

2021 Report of the PICES/ICES/PAME Working Group on an *Integrated Ecosystem Assessment for the Central Arctic Ocean*

PICES joined an existing ICES/PAME (Protection of the Arctic Marine Environment) Working Group on an Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA) in 2016. Preparing an Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean (CAO) is a step needed to provide scientific advice on issues such as the prospect for future fisheries in the Arctic Ocean and sensitivity and vulnerability in relation to shipping activities.

The joint PICES/ICES/PAME Working Group on an *Integrated Ecosystem Assessment for the Central Arctic Ocean* (WG 39) had its fifth meeting on September 2, 2020 (17:00-19:00 Pacific Standard Time, in Sidney, Canada), virtually, at PICES-2021. Co-Chair (PICES), Dr. Sei-Ichi Saitoh, led the meeting.

AGENDA ITEMS 1 AND 2

Review WG 39 terms of reference, history and time plan

Following self-introductions of participants (*WG 39 Endnote 1*), the meeting agenda (*WG 39 Endnote 2*) was reviewed by participants. Dr. Saitoh also introduced the history and time plan of the joint WG.

AGENDA ITEM 3

Review of programs and meetings on the Central Arctic Ocean

Dr. Saitoh reported the overview of spring meeting of WGICA which was held virtually on April 12–13, 2021. WGICA had a spring meeting to: 1) maintain the WGICA Vision of 2015 to provide the scientific background and annual status, trends and pressures reports for the CAO, 2) to kick-start Report 2 part 1 (Human activities, pressures and management bodies), 3) to finish the “possible future situation” of the EO, and 4) Prepare for the October annual meeting (Reports, new ToR, IA). The meeting was convened by the co-leads: Lis Lindal Jørgensen, Martine van den Heuvel-Greve and Sei-Ichi Saitoh. In total were 32 scientists and ICES Secretariat members were participating on day 1 and 31 participating on day two.

AGENDA ITEM 4

Review of WGICA Terms of Reference 2022–2024

The ToR for WGICA for 2022–2024 (see *WG 39 Endnote 3*) were defined at the WGICA meeting in April 2021 and were circulated within the WGICA, PAME, and PICES. The terms of reference were briefly described by Dr. Saitoh and reviewed and approved by the members.

AGENDA ITEM 5

Continuity of WG 39

The continuity of WG 39 was discussed by members in several directions. The WG will ask for a 1-year extension until October 2022¹ in order to continue discussing the continuity of this group, then submitting a proposal for a new Expert Group at PICES-2022.

¹ Governing Council decision 2021/S/10 xi. A 1-year extension of WG39: Joint PICES/ICES/PAME Working Group on an Integrated Ecosystem Assessment for the Central Arctic Ocean to PICES-2022 to complete its Terms of Reference and create a proposal to address future research in this area.

AGENDA ITEM 6

Publication plans

Report 1

Dr. Saitoh reported the status of the first WGICA report. The main product from the work of WGICA is a first version of an Integrated Ecosystem Assessment of the Central Arctic Ocean. A working title for the 1st WGICA report is: 'Integrated Ecosystem Assessment of the Central Arctic Ocean: ecosystem description' The subtitle is intended to explain the scope and content of the report, which is to provide an integrated account of the ecosystem of the central Arctic Ocean. It is in the final stages of preparation for publication by ICES, and will be published as an ICES Cooperative Research Report, after peer review and technical editing.

Report 2, part 1: Human activities, pressures and management bodies (in preparation)

The outline of the report 2 part 1 has been circulated within the WGICA group and PAME and the chapters are currently being written by dedicated author groups from WGICA.

This report will cover the Central Arctic Ocean LME (Large Marine Ecosystem) as geographically defined by WGICA in the opening of the report (page 4). The focus is on present and future human activities, the pressures from these human activities, and the impact of these pressures on the living ecosystem. The report will also describe policy, management mechanisms, and existing measures. It will include a final chapter on what type of analyses and models exist for compiling ecosystem, human activity, pressures and policy metadata. Report 2 part 1 draws from published peer reviewed literature and information in Report 1 and the Ecosystem Overview Report. The six chapters are defined as follows:

Report 2, part 1

- 1 Existing human activities and environmental change originate outside the CAO and brought into the CAO by ocean currents, river water and airborne, and its pressures.
- 2 Existing human activities and environmental change originate inside the CAO (high sea area and in national continental shelves) and its pressures.
- 3 Potential future Human activities inside or originating from outside and transported inside the CAO (high sea area and in national continental shelves) and its pressures.
- 4 How do the pressures impact the living Ecosystem: threshold limits for effects, uncertainty, and knowledge gaps for the CAO?
- 5 Existing management bodies and measures/best practices/tools/regulation in the CAO LME for ongoing Human activities (future activities?)
- 6 Risk analyses - the likelihood of human activities (happening inside and outside the CAO) to have an impact on the CAO ecosystem in the short (2021), medium (2030) and longer

Ecosystem Overview of CAO

An Ecosystem Overview (EO) is also required to finish in 2021 and will be submitted to ICES. An Ecosystem Overview is an ICES advisory report supporting Ecosystem Based Management. The report is short and concise (maximum of 14–16 pages) highlighting the main characteristics and challenges the region faces. The first draft of the Ecosystem Overview for the Central Arctic Ocean was completed in November 2020. ICES conducted a light review of this draft in February 2021. An additional pressure assessment for a future sea-ice free summer situation (ballpark 2050) was conducted online in March/April 2021. Results are being processed. The Ecosystem Overview will be finalized this year.

AGENDA ITEM 7

Proposal of session and workshop for PICES-2022

As a follow-up to the fourth workshop as well as a wrap-up, a one-day WG 39/WG 44 joint workshop (*WG 39 Endnote 4*) is proposed for PICES-2022 to consolidate the WG's findings and advice, connect it to those from ICES and to report to the wider PICES community. WG 39 requests travel support for an expert outside of PICES to attend the workshop at PICES-2022, pending the lifting of travel restrictions due to COVID-19.

AGENDA ITEM 8

Inter-sessional meetings

A 6th WGICA meeting was held virtually, is October 12–14, 2021. Dr. Lis Lindal Jørgensen, Dr. Martine Heuvel-Greve and Dr. Saitoh were the meeting organizers. The meeting agenda is found in *WG 39 Endnote 5*.

A Spring Meeting of WGICA, to be held virtually, is proposed for April 13–14, 2022. Drs. Lindal Jørgensen, Heuvel-Greve and Saitoh will be the meeting organizers.

The 7th WGICA meeting, to be held in person is planned for October 11–13, 2022. Drs. Lindal Jørgensen, Heuvel-Greve and Saitoh, will promote the activity as physical meeting organizers.

AGENDA ITEM 9

Closing

Meeting participants concurred that further communication would be necessary and should be made on-line. The Co-Chair thanked the attendees and closed the successful meeting of WG 39.

WG 39 Endnote 1**WG 39 participation list**Members

Sei-Ichi Saitoh (Japan, Co-Chair/PICES)
Hyoung Chul Shin (Korea/PICES)

Observers

Takafumi Hirata (Japan/WG 44)

Members unable to attend

China: Zhongyong Gao, Guangshui Na, Fang Zhang
Japan: Fujio Ohnishi

PICES

Sanae (Deputy Executive Secretary)

WG 39 Endnote 2

WG 39 meeting agenda

September 2, 2021 Sidney 17:00-20:00 (Canada time)
September 2, 2021 New York 20:00-23:00
September 3, 2021 Oslo 2:00-5:00
September 3, 2021 Tokyo 9:00-12:00

1. Welcome and introductions (S.-I. Saitoh and participants)
2. Review of agenda
3. Review of programs and meetings on the Central Arctic Ocean (S.-I. Saitoh)
4. Review of WGICA TOR 2022–2024 (S.-I. Saitoh)
5. Discussion on continuity of Working Group
6. Publication plans
 - WGICA IEA Report No.1 (in revision)
 - WGICA Ecosystem Overview (EO) Report
 - WGICA IEA Report No.2 Part1 (September 31, deadline)
 - WGICA Annual Report 2021
7. Proposal of session and workshop for PICES-2022
8. Intersessional meeting and workshop (S.-I. Saitoh)
9. Close of meeting (S.-I. Saitoh)

WG 39 Endnote 3

WGICA Terms of Reference 2022–2024

A	Identify relevant audience/stakeholders to the CAO-integrated ecosystem assessment (IEA). Identify and prioritize the relevant social, economic, and ecological (SEE) questions to be asked for the CAO in collaboration with the PAME CAO project.
B	Identify priority semi-quantitative and quantitative methods for doing relevant IEA for the CAO based on existing information already compiled in the WG’s reports, EOs and CRR.
C	Integrate and prioritize scientific SEE questions into the IEA for the CAO, this will include collaboration and development of methods with relevant IEASG and HAPISG groups.

WG 39 Endnote 4

**Proposal for a WG39/WG44 joint Workshop on
 “Integrated Ecosystem Assessment (IEA) to understand the present and future of the Central
 Arctic Ocean (CAO) and Northern Bering and Chukchi Seas (NBS-CS)”
 resubmitted for PICES-2022**

PICES sponsors: SB and FIS

Duration: 1.0 day (0.5 day + 0.5 day). There will be two sessions with focus on CAO and NBS-CS, and a session for joint deliberation will be prepared.

Convenors: Sei-Ichi Saitoh (Japan), Hyoung Chul Shin (Korea), Libby Logerwell (USA), Yury Zuenko (Russia)

Suggested invited speaker: Lis L. Jørgensen (Norway/PAME)

The target LMEs of WG 39 and WG 44 are the Central Arctic Ocean (CAO) and the Northern Bering Sea-Chukchi Sea (NBS-CS) respectively. These two regions are geographically and dynamically connected. The CAO is in rapid transition, driven by North Pacific environmental changes. The rapid loss of sea ice cover has opened up the CAO to a range of activities, including potential fishing opportunities. In this context, the agreement to Prevent Unregulated High Seas Fisheries in the CAO has been signed and will be soon entered into force, which will necessitate joint research and monitoring. The NBS-CS is also experiencing unprecedented warming and loss of sea ice as a result of climate change. Declines of seasonal sea ice and warming temperatures are prominent in the northern Bering and Chukchi seas as in most regions of the Arctic. Chronic and sudden changes in climate conditions in this Arctic gateway are clearly altering the system and its food-webs, and enlarging opportunities for commercial activities (shipping, oil and gas development and fishing), with uncertain and potentially wide-spread cumulative impacts. An integrated ecosystem assessment (IEA) is a useful approach in this circumstance, particularly with substantial science and policy challenges emerging in the Arctic, and thus a coordinated IEA of the CAO and NBS-CS should be a priority. WG 39 has published IEA Report No.1, which provides a description of the ecosystem in the CAO and is beginning to prepare IEA Report No.2, which will deal with impacts from human activities as well as vulnerability characterization. WG 44 was formed in spring 2020 and is just beginning its work. The communication and interaction between WG 39 and WG 44 are warranted to promote overall understanding of the Arctic and neighboring oceans. The main objectives for the workshop are to describe and discuss present ecosystem processes (sources, signals, significance) in the CAO and the NBS-CS based on achievements from existing and future research programs such as MOSAiC and SAS, numerous NBS-CS programs, and Indigenous Knowledge. In addition, it will help to explore and develop future approaches for IEA and jointly organized monitoring in both regions.