: Reported continued progress under the ACCASP program, with regional ecosystem vulnerability assessments and development of adaptation pathways.
- China: (Dr. Shan) Highlighted ongoing modeling efforts under the SMARTNET program and contributions to FishSCORE and IPCC assessment activities.
- Japan: Provided updates on ecosystem modeling and biogeochemical studies, supporting improved understanding of climate–ecosystem linkages.
- Korea: Presented ongoing research on marine ecosystem vulnerability, emphasizing ECOP involvement and integration with regional adaptation frameworks.
- Russia: Shared progress on comparative ecosystem analyses across the North Pacific and Arctic regions.
- United States: (Dr. Holsman) Summarized NOAA's Climate, Ecosystem, and Fisheries Initiative (CEFI) developments, including ACLIM and GOACLIM projects, which support integrated climate–ecosystem advice frameworks.

AGENDA ITEM 5

Adjourn

Dr. Holsman concluded the meeting by thanking participants for their ongoing commitment and collaboration. She emphasized the significant progress made under Phase IV and the importance of continued synthesis and coordination across ICES and PICES communities. The next S-CCME Business Meeting will be held in 2025 in conjunction with the PICES Annual Meeting, where Phase V planning will be finalized.

S-CCME Endnote 1

Members in attendance

Virtual meeting

Members:
Kirstin Holsman (USA), Anne Hollowed (USA), Kathy Mills (USA), Takuya Nakanowatari (Japan), Shin-ichi Ito (Japan), Motomitsu Takahashi (Japan), Sukgeun Jung (Korea), Minji Choi (Korea), Dongwa Shon (Korea), Xiujuan Shan (China), Philina English (Canda), Angelica Pena (Canada)

Observers:
Vivitskaia Tulloch (Canada,Guest), Kathryn Berry (guest, Canada)

In person/hybrid meeting

Members:
Kirstin Holsman (USA), Phoebe Woodworth-Jefcoats (USA), Takuya Nakanowatari (Japan), Hiroe Yutaka (Japan), Guimei Liu (China), Shin-ichi Ito (Japan), Minje Choi (Korea), Seokjin Yoon (Korea), Sukgeun Jung (Korea), Dongwha Sohn (Korea); online Anne Hollowed (USA)

Observers:
Vivitskaia Tulloch (Canada), Isaac Kaplan (USA), David Reid (ICES), Sukyun Kang (Korea), Alan Haynie (ICES), Jo Foden (ICES), Hwansung Ji (Korea), Peng Lian (online at In Person meeting): Kiriil Kivva (Russia), Andrey Krovnin (Russia)

S-CCME Endnote 2

Agenda

1. Business Items (16:00-16:30)

a.	Introductions and welcome	
b.	Adoption of Agenda	
c.	Business items (e.g., nomination of new members)	
d.	S-CCME Phase IV (2021-2025) Implementation Plan Overview	Holsman
e.	Discussion: potential joint sessions or workshops for 2025	Holsman
	1. PICES SC 2025	Holsman
	2. ICES ASC 2025	Mills
f.	Upcoming meetings and workshops PICES	Holsman
g.	Requests/proposals to our parent committees and then SB, which includes: ● Travel support fund, ● change in members/chairs/TORs, ● an extension of the term (only WG), ● planning of capacity development event, ● new EG idea, etc (see the attached EG Report/Requests Form for SB about the instruction of each item)	Holsman

2. S-CCME Activities and Events of Interest in 2023-2024 16:30 - 16:45

a.	ICES 2024 ASC & SICCME	Mills
b.	PICES 2023 SC, S-CCME	Holsman
c.	The 5th International Symposium The Effects of Climate Change on the World's Oceans on 17-21 April 2023 in Bergen, Norway	Holsman & Mills
d.	NEMOW & FishMIP	Hazen/Holsman
e.	WKCLIMAD (ICES)	Holsman
f.	Upcoming events	Holsman

3. Updates on S-CCME relevant activities and events 16:45 -17:00

a.	IPCC WG II AR7	Ito
b.	PICES FUTURE Science Program	Hazen/Holsman
c.	UN Decade of Ocean Science Activities	
	● SG-UNDOS & SMARTNET	Hazen
	● SUPREME	Hazen
	● UNDOS Fish SCORE (Fisheries Strategies for Changing Oceans and Resilient Ecosystems)	Mills
	● UN Decade Program: Ocean Negative Carbon Emission	Zhang
	● UN Decade Program: Ocean to climate Seamless Forecasting System	Zhang
	● UN Decade Network: Decade Collaborative Centre on Ocean-Climate Nexus/Coordination Amongst Partners in P. R. China (DCC-OCC)	Zhang
d.	WG45: WGGRAFY Joint PICES/ICES Working Group on Impacts of Warming on Growth Rates and Fisheries Yields	Holsman/Spencer
e.	Other	

BREAK 17:00 - 17:20

4. National Reports and Updates 17:20 - 17:50

a.	US: EcoCast, Future Seas, ACLIM & GOA-CLIM, NCA5, NMFS-DFO CC workinggroups, CEFI, RAPs, MOMS6	Hollowed, Haynie, Werner, Hazen, Mueter, Holsman, Mills, Woodworth- Jefcoats
b.	Canada	Peña
c.	Japan	Ito, Nakanowatari, Takahashi
d.	Korea	Lee, Jung, Kang, Sohn
e.	China	Liu,Qin,Shan, Wang, Zhang
f.	Russia	Zuenko

5. Wrap up 17:50-18:00

S-CCME Endnote 3

S-CCME Activities identified in the Implementation Plan for Phase 4, 2021-2025.

S-CCME Goals:

- Define, coordinate and integrate the research activities needed to understand, assess and project climate change impacts on marine ecosystems;
- Plan strategies for sustaining the delivery of ecosystem goods and services, and when possible predictions should include quantifying estimations of uncertainty;
- Define and quantify the vulnerability and sustainability of marine ecosystems to climate change, including the cumulative impacts and synergetic effects of climate and marine resource use;
- Build global ocean prediction frameworks, through international collaborations and research, building on ICES and PICES monitoring programs.

Phase 4 S-CCME activities will continue Phase 1-3 initiatives:

1. provide forums for communication and coordination between national climate research nodes modeling teams. A key element of this process will be to propose investigator meetings during the PICES and ICES annual meetings.
2. evaluation and comparison of ecosystem projections and outcomes based on CIMP6 projections and IPCC AR6 results released in 2021. [Decade relevant]
3. continue to expand core research activities, including laboratory and field activities, needed to advance the global synthesis of climate change impacts on marine ecosystems for sustaining the delivery of ecosystem goods and services. Particular focus will be placed on research activities to define and quantify the vulnerability of marine ecosystems and key living marine resources to climate change, including the cumulative impacts and synergetic effects of climate and marine resource use. This will be used to assess research gaps. [Decade relevant]
4. convene dedicated S-CCME topic sessions for PICES and ICES Annual meetings. [Decade relevant]
5. provide a forum for the assessment and synthesis of existing projections of climate change impacts on marine ecosystems through joint theme or topic session and workshops at international symposia including the 5th Effects of Climate Change on the World's Oceans Symposium (tentatively scheduled for June 2023 in Bergen, Norway). [Decade relevant]
6. encourage an integration with the PICES Section on Human Dimensions and the ICES Strategic Initiative on Human Dimensions through joint theme or topic sessions and workshops.
7. publish regional summaries in a timely manner to allow their consideration by the relevant IPCC Assessment Reports. This effort will facilitate international collaboration and will provide a vehicle to communicate our current knowledge to stakeholders and the broader scientific community.

In Phase 4 S-CCME will be advancing on the following activities:

8. help develop and align future scenarios for exploring cultural and social impacts of climate change on fisheries and fishery dependent communities. This would include developing social science metric jointly with PICES Section on Human Dimension and ICES Strategic Initiative on Human Dimensions. [Decade relevant]
9. encourage and integrate S-CCME Science with and between external climate assessment organizations and provide knowledge to the scientific communities, national and global advisory bodies such as the IPCC and IPBES on the impacts of climate change on marine ecosystems.
10. promote innovation in coupled bio-physical-social modelling through workshops and topic sessions. This activity would address things such as: exploration of methodologies in the role of watersheds to ocean coupling and land-sea margins; uptake of nutrients and chemistry; advancements in regional ocean modelling; bias corrections; ensemble modelling scenarios and uncertainty. [Decade relevant]
11. engage Early Career Ocean Professionals in PICES and ICES and continue to increase communication with Early Career Ocean Professionals to contribute to a predictable ocean where society has the capacity to understand current and future ocean conditions [Decade relevant]
12. coordinate or support training programs for scientists involved in providing strategic advice on climate change effects on marine ecosystems. Courses of interest to S-CCME:
    a. technical courses for applied research (e.g. geospatial modeling, Size spectral models, EwE, Atlantis). [Decade relevant]
    b. training for communicating climate impacts to the general public, NGOs and decision makers. This training could include a focus on communication of uncertainty. [Decade relevant]
13. develop and maintain an internal and external S-CCME communication strategy by:
    a. maintaining PICES website: metadata, archiving outputs, links to data delivery sites such as ClimeFish;
    b. Co-chairs working with members to maintain relevant information on publications and presentations;
    c. encouraging members to contribute research products to a distributed database. S-CCME could establish protocols and data management policy for contributions to the shared database (explore FishMIP protocols, and Sea Around Us database).