

## 2022 Report of the Biological Oceanography Committee

The 2022 Biological Oceanography Committee (BIO) meetings took place from 18:00–20:30 (KST) on Sunday, September 25 and from 14:00–18:00 (KST) on Wednesday, September 28 in person at PICES-2022 in Busan, Korea. The Chair, Dr. Akash Sastri, called the meeting to order and welcomed members and observers. Most participants attended in person, however, some attended via Zoom (*BIO Endnote 1*). All members in attendance introduced themselves and absent members were noted. The Chair reviewed membership changes and noted that there was no official representation from Russia and China. Members from all other PICES member countries were present. The draft agenda was circulated. There were additions offered and the agenda was adopted (*BIO Endnote 2*). Dr. Wongyu Park agreed to act as a rapporteur.

### AGENDA ITEM 3

#### Membership changes

- WG 47: Mr. Tatsuki Oshima and Dr. Hidetada Kiyofuji (Japan) are newly appointed members, replacing Dr. Hidetada Kiyofuji and Dr. Nobuaki Suzuki.
- WG 47: Dr. Chris Rooper is a newly appointed member representing Canada.
- WG 47: Dr. Samuel E. Georgian is a newly appointed member representing USA.
- WG 48: Drs. David Kimmel, Julie Keister, Mark Benfield, and Rob Campbell are new members representing USA, and Dr. Alexis Fisher has stepped down.
- WG 48: Dr. Dhugal Lindsay and Prof. Kazutaka Takahashi are new members representing Japan.
- Dr. Jacquelynne King (Canada) stepped down as a S-CCME member.
- Dr. Elliott Lee Hazen is a new S-CCME member representing USA.
- Dr. Takuya Nakanowatari (Japan) is a new member of S-CCME, replacing Dr. Hiroshi Kuroda.
- Dr. Masahide Wakita is a newly appointed member of S-CC, replacing Dr. Akihiko Murata and representing Japan.

### AGENDA ITEM 4

#### Annual review of BIO activities

Not discussed.

### AGENDA ITEM 5

#### Publications

- Report of Working Group 37 on Zooplankton Production Methodologies, Applications and Measurements in PICES Regions, Kobari, T., Sastri, A. and Yebra, L. (Eds.) 2022. PICES Scientific Report No. 63, North Pacific Marine Science Organization, Sidney, BC, Canada, 164 pp.

### AGENDA ITEM 6

#### Selection of Best ECS presentation for BIO

Judges for BIO-sponsored topic sessions, workshops, and poster session were assigned during the BIO Committee meeting. The best ECS BIO oral presentation was awarded to Minju Kim (Korea) presenting in

the BIO Paper Session: *Fiddlers on the tidal flat: fiddler crabs change their tunes depending on the contexts*. The best ECS BIO Poster Presentation was awarded to Gakuto Murata (Japan): *Copepod community determined with metabarcoding analysis represents advection of with coastal waters to the Kuroshio*

AGENDA ITEM 7

**Progress reports and future plans of BIO active groups**

**a) WG 46: Joint PICES/ICES Working Group on Ocean Negative Carbon Emissions (ONCE)**

Dr. Nianzhi Jiao presented an update on Ocean Negative Carbon Emission (ONCE). ONCE is co-chaired by Drs. Nianzhi Jiao and Douglas Wallace (PICES) and Drs. Carol Robinson and Louis Legendre (ICES). The Global ONCE program has now been endorsed as an UN Decade of the Ocean ‘Action’ through Xiamen University. A UN Ocean Conference Side Event: *Global ONCE: Ocean Negative Carbon Emissions and Sustainable Development* was held on June 30, 2022 in Lisbon, Portugal. The event focused on ‘addressing ocean negative carbon emission approaches for the mitigation of climate and the sustainable development of coastal ecosystems and the community as a whole’. Additional online working group meetings were held on June 24 and 29 to discuss progress toward each of the terms of reference and assigned scientific activities. An ONCE co-chairs meeting was convened online on July 20 and yielded a WG newsletter.

Two papers were published:

- Cai, W.J. and Jiao, N. (2022) Wastewater alkalinity addition as a novel approach for ocean negative carbon emissions. *Innovation (Camb.)* **3**(4): 100272, doi: 10.1016/j.xinn.2022.100272.
- Wang, Y., Lu, Y., Liu, J and Zhang, C. (2022) Advocating Eco-engineering Approach for Ocean Negative Carbon Emission. *Bulletin of Chinese Academy of Sciences (Chinese Version)* **36**: 279–287.
- Dr. Douglas Wallace wrote a blog: *Consider the Ocean: Climate change’s invisible solution* on the Canadian Climate Institute’s website: <https://climateinstitute.ca/consider-the-ocean/>.

**b) WG 47: Ecology of Seamounts**

Co-Chair, Dr. Janelle Curtis, updated the BIO Committee on WG 47’s annual meeting business on September 28, 2022 at the PICES Annual Meeting. Members discussed their various areas of expertise, research interests, and anticipated contributions to WG 47’s terms of reference. Some of the anticipated contributions include collating data on species associated with seamounts and submitting those data to appropriate biodiversity databases (e.g., OBIS). The WG also convened a productive two-day workshop (W1) on “*Distributions of pelagic, demersal, and benthic species associated with seamounts in the North Pacific Ocean and factors influencing their distributions*” from September 24–25 2022. The workshop report will be included in the 2022 winter edition of PICES Press newsletter. WG 47 requested that Dr. Patrick O’Hara be added as a Canadian member because he would bring considerable knowledge of and expertise on pelagic seamount taxa to the WG activities given his research and related activities as Co-Chair of the Section on *Marine Birds and Mammals*. Lastly, WG 47 requested: 1) a 1-day Topic Session on “*Seamount biodiversity: pelagic, demersal, and benthic species associated with seamounts in the North Pacific Ocean*”; and 2) a 1-day Workshop on “*The distribution of vulnerable marine ecosystems (VMEs) on seamounts in the North Pacific Ocean and factors influencing their distributions*” at PICES-2023.

**c) WG 48: Towards best practices using Imaging Systems for Monitoring Plankton**

WG 48 Co-Chair, Dr. David Kimmel, reported on WG activities. The goals of WG 48 are to summarize the strengths, limitations, and recent progress of imaging systems and deployment platforms which could facilitate the deployment of imaging systems for plankton monitoring; to establish standard libraries and

protocols to compare different automated plankton recognition and enumeration procedures; and to develop sampling methods that are routinely applicable to natural plankton populations and communities across a wide range of phyla and trophic levels. Most of the WG 48 membership is in place. WG 48 has requested Dr. Sabrina Groves from the University of Maryland to represent USA as a discipline expert and ECS. Dr. Alexis Fisher (USA) has stepped down from the WG. Other new members include Drs. David Kimmel, Julie Keister, Mark Benfield, and Rob Campbell representing USA and Dr. Dhugal Lindsay and Prof. Kazutaka Takahashi are new members representing Japan. WG 48 held its annual business meeting on September 8, 2022. Drs. Hongsheng Bi, Kimmel and Keister co-convoked a Topic Session (S4) on “*Application and best practice of imaging technologies for plankton and ecosystem monitoring*” at the PICES Annual Meeting on September 29. WG 48 members, Bi, Cheng, Keister, Kimmel, and Cheng, convoked scientific session (OT03) on “*Towards best practices for using imaging systems for plankton monitoring*” in theme session Ocean Technologies and Observatories at the Ocean Sciences Meeting, February–March 2022. A background study using the PlanktonScope, Bi *et al.* (2022) *Temporal characteristics of plankton indicators in coastal waters: High-frequency data from PlanktonScope* was published in the *Journal of Sea Research*, **189**: 102283. Additional activities include: 1) development of an hourly plankton dataset which will be used to illustrate the advantages and best practices of using plankton imaging systems; 2) working towards the development of an annotated, plankton image library for the Bering Sea and North Pacific zooplankton; and 3) development of an outline for a review paper on the topic of deep learning application in marine science. WG 48 submitted a proposal for a 1-day Topic Session on “*Applications of deep learning systems in marine science*” at PICES-2023 in Seattle.

#### **d) S-CCME: Section on *Climate Change Effects on Marine Ecosystem***

Dr. Kirstin Holsman provided an update on S-CCME/SICCME) 2022 activities and accomplishments. Drs. Kirstin Holsman (USA) and Xiujuan Shan (China) are the Co-Chairs from PICES. The two new Co-Chairs from ICES are Drs. Kathy Mills (USA) and Alan Baudron from Scotland. Dr. Takuya Nakanowatari (Japan) is a new S-CCME member replacing Dr. Hiroshi Kuroda. Dr. Elliott Lee Hazen is a new S-CCME member representing USA and Dr. Jacquelynne King (Canada) has stepped down as a S-CCME member.

S-CCME members, Drs. Ito and Holsman were co-authors on the IPCC AR6 WKII report (public release early 2022). Drs. Mills (SICCME Co-Chair) and Holsman (S-CCME Co-Chair) were also authors on the ‘Oceans and Marine Resources’ chapter of the 5th US National Climate Assessment (to be finalized fall 2023). S-CCME members have a proposed six sessions and/or workshops for the April 2023 ECCWO5 meeting in Bergen, Norway. S-CCME members continue to be engaged in multiple ongoing ICES/PICES collaborative working groups (WGGRAFY, WKCLIMAD, SNAPP) and UN Decade working groups (SMARTNET, SUPREME, Fish SCORE, SG-UNDOS, IPOD). For PICES-2023, S-CCME requested: 1) a ½-day virtual business meeting; 2) a 1-day workshop to support a session proposed by Wise *et al.* (later renamed as “*Indigenous and community-led approaches to support climate change adaptation and ecosystem resilience in the North Pacific and Arctic*”; and 3) a S-CCME Workshop on “*Towards climate-informed ecosystem-based fisheries management*”. The Section has also proposed two theme sessions (“*Towards climate-informed ecosystem-based fisheries management*” and “*Predictions of top predator habitat change to inform management*” for ICES ASC 2023.

#### **e) S-CC: Section on *Carbon and Climate***

S-CC Co-Chair, Dr. Tsuneo Ono, gave an update on S-CC activities to BIO. Dr. Akihiko Murata (Japan) was replaced by Dr. Masahide Wakita. Among the highlighted S-CC achievements were: 1) the ISO/DIS 5667-26 “Guidance on sampling for the parameters of the oceanic carbon dioxide system” was prepared, differing from PICES Special Publication 3, “Guide to Best Practices for Ocean CO<sub>2</sub> Measurements”. S-CC will follow the community’s response to this new water sampling standard as well as the traditional one (PICES

Special Publication 3); 2) the metadata for coastal monitoring stations, which include either oxygen and/or pH in their measurements, were uploaded from each PICES member country to the TCODE metadata catalog; and 3) several S-CC members contributed to the 5th International Symposium on “the Ocean in a High CO<sub>2</sub> World” (September 13–16, Lima, Peru) as International Science Committee members. S-CC proposed a 1-day topic session for PICES-2023, entitled, “*Ocean acidification and deoxygenation in the ocean margin ecosystems: causes and consequences for ecosystems and fisheries*”.

**f) S-MBM: Section on *Marine Birds and Mammals***

Dr. Patrick O’Hara, S-MBM Co-Chair, summarized the 2015-2020 S-MBM project and updated annual activities for the Section on *Marine Birds and Mammals*. Dr. Miran Kim (Korea) replaces Dr. Kaoru Hattori (Japan) as Co-Chair. Dr. O’Hara (Canada) will continue as co-chair for two more years. The 2015–2020 S-MBM project “*Climate and Trophic Ecology of Marine Birds and Mammals*” is focussed on food consumption estimates using a new generation of bioenergetic models, and is intended in part as an update to the 2000 S-MBM PICES Scientific Report No. 14 on Predation by Marine Birds and Mammals in the Subarctic North Pacific Ocean. Much of the data set collection, appendices, and sections on Birds and Mammals are complete. In progress are the Introduction and Discussion sections. S-MBM convened Workshop (W7) on “*Anthropogenic stressors, mechanisms and potential impacts on marine birds, mammals, and sea turtles*” at PICES-2022. The workshop was well subscribed (approximately 12 talks). Dr. O’Hara also updated the BIO Committee on five proposed thematic workshops spanning the 2022–2025 activity plan term. S-MBM proposed a 1.5–2 day topic session entitled, “*Anticipated and realized effects of climate change on predatory fish, birds, and mammals of the North Pacific*” for PICES-2023. A 1-day S-MBM/MEQ workshop, “*Bio-indicators of meso to global scale marine pollution: techniques for integration and standardization*” was also proposed for PICES-2023. Finally, Dr. O’Hara provided an updated on international symposia related to S-MBM activities: the Pacific Seabird Group meeting held virtually February 2022, and the 24<sup>th</sup> Biennial Conference on the Biology of Marine Mammals held as a hybrid meeting (poorly attended) in Florida, August 2022.

**g) SEAturtle: Special project on “*Sea turtle ecology in relation to environmental stressors in the Northwest Pacific regions*”**

Dr. Taewon Kim (Korea) updated the BIO Committee on the Special Project on SEAturtle. The special project term has been extended to November 2023. Dr. Kim presented results of four project research activities: 1) tracking sea turtles with iridium transmitters; 2) tracing ancestry using population genetics; 3) tracking with stable isotope analysis; and 4) threats of plastics and derelict fishing gear. SEAturtle conducted diving surveys using 14 tagged turtles to track their movements from Jeju Island, overwintering behaviors, and dive duration relative to temperature. Genetic analysis was used to place study animals in the western Pacific into a genetic context for the larger North Pacific. Dr. Kim presented some early results of a novel approach to tracking by using d<sup>18</sup>O from commensal barnacle calcite shells. Lastly, updates were provided on characterization of the types of plastic and derelict fishing gear ingested and identified in sea turtles during necropsy.

AGENDA ITEM 8

**FUTURE program update**

NO update presented.

## AGENDA ITEM 9

**PICES data policy and inventory**

Not discussed.

## AGENDA ITEM 10

**Relation with other international organizations/programs****Surface Ocean Lower Atmosphere Study (SOLAS)**

Dr. Kitack Lee updated the BIO Committee on behalf of Surface Ocean Lower Atmosphere Study (SOLAS). Core themes of SOLAS include greenhouse gases and the oceans, air–sea interface and fluxes of mass and energy, atmospheric deposition and ocean biogeochemistry, interconnections between aerosols, clouds, and marine ecosystems, and ocean biogeochemical controls on atmospheric chemistry. Dr Lee highlighted the new SOLAS structured research master’s program established in Galway, Ireland. Courses of the program include four core modules and two optionals, and research projects conducted with leading SOLAS scientists worldwide. Activities of SOLAS Core Theme 3 include: A discussion session on an UNDOS Proposal: *Aerosol Exchange with Marine Ecosystems* at the 8<sup>th</sup> SOLAS Open Science Conference scheduled for late October 2022 in Cape Town, South Africa, and a COP 27 UN Climate Change Conference Side Event: *Fire risk increase, a challenge for Earth system and societies*, scheduled for November 6–18, 2022, in Sharm El-Sheikh, Egypt. Other upcoming SOLAS activities include: the 3<sup>rd</sup> SOLAS Seminar on *Ocean-atmosphere exchange of aerosol particles: impact on marine ecosystems* (online, October 19, 2022); the 6<sup>th</sup> Xiamen Symposium on Marine Environmental Sciences (hybrid, Xiamen, China January 9–12, 2023); the 9<sup>th</sup> SOLAS Summer School scheduled for June/July 2023 in Mindelo, Cape Verde; and the GOOD – OARS Summer School scheduled for November 6–12 2023, Coquimbo-La Serena, Chile.

**North Pacific Fisheries Commission (NPFC)**

Dr. Janelle Curtis updated BIO on behalf of North Pacific Fisheries Commission (NPFC) activities during the past year and presented the NPFC–PICES framework for enhanced scientific collaboration in the North Pacific. NPFC and PICES identified three top priorities: Support for stock assessment of priority species; vulnerable marine ecosystems (VMEs); and developing an ecosystem approach to fisheries management. Joint activities during 2021–2022 were that NPFC and PICES representatives attended each other’s annual meetings (2021 PICES Annual Meeting and NPFC’s 6<sup>th</sup> Scientific Committee Meeting). Also, NPFC representatives took part in the PICES–ICES joint Working Group on *Small Pelagic Fish* (WG 43). The PICES–NPFC joint international course/workshop on VME indicator taxa identification, with a financial contribution of \$15,000 USD from each organization was postponed. PICES’ FIS and NPFC convened a PICES-2022 Topic Session entitled “*Environmental variability and small pelagic fishes in the North Pacific Ocean*”. NPFC will sponsor a 1-day Topic Session on “*Seamount biodiversity: vulnerable marine ecosystems (VMEs) and species associated with seamounts in the North Pacific Ocean*” proposed for PICES-2023 by WG 47, as the proposed research aligns with the NPFC–PICES framework for enhanced scientific collaboration in the North Pacific.

**Basin Scale Coastal Impacts (BECI)**

Mr. Robin Brown introduced the PICES–NPAFC project: Basin Scale Coastal Impacts (BECI), to BIO Committee members. This project is endorsed by the UN Decade of the Ocean. The team responsible for BECI organization are supported by PICES, NPAFC, Fisheries and Oceans Canada, the Pacific Salmon Foundation and Long Live the Kings. The objective of BECI is to “*implement an international ocean intelligence system of monitoring, research and analytical approaches that provides timely advice to decision*

*makers about the impact of current and future climate conditions on socio-ecological systems*". The practical intent for BECI, as evidenced with the International Year of the Salmon (IYS), is to leverage resources across the North Pacific Ocean and provide a platform to develop an integrated intelligence system. BECI will take a modular approach for species of interest leveraging the exemplary model of salmon. Mr. Brown outlined the four BECI principles: funding through partnerships; reflecting diversity; incorporation of indigenous and western scientific knowledge; and complementary to domestic programs. Four technical workshops were held in May, June, and July 2022 to assess the technical feasibility of BECI: Climate and ocean ecosystem modelling; linking ocean processes and ecosystem changes to fish production; technology and tools for monitoring and data synthesis; and data mobilization and knowledge synthesis. Following updates to PICES and NPAFC in September 2022, the BECI project is continuing integration and ongoing development of the BECI Science Plan and outreach to potential partners and donors.

AGENDA ITEM 11

**Proposals for new Expert Groups**

No new expert group proposals were submitted for BIO.

AGENDA ITEM 12

**Planning for PICES-2023**

- **S-CCME:** 1-day Workshop on “*Towards climate-informed ecosystem-based fisheries management*” (proposed by K. Holsman).
- **S-CC:** 1-day Topic Session on “*Ocean acidification and deoxygenation in ocean margin ecosystems: causes and consequences for ecosystems and fisheries*” (proposed by T. Ono).
- **S-MBM:** 1.5-day Topic Session on “*Anticipated and realized effects of climate change on predatory fish, birds, and mammals of the North Pacific*” (proposed by P. O’Hara).
- **S-MBM:** 1-day Workshop on “*Bio-indicators of meso to global scale marine pollution: techniques for integration and standardization*” (proposed by P. O’Hara).
- **WG 48:** 1-day Topic Session on “*Applications of Deep Learning Systems in Marine Science*” (proposed by H. Bi).
- **WG 47:** 1-day Topic Session on “*Seamount biodiversity: pelagic, demersal, and benthic species associated with seamounts in the North Pacific Ocean*” (proposed by J. Curtis).

AGENDA ITEM 13

**PICES-sponsored conference/symposia in 2021 and beyond**

- November 7–11, 2022, SPF-2022 International Symposium on *Small Pelagic Fish: New Frontiers in Science and Sustainable Management*. Lisbon, Portugal (ICES/PICES)
- April 17-21, 2023, 5<sup>th</sup> International Symposium on *The Effects of Climate Change on the World’s Oceans*. Bergen, Norway
- March 17-22, 2024, 7<sup>th</sup> International Zooplankton Symposium, Hobart, Tasmania, Australia (ICES, PICES, University of Tasmania, IMA)

AGENDA ITEM 14  
**Capacity building**

Not discussed.

AGENDA ITEM 15  
**Documenting business meetings, topic sessions and workshops**

Dr. Sastri reminded BIO expert group Co-Chairs that summary reports should be submitted to the Secretariat within one month of the Annual Meeting.

AGENDA ITEM 16  
**Other business**

Professor Wongyu Park (Korea) concluded his term as BIO Vice-Chair and Dr. David Kimmel (USA) was elected to replace him. Dr. Akash Sastri (Canada) was re-elected as BIO Chair.

AGENDA ITEM 17  
**Adoption of BIO report and recommendations to Science Board**

All proposed sessions/workshops were supported by the BIO Committee and recommended to Science Board.

**BIO Endnote 1**

**BIO participation list**

Members

Akash Sastri (Canada, Chair)  
Wongyu Park (Korea, Vice-Chair)  
Janelle Curtis (Canada)  
Kaoru Hattori (Japan)  
Motomitsu Takahashi (Japan)  
Se-Jong Ju (Korea)  
Taewon Kim (Korea)  
Julie Keister (USA)  
David Kimmel (USA)

Observers

Kristin Holsman (S-CCME Co-Chair)  
George Balazs (SEATurtle PST Co-Chair)  
Nianzhi Jiao (WG 46 Co-Chair)  
Alexander Kozyr (S-CC Co-Chair)  
Miran Kim (S-MBM Co-Chair)  
Kitack Lee (SOLAS)  
Patrick O'Hara (S-MBM Co-Chair)  
Tsuneo Ono (S-CC Co-Chair)  
Rui Zhang (China)  
Kirill Kivva (Russia)  
Robin Brown (NPAFC/BECI)

PICES

Vera L. Trainer (SB Chair)

**BIO Endnote 2**

**Agenda for BIO Committee meeting agenda**

*Day 1: Sunday, September 25, 2022, 18:00 – 20:30 (Pusan, Korea, KST)*

1. Welcome, introductions, opening remarks
2. Adoption of agenda and appointment of rapporteur
3. Membership changes
4. Annual review of BIO activities
5. Publications
6. Selection of Best ECS presentations for BIO
7. Progress reports and future plans of BIO active groups

*Day 2: Wednesday, September 28, 2022, 14:00 – 18:00 (Pusan, Korea, KST)*

8. FUTURE Program: Science Program Update (R. Rykaczewski)
9. PICES data policy and inventory (<https://meetings.pices.int/about/PICES-Policy>)
10. Relation with other international organizations/programs
11. Review proposals of new Expert Groups (if any proposals submitted)
12. Planning PICES 2023 Annual Meeting (Seattle, USA; Oct. 23–Oct. 27, 2023)
13. PICES-sponsored conference/symposia in 2022 and beyond
14. Capacity Building
15. Documenting business meetings, topic sessions and workshops
16. Other business
17. Adoption of BIO report and recommendations to Science Board