



**REPORT of the PICES Science Board (SB)
2020 Intersessional Meeting**

Held April 29 - May 2, 2020 (according to local times),
via Zoom Video Conferencing.

Prepared by Science Board Chair, Dr. Vera Trainer, and the PICES Secretariat

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Introduction

The 2020 PICES Inter-sessional Science Board (ISB-2020) meeting took place in unprecedented circumstances. Travel was not possible because of the COVID-19 pandemic, and the meeting format was revised from the planned face-to-face meetings originally to be held in Vladivostok from April 29 to May 1, 2020, to instead being held as a three-day series of three-hour "Zoom" video conference calls on the same dates. Having never held PICES business meetings in this fashion before, and due to the time differences for participating members, there was some uncertainty with respect to how well this meeting format would work, and how much of the required Science Board work could be accomplished during these calls.

The challenges presented by the circumstances were minimised through significant advance preparation, including practice with the technology by all participants. As outlined in this report, the virtual ISB-2020 was a fruitful series of meetings.

A detailed report on each agenda item follows. Brief notes on the Science Board's use of videoconferencing technology to ensure successful meetings are included as Appendix A.

Agenda Item 1: Welcome

The Science Board Chair, Dr. Vera Trainer, welcomed all of the meeting participants. She directed Science Board members to review the agenda, and explained that the meeting agenda was a very ambitious one for the call times as set out. Dr. Trainer encouraged participants to focus on decisions that needed to be made, and to keep presentations brief. Participants were encouraged ask for clarification when needed.



Meeting Participants

Science Board Chair, Dr. Vera Trainer, welcomed the following participants to the ISB meeting calls. A screenshot of the participants follows.

Science Board	Vera Trainer	Science Board Chair	vera.l.trainer@noaa.gov
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AGENDA ITEM 2 – Mid-year report from FUTURE Scientific Steering Committee

Dr. Steven Bograd, with the support of his co-chair, Dr. Sukyung Kang, provided the FUTURE SSC (Scientific Steering Committee - herein after referred to as "FUTURE") mid-year report. Explaining that FUTURE had just completed its Inter-sessional meeting through a series of virtual meetings over the past three days, Dr. Bograd relayed that the meetings had been very productive and useful, with good discussions. Involving 25 -26 people from seven different countries, the primary items discussed were contributions to the UN Decade of Ocean Science (UNDOS) membership issues, general business, and updates.

Dr. Bograd thanked Drs. Ian Perry (Canada) and Sinjae Yoo (Korea), for their years of service, as both were stepping down from FUTURE. He welcomed Dr. Hanna Na who replaces Dr. Sinjae Yoo as FUTURE SSC member .

Expert groups were discussed, and Dr. Bograd explained that several groups - particularly working groups - would be ending in the next three years. For the benefit of those new to FUTURE, Dr. Bograd outlined the structure for communications between FUTURE and working groups. Each FUTURE participant is assigned as a liaison to a

specific working group, and is responsible for communicating the work of FUTURE to the working group, and vice-versa, to ensure alignment of goals and consistent communication.

Next, Dr. Bograd provided updates on two groups which are co-parented by FUTURE: Working Group 35 (Working Group on Third North Pacific Ecosystem Status Report; WG-NPESR3) and 36 (Working Group on Common Ecosystem Reference Points across PICES Member Countries).

[WG 35 - NPESR3](#)

WG 35 is co-chaired by Mr. Peter Chandler and Dr. Sinjae Yoo, and its term has been extended to 2020 to complete the writing of the NPESR3 report, which is due for release as a PICES Special Publication ahead of PICES-2020. To date, contributions have been received and compiled for the Synthesis report which will be published in hard copy and as an online PDF. The series of regional chapters which support this main document are currently with the FUTURE editorial board, and will be published as online PDFs.

[WG 36 - Common Ecosystem Reference Points](#)

WG 36 is co-chaired by Dr. Mary Hunsicker (USA) and Dr. Xiujuan Shan (China), and has also been granted an extension to 2020 by Science Board/Governing Council to finish writing their final report. Also in progress is a draft manuscript based on a case study from Vancouver Island illustrating ecosystem thresholds, and a draft manuscript elucidating the pros and cons of various methodologies used by different PICES groups to quantify thresholds in ecological time series and driver-response data.

[FUTURE ECS Award](#)

Dr. Bograd outlined discussions being held regarding the FUTURE Early Career Scientist (ECS) Award. The intention of this award is to support one or more ECS who apply the Social-Ecological-Environmental System (SEES) approach in PICES activities. The award was originally meant to provide travel support so that ECS could attend a PICES annual meeting and present their work in a plenary session. Although it is uncertain whether PICES-2020 will occur in the fall, FUTURE is examining other ways of making this award available to one or more ECS.

[FUTURE Planning](#)

Upcoming tasks include the completion of a product matrix, and the continued planning of the FUTURE Open Science Meeting (OSM), which is tentatively scheduled for 2022, and will be organized around the theme of Social-Ecological-Environmental Systems.

[FUTURE SSC Recommendations \(from Apr and PICES-2019 meetings\)](#)

- Momentum developed during FUTURE Phase II should be maintained;
- Overall objectives and key questions of FUTURE remain relevant and reflective of the needs of PICES integrative science;
- New Phase III of the FUTURE program will be implemented to build upon recent accomplishments (SEES approach), provide leadership to UNDOS, and enhance communication and Early Career Ocean Professional (ECOP) involvement. The FUTURE Phase III Science and Implementation plans should be provided for Science Board review prior to PICES-2020;
- FUTURE will evaluate Phase II progress towards objectives, determine which objectives cannot be resolved or are now of lower priority, and identify new activities needed to accomplish objectives;
- FUTURE will prepare a Phase II Final Report for Science Board review prior to PICES-2020.
- FUTURE will continue to facilitate trans-disciplinary research and communication, although PICES will maintain activities in its traditional disciplines;
- PICES integrative science should encourage and facilitate participation of early career scientists (e.g. SEES travel award);
- PICES will address inherent geographical constraints through inter-sessional and remote expert group activities

- and cross-WG meetings at the Annual Meeting.
- Plan to have a report for PICES-2020.

AGENDA ITEM 3 – Next integrative science program

The FUTURE SSC is currently drafting its FUTURE Phase III Science and Implementation plans, which will be provided prior to PICES-2020. These are centered on the United Nations Decade of Ocean Science (UNDOS) and entitled: "*UNDOS: What is the science we need for the ocean that we want?: Looking at FUTURE's role.*" Dr. Bograd explained that during the FUTURE SSC meeting (April 26-29, 2020), there had been fruitful discussions of this theme, based on an idea by Dr. Mitsutaku Makino, to have each FUTURE participant describe their hopes for the ocean at the close of the UN ocean decade. Specifically, each member gave thought to what advancements they imagined and what future ocean they wanted in order to help the group to strategize activities, expert groups, and work requirements that will meet the overarching goals.

The examples provided captured many of the same themes, which included:

- Climate and ecosystem predictability
- Social Ecological Environmental Systems(SEES)
- Hazards and extreme events
- Communication
- Equity and diversity
- Food security and human health
- Resilience and sustainability

Science Board discussed the need for the PICES contributions to UNDOS to be transformative, beyond actions and outcomes, and promoting true innovation; there should be broader and more interdisciplinary goals for new WGs, and envisioning a future with fewer WGs having broader expertise, more ambitious goals and longer time spans. Some specifics of the discussion focused on how PICES could serve the people from all over the world with predictions, and on documenting the experience of people who experience the Decade by promoting diverse cultural inclusion. One aspect of FUTURE III could include research or ocean solutions for fisheries by working with regional fisheries management organizations to move science into an operational phase. Aquaculture is an important issue for the future. There is a need to model future distribution and abundance of target species under climate/ocean ecosystem change which are destabilizing to management. The need for an accessible PICES website that includes communication to different audiences was discussed.

The FUTURE SSC will continue its discussions around these themes, and will discuss ways of developing them further through the creation of appropriate scientific expert groups and partnerships with industry, coastal communities, indigenous communities, young scientists and under-represented peoples. The FUTURE SSC will hold a virtual call in May to develop specific recommendations for PICES contributions to UNDOS. Members will also discuss revising the announcement of the SEES award for a remote presentation at PICES-2020.

Action: FUTURE SSC to provide FUTURE II summary report and FUTURE III Implementation and Science plans.

Decision: The Science Board voted to endorse the approach for FUTURE Phase III, as presented by Dr. Bograd. The FUTURE II summary report and the FUTURE III implementation and science plan will be provided to SB prior to PICES-2020.

AGENDA ITEM 4 – Special Projects – Inter-sessional reports

FishGIS – Special Project: Final Report

<https://meetings.pices.int/projects/FishGIS>

Dr. Makino presented the final report for the PICES/MAFF FishGIS Special Project, a capacity building initiative in

Indonesia, focussed on smart phone technology, allowing local communities to monitor coastal ecosystems. This project - particularly the capacity-building aspect - was very successful. The "fishers teaching fishers" model brought a strong sense of ownership and pride to the project, and will help ensure its long-term sustainability.

The Project Science Team (PST) is now completing the final deliverables for this Special Project, which include: a final report for MAFF/JFA to be submitted by June 30, 2020; followed by a PICES FishGIS Scientific Report being prepared for the fall of 2020; and a PICES Press article in Winter 2020.

Dr. Makino clarified that the data for this project are owned by the Indonesian government, with Indonesian researchers able to access and use the data. Fisheries and water quality data collections gathered in FishGIS and the new PICES-MAFF Ciguatera project will be responsibly managed by the Indonesian National Data Center to guard against loss and to enable responsible use by Indonesian government agencies and their corresponding collaborators - in this case the PICES Project Science Team. Per established PICES Data Management Policy, PICES will respect the ownership rights and any restrictions placed on these data by the Indonesian government. Data request protocols and procedures will be established by PST during the PICES/MAFF project.

SEAturtle – Special Project Report
<https://meetings.pices.int/projects/SEAturtle>

Dr. Sastri reported on the SEAturtle Special Project examining sea turtle ecology in relation to environmental stressors in the North Pacific region, headed by co-chairs Taewon Kim and George Balazs. The project began in 2018, is scheduled for completion in November 2022, and recently welcomed new member Dr. George Shillinger, the executive director of Upwell, in Monterey, California, USA.

The SEAturtle team submitted two abstracts to the following symposia, however both meetings have been postponed due to COVID-19:

1. **International Sea Turtle Symposium:** PICES special project on "Sea Turtle Ecology in relation to Environmental Stressors in the North Pacific regions", Taewon Kim, Byung-Yeob Kim, George Shillinger, Soojin Jang, Miyeon Kim, Jibin Im, and Jeongjoo Ha. Rescheduled to Cartagena, Columbia in February 2021.
2. **AOGS (Asia Oceania Geosciences Society):** Thermal Migration and Overwintering of Green Sea Turtles, *Chelonia mydas*, Observed by Using SeaTrkr GPS/Iridium Marine Systems, Jibin Im, Seo Jeong Park, Soojin Jang, Mi Yeon Kim, Byung-Yeob Kim and Taewon Kim. Scheduled to be held in Hongcheon, Korea, on June 28 to July 4, 2020.

The SEAturtle project recently published an article in PICES Press:

- Taewon Kim, Soojin Jang, Mi Yeon Kim, and Jibin Im. [PICES Special Project: Sea Turtle Ecology in Relation to Environmental Stressors in the North Pacific Regions](#). PICES Press Vol. 28, No. 1, 2020.

Robin Brown asked where the unique data set for this project is being held. Dr. Sastri clarified its location and agreed to ensure that the SEAturtle group provide PICES with additional information on the datasets for inclusion in the PICES Data Inventory.

Action: SEAturtle to provide additional information for datasets, for inclusion in PICES Data Inventory.

Ciguatera – Special Project: Introductory Report

<https://meetings.pices.int/projects/Ciguatera>

Dr. Makino introduced a new PICES/MAFF Special Project "*The Detection and Human Dimension - of Ciguatera Fish Poisoning (CFP) in Indonesia.*" This three-year project began in April 2020, and is the follow-on project from the FishGIS project, also supported by MAFF Japan.

Anticipated outcomes for this project include:

- A PICES Scientific Report Series based on the results from the project and lessons learned;
- Several *PICES Press* articles;
- A brochure summary published for the local people highlighting the project's purpose and findings;
- Project training materials to be collated and translated into Indonesian Bahasa to provide sustained training by Indonesian government personnel and community leaders beyond the term of the project;
- Generation of an electronic database of citizen-science data collection that is automatically uploaded to the Indonesian National Ocean Data Center.

Dr. Makino noted that the first project science team (PST) meeting for SEATurtle had been planned for the PICES/ICES MSEAS-2020 symposium in May 2020 in Yokohama, Japan. The PST meeting will now occur virtually.

Mr. Robin Brown congratulated Japan on having the foresight to develop and fund the FishGIS and Ciguatera projects. He noted that the methodology of having the same project teams and building on technology addresses issues of some projects being of too short a duration to develop capacity building. The PICES/MAFF projects also align well with the goals of the UN Decade of Ocean Science.

Further discussion on the Ciguatera project touched on: food security as an important underlying motivation for the project; uncertainty regarding how causative organisms are moving northward; conditions for survival of causative organism becoming more common in Northern waters, and consideration for the creation of a smart-phone based educational tool rather than a printed brochure for this project, since the project is cellphone based. Timelines were discussed and it was requested that Dr. Makino contact MAFF to determine whether project deadlines could be shifted if necessary due to COVID-19.

Action: Dr. Makino to contact MAFF regarding potential delay in project deadlines.

AGENDA ITEM 5 – Awards

Science Board moved to an *in camera* session to review nominations for the Wooster, and Zhu-Peterson early career scientist awards. MONITOR and TCODE provided their recommendation to Science Board for the POMA award.

Decision: Science Board selected award recipients, to be announced during the Opening Session at PICES-2020.

AGENDA ITEM 6 – Scientific and Technical Committee Mid-Year Reports

BIO – Biological Oceanography Committee

Dr. Akash Sastri, BIO Chair reported that BIO submitted a draft of its 3-year Action Plan to Science Board for review and for the Secretariat at PICES-2019.

BIO Topic sessions and workshops planned for PICES-2020:

- S5: BIO/POC Topic Session: Atmospheric nutrient deposition and microbial community responses, and predictions for the future in the North Pacific Ocean
- W2: BIO/FIS Workshop: Can we link zooplankton production to fisheries recruitment?
- W8: BIO/MEQ Workshop: Sea turtles and environmental stressors in the North Pacific
- BIO Contributed Paper Session:

S-MBM: Section on Marine Birds and Mammals

The Section on Marine Birds and Mammals held a topic session and workshop at PICES-2019. None are planned for PICES-2020, as the timing of the PICES Annual Meeting conflicts with S-MBM members' participation at the World Seabird Conference in October 2020 in Hobart, Australia. S-MBM recently reviewed its 2015–2020 project "*Climate and Trophic Ecology of Marine Birds and Mammals*" and have drafted chapters for a PICES Scientific Report intended to be ready for PICES-2020. Another five-year project (2021–2025) discussed by the Section will focus on the interaction between MBMs and other ecosystem components and stressors.

WG 32: Working Group on Biodiversity of Biogenic Habitats

WG 32 submitted its final report to BIO for initial review prior to ISB. Following its review, BIO will provide recommendations to Science Board at PICES-2020. Dr. Sastri is working with WG 32 on a proposal for a new working group on the biodiversity of seamounts, expected to be submitted to BIO for review before PICES-2020.

Robin Brown requested that WG 32 review its datasets in light of the PICES Data Management Policy (<https://meetings.pices.int/about/PICES-Policy>), and notify TCODE, BIO, and the Secretariat of the nature and location of datasets related to the work of this group. Dr. Sastri will contact the group regarding its data. WG 32 final report will be submitted to Science Board for approval at PICES-2020.

Actions:

- Dr. Sastri to contact Dr. Curtis regarding any data or data products for the PICES Data Inventory.
- BIO to review WG 32 report and provide recommendation for publication at PICES-2020.
- Science Board Recommended publication of WG 32 report, pending editorial review by BIO.

WG 37: Working Group on Zooplankton Production Methodologies, Applications and Measurements in PICES Regions

Dr. Sastri reported that WG 37 had a successful second-phase practical workshop co-sponsored with the Hakai Institute, from October 12-13, 2019 on Quadra Island, before PICES-2020. WG 37 recently published the following paper in the Bill Peterson Special Issue of *Progress in Oceanography*.

- Evaluation of trade-offs in traditional methodologies for measuring metazooplankton growth rates: Assumptions, advantages and disadvantages for field applications. T. Kobari, A.R. Sastri, L. Yebra, H. Liu, R.R. Hopcroft *Progress in Oceanography* (2019) 178: <https://doi.org/10.1016/j.pocean.2019.102137>

Members of WG 37 partnered with members of PICES AP-NPCOOS (Drs. Toru Kobari and Naoki Yoshie) to organize the "PICES-2020 Spring School on Coastal Ocean Observatory Science" planned for March 4-8, 2020 at Kagoshima University, Kagoshima, Japan. Unfortunately, the spring school was cancelled due to COVID-19 concerns. WG 37 expects to reschedule the school. WG 37 hopes to hold a workshop in 2021 on secondary production and fisheries, and will provide more details when they become available.

FIS – Fishery Science Committee

Dr. Xianshi Jin reported that FIS will sponsor three topic sessions, a FIS paper session and three workshops at PICES 2020, as follow:

- S6: (FIS/POC) Environmental variability and small pelagic fishes in the North Pacific: exploring mechanistic and pragmatic methods for integrating ecosystem considerations into assessment and management
- S14: (FIS) Implementing a collaborative, integrated ecosystem high seas survey program to determine climate/ocean mechanisms affecting the productivity and distribution of salmon and associated pelagic fishes across the North Pacific Ocean
- S15: (FIS/POC) Species migration and shifts responding to climate change: linking physics, plankton dynamics and fish ecology
- FIS-P: Fishery Science Committee Paper Session
- W3: (FIS) Integrating biological research, fisheries science and management of broadly distributed flatfish species across the North Pacific Ocean in the face of climate and environmental variability
- W5: (FIS) Pelagic and forage species – predicting response and evaluating resiliency to environmental variability
- W6: (FIS) Research priorities for understanding the population dynamics of small pelagic fish in the North Pacific

S-CCME: PICES/ICES Section on Climate Change Effects on Marine Ecosystems

Dr. Jin noted that S-CCME's term was extended at PICES-2019 from three to five years phases, so that Phase IV would be from 2021 to 2025.

WG 34: PICES / ISC Working Group on Ocean Conditions and the Distribution and Productivity of Highly Migratory Fish

WG 34 has had a number of significant achievements with respect to its terms of reference, as outlined by Dr. Jin. The group worked to "facilitate communication, regular exchange of information and organization of meetings to discuss and publish data, methodologies and results of research" by presenting at two sessions (TOR#2). WG 34 also worked to identify relevant environmental and distribution data sets for derivation of habitat models for albacore tuna, and other key large pelagic fish species where available. Use of these data to develop habitat models (and quantify model uncertainty) that identify oceanographic conditions that drive distribution of albacore tuna and predict fishery CPUE "hot spots" (TOR#3). They published their results in the ICES Journal of Marine. WG 34 met their goal of holding three workshops, the results of which will be jointly published by PICES and the ISC (TOR#4). Lastly, WG 34 met their publication goals via peer-reviewed papers describing their scientific results (TOR#6). The final report of PICES Working Group 34, as approved by the FIS committee in November of 2019, is expected to be published in the near future (TOR#7). The FIS Committee reported that WG 34 had fulfilled its terms of reference and recommended publication of the final report of WG 34 at PICES-2019. During ISB-2020, it was agreed that it would be useful to add an appendix containing the materials of WG 34's inaugural meeting (Herein after referred to as the "Hawaii Appendix").

Action: Secretariat to add materials from a kickoff meeting as a "Hawaii Appendix" to the final report.

WG 43: PICES/ICES Working Group on Small Pelagic Fish

A kickoff workshop for the working group was held in Copenhagen at ICES Headquarters from March 9-11, 2020, and there have been two working group conference calls to date (March 23 and April 6, 2020). The group is currently working to form three task forces to address key elements of the working group goals, and to scope out activities of each task force and identify project co-leads for each activity. WG 43 is planning a workshop (W6) as well as involvement in a number of topic sessions for PICES-2020, and is working towards convening an international symposium on "Small Pelagic Fish: New Frontiers in Science and Sustainable Management" tentatively proposed to

be held in early December of 2021, perhaps in Barcelona, Spain. It was noted that there is currently a membership imbalance, with ICES members dominating this working group.

HD – Human Dimensions Committee

HD Chair, Dr. Makino, outlined recent HD activities, including completion of the HD chapter of the NPESR report, led by Dr. Keith Criddle. HD was also involved in the planning of the (now postponed) MSEAS-2020 Symposium scheduled to be held in Japan in 2020. A by-product of the postponement of MSEAS-2020 is the HD PICES/ICES Communication Initiative.

Dr. Makino outlined that the Communication Initiative could, in the near future, become an expert group, under co-parents HD and the FUTURE SSC. This group is in the process of drafting its Terms of Reference, and intends to present them at PICES-2020.

Actions:

- SB and FUTURE to work with Early Career Ocean Professional network to develop PICES mentorship framework.
- HD Committee to work with the Secretariat to access previous PICES Abstracts for the PICES Knowledge Map project.

WG 41: Working Group on Marine Ecosystem Services

WG 41 is working on its MES overview paper, with the methodology sections in development and review. Report authors are coordinating via email and conference calls. Scientists have contributed from Canada, China, Japan and USA. The group has also undertaken a web-based survey to quantify the economic valuation of MES. Country specific versions of the survey are being developed and will be pre-tested over the summer, with survey release in the fall of 2020 and final reporting in the winter. It is anticipated that both projects will result in separate publications. WG 41 requests funds for an Inter-sessional Workshop to be held in the Spring of 2021 in Seattle, USA. Robin Brown noted that such requests for funding are generally accompanied by a thorough workshop proposal with well-described activities.

Action:

- WG 41 to provide additional details for an inter-sessional workshop and submit its proposal at PICES-2020.
- WG 41 to review its activities and identify items for the PICES Data Inventory if appropriate.

MEQ – Marine Environmental Quality Committee

Dr. Guangshui Na, MEQ Chair, noted that there have been recent membership changes in MEQ, with Dr. Kazuhiko Mochida replacing Dr. Toyomitsu Horii of Japan, Dr. Akihide Kasai replacing Prof. Ichiro Imai of Japan, and Dr. Pengbin Wang replacing Dr. Douding Lu of China. MEQ has two topic sessions, one workshop, and an MEQ contributed paper session planned for PICES-2020. Dr. Na noted that Dr. Seung-Kyu Kim, a PICES co-convenor, will attend the International Symposium on Plastics in the Arctic and the Sub-Arctic Region in Reykjavik, Iceland, rescheduled for September 28-30, 2020 because of COVID-19.

S-HAB: Section on Ecology of Harmful Algal Blooms in the North Pacific

Several members of this Section authored two papers published in the special issue on "*Climate change and harmful algal blooms*" (C. J. Gobler, ed.) in *Harmful Algae*, 2019, Vol. 91:

1. Future HAB science: Directions and challenges in a changing climate, <https://doi.org/10.1016/j.hal.2019.101632>
2. Pelagic harmful algal blooms and climate change: Lessons from nature's experiments with extremes, <https://doi.org/10.1016/j.hal.2019.03.009>

AP-NIS: Advisory Panel on Marine Non-indigenous Species

While no decisions were required of Science Board, Dr. Na noted that NOWPAP would like to work closely with PICES on eDNA activities.

WG 42: Working Group on Indicators of Marine Plastic Pollution

WG 42 requests additional scientists to fulfill its membership.

Request: Three members from Russia, two from Canada and one from the USA to be added to the WG 42 membership.

WG 30: Working Group on Assessment of Marine Environmental Quality of Radiation around the North Pacific

Dr. Na detailed the status of the Working Group 30 final report and brochure. Dr. Batchelder did not think the brochure met the outreach objectives of PICES. Dr. Trainer instructed Dr. Batchelder to work with WG 30 to revise it. WG 30 is making final revisions and intends to submit its final report to MEQ and the Secretariat ahead of PICES-2020.

Action:

- Dr. Batchelder to work with WG 30 to finalize the brochure.
- Dr. Na to contact Dr. Yusheng Zhang to identify any data or data products for the PICES Data Inventory and supply the information to MEQ and the Secretariat.

POC – Physical Oceanography and Climate

POC Chair, Dr. Emanuele Di Lorenzo, provided an outline of POC's updated Action Plan (2019-2022). POC will meet virtually soon to discuss new expert groups that align with FUTURE and the POC Action Plan.

S-CC: Section on Carbon and Climate

Recent highlights of S-CC:

- J.R. Christian and T. Ono (Eds.) 2019. on Ocean Acidification and De-oxygenation in the North Pacific Ocean PICES Special Publication 5.
- A. Sastri, J. R. Christian et al. Perspectives on in situ sensors for ocean acidification research. *Frontiers in Marine Science* (2019) 6: 653. <https://doi.org/10.3389/fmars.2019.000653>

Upcoming activities include an ICES/PICES Theme Session K at ICES ASC 2020 entitled: "Taking stock of ocean acidification research for provision of future efforts" co-convened by Dr. Tsuneo Ono (postponed to 2021 due to

COVID-2019). S-CC requested funding from Japan in order to undertake an experiment comparing pH and ρCO_2 sensors but has been unsuccessful to date.

Dr. Minhan Dai (China) is stepping down. S-CC suggests the appointment of Dr. Xianghui Guo (Xiamen University).

[Request: S-CC requests the appointment of Dr. Xianghui Guo to replace Dr. Minhan Dai, representing China.](#)

[AP-CREAMS: Advisory Panel for a CREAMS/PICES Program in East Asian Marginal Seas](#)

Dr. Di Lorenzo explained that the AP-CREAMS has been a very long-term panel since October 2005 (renewed at PICES-2019 to October 2024). AP-CREAMS held a workshop at PICES-2019: W4: "Circulation, biogeochemistry, ecosystem, and fisheries of the western North Pacific marginal seas: Past and future of CREAMS" and conducted a joint Korea-Russia cruise in the EAST-I area on the R/V *Akademik Oparin*, October-November 2019.

Upcoming AP-CREAMS activities include an inter-sessional meeting - originally scheduled for May 2020 in Vladivostok, Russia, but currently postponed due to COVID-19. When the meeting is re-scheduled, items for discussion will include broadening the scope of work as part of its revised Terms of Reference. A joint Japan-China-Korea cruise in the EAST-II area, planned for July–September 2020 will also be discussed, along with joint US Naval Research Laboratory-Korea cruises between September 2020 and March 2021. AP-CREAMS will also talk about closer collaborations with other groups in the region, such as WG-06/WESTPAC, NOWPAP and PEACE.

An AP-CREAMS/PICES Summer School on "Ocean turbulence" (Qingdao, August 2020) and support for a NOWPAP training course on "Remote Sensing Data Analysis" (Japan, 2020) have been postponed.

[WG 38: Working Group on Mesoscale and Submesoscale Processes](#)

WG 38 sponsored a POC Topic Session at PICES-2019. Planned upcoming activities include a POC Topic Session at the upcoming PICES 2020 meeting, entitled: "Upper ocean energetics from mesoscale, submesoscale to small-scale turbulence in the North Pacific."

WG 38 has been preparing a review paper "*Review: Oceanic mesoscale processes in the North Pacific: physical and biogeochemical impacts*" to be submitted to *Progress in Oceanography*. The status of the paper is uncertain due to a disagreement in finalization of the paper. POC is working with the WG Co-Chairs to find a resolution.

[WG 40: Working Group on Climate and Ecosystem Predictability](#)

Dr. Di Lorenzo mentioned that POC is very proud of WG 40, which was created in cooperation with CLIVAR. This cooperation has added capacity to the PICES activity.

Recent activities:

- A PICES Press article: Ryakczewski, R. and Capotondi, A., Towards an integrated approach to understanding ecosystem predictability in the North Pacific, PICES Press, Winter 2020, Vol. 28, No. 1, pp. 51-53.
- WG 40 is putting together a Special Issue on "North Pacific Climate and Ecosystem Predictability on Seasonal to Decadal Timescales" in *Frontiers in Marine Science*, which has a total of sixteen submitted papers to date. It is expected that WG 40 will request Science Board approval at PICES 2020, to publish this Special Issue.

Upcoming activities:

- Topic Session (S12) on "Predictions of extreme events in the North Pacific and their incorporation into management strategies." (If PICES-2020 is postponed, WG 40 will discuss restructuring this session.)

MONITOR – Technical Committee on Monitoring

MONITOR Chair, Dr. Sung Yong Kim, relayed that MONITOR recommends the appointment of Dr. Clare Ostle as *ex-officio* member for CPR to MONITOR, replacing Dr. Sonia Batten.

Decision: Science Board recommends appointment of Clare Ostle as *ex-officio* member for CPR to MONITOR.

AP-NPCOOS: Advisory Panel on North Pacific Coastal Observing Systems

The PICES Spring School on “What is the Deep Scattering Layer”, scheduled for March 2–6, 2020 and organized by AP-NPCOOS and WG 37, was cancelled due to COVID-19. Discussions are underway to re-schedule the school.

Dr. Jack Barth and Dr. Sung Yong Kim are stepping down as Co-Chairs. AP-NPCOOS recommends Dr. Kim Juniper (Canada) and Naoki Yoshie (Japan) as next co-chairs, pending GC approval at PICES-2020. SB considered and accepted the nominations of Dr. Juniper and Dr. Yoshie to serve as co-chairs, pending GC approval at PICES-2020.

AP-NPCOOS is preparing a report on the North Pacific entitled “*Spatial and temporal coverage by EO/EBV of long-term sustained coastal ocean observations*” for the upcoming OceanObs Research Coordination Network meeting, subsequent to OceanObs 2019. AP-NPCOOS also had two recent publications:

1. Barth, J. A. et al, 2019: Better Regional Ocean Observing Through Cross-National Cooperation: A Case Study From the Northeast Pacific, *Frontiers in Marine Science*, 6, doi:10.3389/fmars.2019.00093
2. Lee, E. A., S. Y. Kim, and H. S. Min, 2019: Climatological descriptions on regional circulation around the Korean Peninsula, *Tellus A: Dynamic Meteorology and Oceanography*, 71:1, 1 - 22
doi:10.1080/16000870.2019.1604058

TCODE – Technical Committee on Data Exchange

TCODE Chair, Ms. Janette Gann, reported that Mr. Peter Chandler was re-elected as Vice-Chair at PICES-2019 and will continue for one additional year.

A ransomware attack occurred in late 2019 on PICES’ rented server, but Dr. Igor Shevchenko was able to save all metadata records. PICES will terminate its contract with the service provider, who did not back up the server and did not investigate the incident.

TCODE has activities planned for the upcoming UN Decade of Ocean Science, based on a proposal by Dr. Anne Christine Brusendorff (ICES) for an ICES/PICES/NOAA collaborative pilot study in the Arctic. Based on the UN Decade theme of ‘Transparent and Accessible Oceans,’ PICES involvement would include sharing protocols and data hosting. TCODE has agreed to support this project.

Ms. Gann spoke briefly about the PICES TCODE Catalogue Service as a collaborative data portal to host all PICES data products and metadata. It is currently in its testing phase. All PICES participants are invited to register and start their metadata collections or input information to datasets, maps, graphics, expert group outputs, and PICES Digital Document library.

AGENDA ITEM 7 – Expert Group Updates

WG 39: Joint PICES/ICES/PAME Working Group on an Integrated Ecosystem Assessment for the Central Arctic Ocean

Revised terms of reference for WGICA were approved by ICES earlier in 2019 (see Appendix B). Dr. Sei-Ichi Saitoh, WG 39 Co-Chair, presented them to Science Board at PICES-2019, but they were not forwarded to Governing Council for approval at the time.

Activities since PICES-2019:

WG 39 (WGICA) is compiling a first Integrated Ecosystem Assessment (IEA) report titled “Integrated Ecosystem Assessment of the Central Arctic Ocean: ecosystem description and vulnerability characterization”.

Activities planned for 2020:

- A 5th WGICA meeting, from April 27 to April 29, 2020, Copenhagen, Denmark, in conjunction with the UN Decade of Ocean Science Arctic workshop in Copenhagen, from April 28 to May 1, 2020, Copenhagen. (Due to the COVID-19 pandemic, WG 39 will hold its meeting virtually using WebEx).
- UNDOS Arctic workshop has been rescheduled to October 21–23, 2020 in Copenhagen. WG 39 will have a one-day workshop right after the UNDOS Arctic workshop, on October 24, 2020, also in Copenhagen, to follow up on online WGICA workshop and to develop a second IEA report of CAO.
- A final version of the first IEA report will be submitted to ICES and PICES at the end of April.
- WG 39 will hold a half-day Workshop (W4) on “How does the Pacific Arctic gateway affect the marine system in the Central Arctic Ocean (CAO)?” at PICES-2020. Co-convenors are Sei-Ichi Saitoh (Japan), Hyoung-Chul Shin (Korea), Guangshui Na (China), Lisa Eisner (USA), and Libby Logerwell (USA).

Other issues:

The Arctic Monitoring and Assessment Programme (AMAP) would like to join WGICA so we will be “ICES-PICES-PAME-AMAP” joint working group.

Request: Science Board to advise WG 39 how to proceed with the process of joining WGICA.

Recommendation: Science Board recommends GC approval of WG 39 revised terms of reference.

WG-ONCE: ICES/PICES Ocean Negative Carbon Emissions (ONCE)

Hal Batchelder explained that he, Dr. Se-Jong Ju, and Dr. Di Lorenzo had been tasked at PICES-2019 with improving the Terms of Reference for WG ONCE, as Science Board had expressed concerns regarding its membership. Many academics were originally included as potential members, but few government scientists. Science Board agreed that BIO and POC will serve as the parent committees, with S-CC also to be involved, as requested. Dr. Trainer requested that Early Career Ocean Professionals (ECOP) be added to the membership, and that broader communications deliverables, beyond peer-reviewed publications, be included.

Actions:

- Secretariat to work with WG proponents to refine the Terms of Reference and have ready for Science Board approval at PICES-2020;
- Secretariat to work with WG proponents to seek ECOP nominations for membership.

[WG:GRAFY: Joint ICES/PICES Working Group on Impacts of Warming on Growth Rates and Fisheries Yields](#)

Dr. Batchelder provided an overview of the GRAFY working group (see Appendix C), which is strongly linked to elements of the FUTURE Science Program. At Science Board's recommendation at PICES-2019, improvements were made to the Terms of Reference, and proposed membership completed. Dr. Trainer suggested that a broader outreach communications deliverable be added to the ToR's, and that consideration be given to requesting ECOPs join their membership. Science Board suggested that this group also collaborate with WG 43, and consider holding a joint business meeting at PICES-2020.

Decision: Science Board recommends establishment of Working Group GRAFY (WG 45) pending additional terms of reference.

[WG 44: Joint PICES/ICES Working Group on Integrated Ecosystem Assessment for the Northern Bering Sea - Chukchi Sea \(NBS-CS\)](#)

Mr. Brown explained that there was extensive discussion regarding this working group at both Science Board and Governing Council meetings at PICES-2019 before being established at the Meeting. Members are in place, but co-chairs still need to be determined.

[WG-CHANGE: Working Group on Correlating Habitats using Artificial Intelligence, Numerical models and Gathered Empirical Data](#)

Information on WG CHANGE was provided to Science Board for their reference and further discussions will take place during PICES-2020.

[SG-IMCE: Study Group on Impacts of Mariculture on Coastal Ecosystems](#)

Mr. Brown noted that at the MEQ workshop (W19) on "The impacts of mariculture to coastal systems" at PICES-2019, the group was unable to reach consensus on the direction to pursue for a working group.

Action: Science Board Chair, Secretariat, to work with SG-ICME to determine the focus for a WG, by PICES-2020..

[Revising Section and Advisory Panel Terms from three to five years](#)

Science Board discussed extending the interval for reviewing Sections and Advisory Panels from every three years to every five years. Dr. Batchelder explained that Sections were originally reviewed at five years, and that the longer duration is appropriate for Sections, due to the large volume of work they are required to complete. Dr. Alex Bychkov provided additional clarification that Sections originally had five-year periods before they were reviewed by the parent Committee(s) and reauthorized by Science Board, but this had been amended to three years in the Rules of Procedure by Governing Council at PICES-2010. In 2015 the interval for review was changed back to 5 years in the Rules of Procedure. Dr. Trainer agreed with Dr. Bychkov and Dr. Batchelder that it is appropriate for Sections to continue five-year terms before being reauthorized.

Decision: Science Board Recommends to Governing Council that Sections and Advisory Panels, be amended to five year terms.

Action: Executive Secretary to review Rules and provide proposed amendments to GC for review at PICES-2020.

AGENDA ITEM 8 – Committee Action Plans - Do we need them?

Dr. Trainer introduced an Action Plan example, and Science Board members discussed the intent and utility of Action Plans.

Decision: Science Board supports review and updating of Action Plans once every three years.

AGENDA ITEM 9 – Third North Pacific Ecosystem Status Report

Dr. Batten provided an overview of the form and status of the Third North Pacific Ecosystem Status Report (NPESR3). There was consensus that its publication in a timely manner is important. The review process was discussed, and Mr. Robin Brown explained the purpose of the NPESR Editorial Board as a vehicle for ensuring broad input from all Committees and Expert Groups.

Decision: Science Board recommends publication of: NPESR3 Synthesis report in hard copy as PICES Special Publication 7 and as an online PDF version, subject to final editing by report editors, and pending review of Parent Committees and sign off by the Editorial Board.

Action: Editorial Board to review the regional chapters for online publication and submit to Science Board for approval prior to PICES-2020,.

AGENDA ITEM 10 – Greener PICES Meetings

Dr. Trainer introduced the concept of greener meetings. There was agreement among Science Board members that this direction is positive and necessary. It was noted that: technology for having remote meetings is improving; it is important that PICES set an example with respect to lowering carbon emissions with its meetings; more frequent virtual meetings may make PICES work more efficient, particularly for working groups and committees; increased participation may be possible for those with disabilities, or lower incomes that would normally preclude them from attendance at physical PICES meetings.

Actions:

- Science Board Chair and Secretariat to discuss options and provide recommendations for greener PICES meetings by PICES-2020;
- Science Board to send suggestions to the PICES Executive Secretary with respect to greener meetings by PICES-2020;
- Secretariat to document carbon savings for PICES-2020;
- Science Board to advise Secretariat of any good carbon calculators they find.
- Dr. DiLorenzo to provide the Secretariat with a carbon calculator developed by his team.

AGENDA ITEM 11 –PICES-2020 Update

Dr. Batchelder provided a brief update on the planning for PICES-2020. PICES Chair, Dr. Chul Park, stated that a decision regarding the status PICES-2020 would be forthcoming.

AGENDA ITEM 12 – UN Ocean Decade

Dr. Erin Satterthwaite presented on "The Contribution of Early Career Ocean Professionals (ECOPs) to the UN Decade of Ocean Science for Sustainable Development (2021-2030)." A self-organized group of ECOPs has organized and formed a diverse worldwide working group. Early initiatives have included a global survey of ECOPs to

collect views to incorporate into planning for the UNDOS. The ECOP group has also requested ECOP representation at UNDOS planning meetings. The group is hoping to increase communication and collaboration, enhance training and mentorship opportunities, provide a sharing portal for professional development and partnerships, and to share funding opportunities for ECOPs. The group intends to hold an ECOP workshop at PICES-2020 (VW9, (FUTURE): Building a PICES early career professional network) which will aim to make recommendations for increased ECOP engagement and contributions to PICES. The ECOP network is currently formalizing its plans and vision statement. Science Board members offered encouragement to this group, and requested that Dr. Satterthwaite and her group reach out if they were in need of any assistance from PICES.

Dr. Bograd provided an overview of planning to date for the UNDOS. Recently, the first draft of a planning document was released by the UN for public comment. Due to COVID-19, the deadline for comments was extended to late April. The window for comments has now closed and comments received are being incorporated into the next draft of the Implementation Plan. The UN has stated that it wants to ensure that the projects undertaken in relation to UNDOS be "Transformative" science. The intention is that at the end of UNDOS, our global oceans will be in a much better state than they are currently.

Dr. Bograd explained the planning and structure of UNDOS and PICES/ICES cooperation initiatives to date. The UN has identified a number of levels of contribution that individuals or organizations can make towards UNDOS. These range from contributions (monetary or in-kind) to activities, projects, or, the most significant category: programmes. Initial discussions, in partnership with ICES, have helped FUTURE to determine that due to its interdisciplinary global network of scientists and institutions, PICES is well positioned to propose a programme for UNDOS. To this end, ICES/PICES drafted a joint statement on UNDOS, and are collaborating on a draft strategic plan for PICES/ICES UNDOS activities. In addition, they have provided joint comments on the UNDOS Implementation Plan and on the Decade of Ocean Science. A letter sent to both organizations requested both organizations review the *Draft Implementation Plan* for UNDOS; review joint ICES/PICES activities to determine alignment with UNDOS themes and goals; and, consider support for future joint ICES/PICES UNDOS activities.

[AGENDA ITEM 13 – FUTURE OPEN SCIENCE MEETING](#)

Planning is in progress for the next FUTURE Open Science Meeting, scheduled for 2022. Additional details for the conference will be available at PICES-2020.

[AGENDA ITEM 14 – PICES-sponsored conferences / Symposia](#)

[ECCW05 International Symposium on the Effects of Climate Change on the World's Oceans](#)

Mr. Brown outlined that Science Board would need to identify PICES members for the leadership team of the 5th International Symposium on "The effects of climate change on the world's oceans", which is to be held in Bergen, Norway in May of 2023.

Action: SB to determine a PICES organizer and PICES SSC member, in cooperation with FUTURE and S-CCME prior to PICES-2020.

[PICES International Year of the Salmon \(IYS\)](#)

Dr. Batchelder provided an update on the International Year of the Salmon, which is part of a five-year plan to investigate the distribution of salmon across the North Pacific. The first major field year was 2019, and the planning group has held successful meetings. Additional field seasons are planned, based on the progress made so far. This activity is a joint NPAFC/PICES activity, and PICES' role is to provide information and guidance. It is likely that the results of the salmon research conducted will be presented at PICES-2020.

ICES / PICES ZPS7 (7th Zooplankton Production Symposium)

The seventh Zooplankton Production Symposium is scheduled to be held in Hobart, Tasmania, in March of 2022, hosted by CSIRO. Science Board is expected to identify PICES members to serve on the Scientific Steering Committee for this symposium. The Local Organizing Committee has requested a Zooplankton Ecologist from BIO, and would also like to have an SSC member from China.

Action: Dr. Batchelder to contact BIO to determine appropriate representation for the ZPS7 SSC prior to PICES-2020.

International Symposium on Small Pelagic Fish

Discussions on dates (due to COVID-19) and location are currently being discussed by WGSPF Co-chairs. It is hoped that additional details will be provided by PICES-2020. The Symposium may be delayed until Spring of 2022.

AGENDA ITEM 15 – Capacity Building

Dr. Batchelder presented details of the Early Career Scientist Conference, which is expected to be held in partnership with ICES in 2022 in Eastern Canada. It is expected to attract more than 120 people, with two concurrent sessions of early career scientist presentations. The approximate budget will be \$70,000. Mr. Brown noted that this conference is important because of its timing and its Ocean Decade theme, which fits well with UNDOS planning.

Action: Science Board to identify PICES ECOP members for the Scientific Steering Committee by PICES-2020.

Two additional schools have been postponed. Science Board discussion of these has been tabled to PICES 2020:

- IMBeR ClimEco7 Summer School, likely to be held in Vancouver in 2021;
- PICES/AP-CREAMS Summer School on Ocean Turbulence.

Mr. Brown noted that the AP-CREAMS Summer School proposal needs additional work in order to be supportable.

Action: Science Board to work with AP-CREAMS to enhance their proposal, for review at PICES- 2020.

AGENDA ITEM 16 – PICES-2022

Mr. Brown outlined for Science Board that earlier plans for holding a joint PICES/ICES science conference in 2022 may be premature, due to COVID-19. Although discussions are ongoing, it appears that this meeting will be shifted to 2023. However, he noted, the FUTURE SSC and ISB-2020 conference calls have shown that it is possible to complete business meetings by conference call, meaning the future focus of the planned meetings could be on the progress of PICES/ICES science. Science Board discussed the importance of an ICES/PICES joint meeting to ensure institutional bridge-building, and to solidify work in partnership. Dr. Trainer pointed out that this meeting will be particularly relevant in light of UNDOS.

AGENDA ITEM 17 – PICES Publications

Dr. Batchelder reviewed with Science Board the provided updated table of PICES publications, noting that there have been significant achievements by PICES members with respect to the volume of recent publications. Of note, Dr. Batchelder highlighted that there have recently been several "Special Issues" published, including: two in *Deep- Sea Research II*, and one each in *Marine Ecology Progress Series*, and *ICES Journal of Marine Science*.

In progress is also a Special Issue on *Environmental Pollution*, based on review papers written by Working Group 42. A decision on publication of this issue is expected by Science Board at PICES 2020, and further information will be available at that time.

Recommendation: Science Board recommends publication of the following volume:

- *Frontiers in Marine Science* special issue on North Pacific Climate and Ecosystem Predictability on Seasonal to Decadal Timescales resulting from the 2019 Qingdao workshop and papers from the PICES-2019 Annual Meeting in Victoria. Editors: S. Minobe, A. Capotondi, F. Chai, M. Jacox, M Nonaka, and R. Rykaczewski.

Actions:

- HD to review FishGIS project final report, and provide recommendations to SB by PICES-2020;
- Dr. Trainer to work with the Secretariat to complete the FishGIS brochure;
- Secretariat to work with WG 30 to finalize the WG 30 brochure.

AGENDA ITEM 18 --PICES ISB-2021

As the Inter-sessional Science Board video conference calls were running late, and as there was ongoing uncertainty regarding future meetings due to the COVID-19 pandemic, Dr. Trainer stated that discussions regarding ISB-2021 would be deferred for future discussion until PICES-2020.

Action: Science Board to discuss time and venue of ISB-2021 at PICES-2020.

AGENDA ITEM 19 – Virtual Science Board Meetings

The Science Board had a broad discussion on initial thoughts on the effectiveness of the use of video-conferencing tools to facilitate Science Board meetings. There was general agreement that the Secretariat had done a very good job of being well prepared for these meetings, that the meetings ran smoothly, and that participants were able to accomplish the tasks at hand. Dr. Trainer thanked the participants for their willingness to participate in the meetings from many different time zones. Dr. Chul Park echoed Dr. Trainer's sentiment, expressed his thanks to the Secretariat, and suggested that video-conferencing platforms may work for larger meetings. Science Board members noted that it may be necessary in the near future to explore other platforms, as Zoom may be disallowed by some PICES member agencies. Suggested alternatives included: Google, Skype, and WebEx. It was noted that the Zoom platform worked well, and that having the chat box as a way of being able to see and track decisions was helpful for some non-native English speakers. The advantage of video-conferencing as a way of allowing differently-abled persons to participate, and for people who might otherwise be unable to participate due to financial reasons were also noted. It was acknowledged that these meetings require a large amount of preparation on the part of the Secretariat. Dr. Sonia Batten, Executive Secretary, noted that because an Annual Meeting has many sessions, the total time needed by the Secretariat for preparation would need to be considered. Lastly, a concern was expressed that a higher degree of control over participants may need to be exerted to avoid problems such as "Zoom-bombing," the recent phenomena of an uninvited disruptive intrusion of an individual into a video conference call.

AGENDA ITEM 20 – Code of Ethics for the Operations of PICES

At PICES-2019, the Governing Council declared that a Code of Ethics for the operations of PICES (members and Secretariat staff) be developed to promote the fair, transparent and equitable treatment of all participants. Council directed the Executive Secretary to work with Science Board Chair and F&A to review best practices, policies and experience of similar organizations, and to draft new policies and practices for discussion at ISB-2020 and by

correspondence between ISB-2020 and PICES-2020. At the end of the Intersessional Science Board meeting calls, there was insufficient time to discuss the Code of Ethics.

Action: Secretariat to follow up with respect to this agenda item by correspondence and potentially an additional video conference call.

AGENDA ITEM 21 – Science Board / Governing Council Decisions

The out-going Executive Secretary, Mr. Robin Brown, stated that the Secretariat would follow up with correspondence in the near future to provide an overview of the status of implementation of SB / GC decisions from ISB-2019 and PICES-2019.

Action: Secretariat to provide an overview of the status of implementation of SB / GC decisions from PICES-2019.

AGENDA ITEM 22 – PICES Partners List for Science Board Review

The Science Board Chair noted that the Partners List would be updated at PICES-2020, and that reviewing and giving consideration to Partner organizations is a particularly important activity in order to ensure that the list is current moving into the UN Decade of Ocean Science. PICES will seek to engage additional partners in order to increase scientific capacity and to have a positive global impact in the coming decade, and the Partners List is designed as a tool to assist the partnership process.

Action: Science Board to

1. Review the list of Partner organizations and programs relevant to PICES; and,
2. Provide any recommended additions to Lori.Waters@pices.int prior to PICES-2020.

//end.

APPENDIX A – Video Conference Details

Call times:

The video-conference call times are shown in Table 1. These times were the best compromise for all of the included time zones, and that the three-hour duration of the calls was appropriate. Holding the calls at the times outlined meant that it was neither too late nor too early for any participant. The exception to this was one ICES Guest calling in from Europe who had to call in in the middle of the night local time. Managing for time zones will continue to be an important consideration if PICES continues to hold meetings in this way - as it may become the "new normal" following the COVID-19 pandemic and with the drive for "greener" meetings.

Location	Start Time, local (All days)	ISB Day One (local date)	ISB Day Three (local date)
Atlanta (US East Coast); [UTC-4]	9:00 PM	29 April (local Wed)	1 May (local Fri)
Sidney, BC (US West Coast); [UTC-7]	6:00 PM	29 April (local Wed)	1 May (local Fri)
Vladivostok (Eastern Russia); [UTC+10]	11:00 AM	30 April (local Thu)	2 May (local Sat)
Seoul (South Korea); [UTC+9]	10:00 AM	30 April (local Thu)	2 May (local Sat)
Yokohama (Japan); [UTC+9]	10:00 AM	30 April (local Thu)	2 May (local Sat)
Qingdao (China); [UTC+8]	9:00 AM	30 April (local Thu)	2 May (local Sat)

Held over three days, the three-hour video-conferences covered an ambitious agenda, incorporating the majority of items normally covered during a face-to-face Intersessional meeting. Details on each agenda item follow.

Voting

Voting at the ISB was conducted using the "Chat" function in the Zoom video-conferencing interface. The requests were put in writing to the Science Board by the recorder within the "Chat" window, and each of the SB voting members registered their votes as "yes" or "no". The Secretariat renamed participants as they initially joined the meeting, so when members voted, it was easy to associate their votes with the committee for which they were voting. This method worked well and gave the Secretariat a simple way of ensuring that votes were recorded when the "Chat" records were saved at the close of each videoconference meeting session.

Call Protocol

The following call protocol was discussed at the outset of the meeting and was used throughout the meetings to help ensure efficient discussions. This approach worked well and is recommended for other PICES groups contemplating regular videoconference meetings.

To help us have successful Zoom meetings, please observe the following videoconferencing practices:

1. Test your microphone and video settings beforehand at <https://zoom.us/test> to ensure all technical aspects are working properly;
2. If you can, connect to the internet via an ethernet cable, to ensure the best quality connection;
3. Because we are compressing a normal 3-day Science Board meeting into 9 hours of video conferencing, it is critical that participants have become familiar with the agenda and briefing materials. If we cannot address the issues in the allotted time, we may have to defer some agenda items to a subsequent (additional) web conference session;
4. Please connect to the meeting 10 to 15 minutes in advance of the start time, This will provide an opportunity to work out any "bugs" in the connection;
5. Set up in a quiet location and silence personal devices before you join each video call;
6. Remove distractions, and, if possible, avoid multitasking during call, such as eating, checking email/phone/web;

7. The Chair will guide a round of individual introductions;
8. Mute your microphone when you're not speaking;
9. Please be aware that PICES intends to record this meeting;
10. Please open each of these Zoom feature windows during the call, in order to access the additional functionality described below:
 - o **"Participants"** - allows you to: see who is in the meeting; who is sharing their desktop; who has "raised their hand". At the bottom of this feature, you will see that you can raise and lower your hand to ask a question. You can also change how your name appears in the meeting by clicking on the "more ..." by your video, and selecting "rename." Please use your full name for the purposes of these meetings;
 - o **"Chat"** - allows chatting with individual or all participants, file and URL sharing as described below. This can be very useful if you are experiencing technical problems.
 - o Primary video window - allows you to see other participants, as well as presentations and files being shared to the meeting.
11. Please familiarize yourself with the use of the following Zoom functions:
 - o "Raise your hand": if you wish to ask a question - this function will be used for the Chair to organize the sequence of speaking;
 - o "Chat": if you wish to chat with individual members or with everyone in the meeting;
 - o Sharing URL's: URL's can be shared with the group by pasting them into chat messages;
 - o "Share file" - send files during the meeting using the share file function within the chat window;
 - o Share screen: allows you to share your screen with everyone in the meeting when requested to do so by the meeting host.
12. If you/we start to experience bandwidth problems, it may be necessary to disable/shut down your video.
13. This is an experiment for PICES. Please keep track of what works and what doesn't work. We plan to conclude each session with a short discussion on this, with the objective of making improvements as we go along.

Instructions/Invitation for joining the virtual meeting will be sent to you by email prior to each meeting. Please be on the lookout for these instructions. If you need to use an email address that differs from the one listed for you on the Science Board webpage (<https://meetings.pices.int/members/committees/SB>) please let us know.

APPENDIX B – Working Group 39 Revised Terms of Reference

Original, 2016

1. Consider approach and methodology (-ies) for doing an IEA for the CAO
2. Assemble data and information and carry out appropriate statistical and other types of analyses including mathematical modelling
3. Prepare an IEA outline for the current status of the CAO ecosystem (CAO LME and adjacent slope waters including Atlantic and Pacific inflows and relevant shelf-basin exchanges) and effects, potential effects and vulnerability in relation to climate variability and change and human activities such as Arctic shipping and potential future fisheries
4. Consider requirements and design of monitoring of the CAO to meet the need for repeated IEA in the near future as well as other types of assessments (which can be modular components of IEAs)
5. Identify priority research issues which, when addressed, can improve the knowledge base for the future iterations of the IEA

Revised, 2019

1. Review and consider approaches and methodologies for conducting an IEA of the CAO ecosystem;
2. Review and report on ongoing and recent changes and events in the CAO ecosystem associated with changes such as in sea ice, oceanographic circulation, and hydrographic properties;
3. Continue to examine the effects of climate change on the CAO ecosystem by compiling and reviewing information on changes in response to the ongoing 'Great melt', and assess likely consequences to the CAO ecosystem of projected future changes associated with further loss of sea ice and other climate-related changes (i.e., a climate impact assessment);
4. Assess the consequences of recent and ongoing climatic and oceanographic changes on transport pathways (physical and biological) and potential effects of contaminants in the CAO ecosystem;
5. Review and report on new studies on fish as well as other biological components of the CAO ecosystem;
6. Continue to identify priority research needs and monitor how identified knowledge gaps (needed to improve IEA and management effectiveness) are being addressed and filled;
7. Prepare an Ecosystem Overview for the CAO ecosystem.

APPENDIX C – Working Group WG GRAFY

WG GRAFY: Joint ICES/PICES Working Group on Impacts of Warming on Growth Rates and Fisheries Yields

Group Type: Working Group

Group Name: Joint ICES/PICES Working Group on Impacts of Warming on Growth Rates and Fisheries Yields

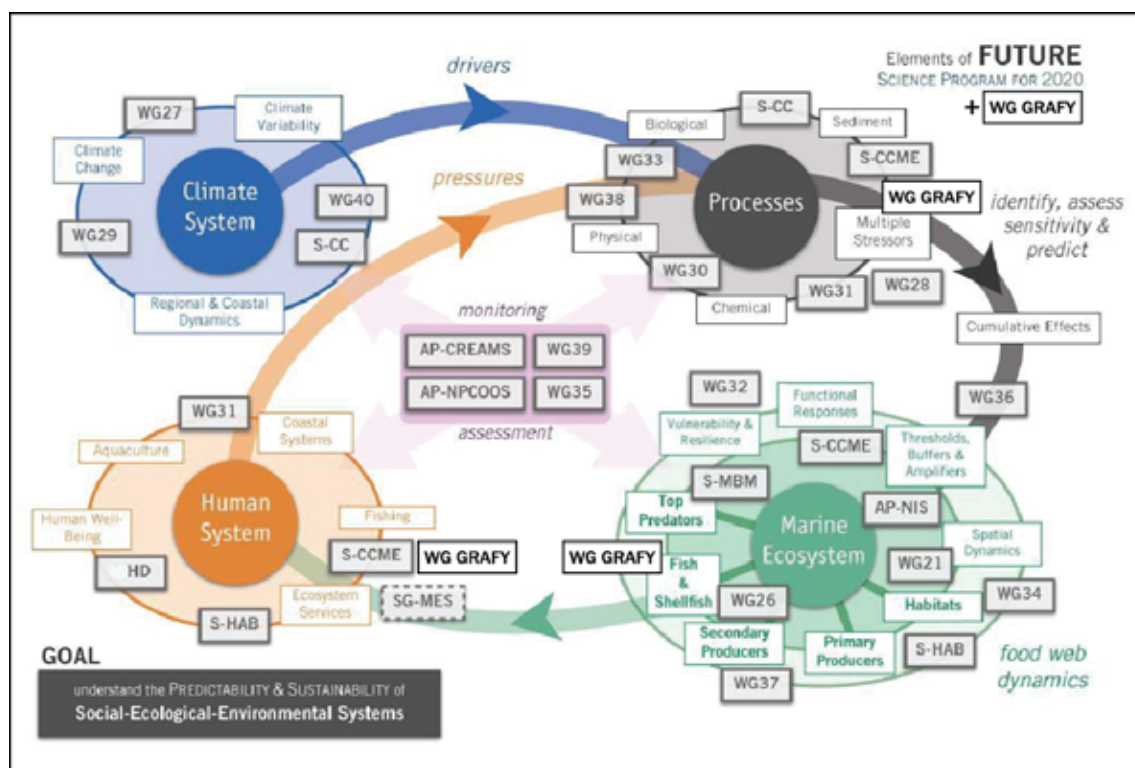
Reporting to: FIS

Term: October 2020 – October 2023

Linkage(s) to previous PICES Expert Groups or activities (if any): None

Linkage(s) to other organizations and programs (if any): : Joint ICES-PICES WG; administered in ICES by the Ecosystem Processes and Dynamics Steering Group chaired by Dr. Silvana Birchenough (<http://www.ices.dk/community/groups/Pages/WGGRAF.Y.aspx>)

Linkage/Contributions to the FUTURE program (if any): WGGRAF.Y will contribute to address the second key question of FUTURE “How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?” by identifying whether temporal trends in individual growth rates of marine fish are consistent with the Temperature Size Rule. WGGRAF.Y will contribute to better understanding of processes of marine ecosystems, improvement of projection skill of fish responses, and advise for future fisheries yields. The outputs from WGGRAF.Y will contribute to S-CCME (Climate Change Effects on Marine Ecosystems) and WG-40 (Climate and Ecosystem Predictability).



WG GRAFY Linkage/Contributions to the FUTURE program (if any): WGGRAF.Y will contribute to address the second key question of FUTURE “How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?” by identifying whether temporal trends in individual growth rates of marine fish are consistent with the Temperature Size Rule. WGGRAF.Y will contribute to better understanding of processes of marine ecosystems, improvement of projection skill of fish responses, and advise for future fisheries yields. WGGRAF.Y outputs will contribute to S-CCME (Climate Change Effects on Marine Ecosystems) and WG-40 (Climate and Ecosystem Predictability).

Motivation and Goals and/or Background: The Temperature Size Rule (TSR) proposes that fish living

at warmer temperatures will have rapid early growth but lower adult size (Forster et al. 2012). Several North Sea fish stocks have exhibited a synchronous, common trend towards smaller maximum body sizes that was correlated with increasing temperature. This “shrinking” decreased per-capita yields of those stocks by ca. 23% (Baudron et al. 2014). Similarly, it has been projected that by 2050 global fish yields will decrease by 14-24% due to shifting biogeography and the TSR (Cheung et al 2012). Forecasting climate impacts on food security require establishing how past warming has impacted fish growth rates and subsequently fisheries yield.

The aim of WGGRIFY is to determine whether temporal trends in individual growth rates of marine fish are consistent with the TSR and, if so, evaluate the impacts of these responses for fisheries yields. Length and age have been routinely measured for many commercial fish stocks around the world on time scales that are associated with warming. These substantial data have never been compiled as a single, analytical resource for climate change research on global scales.

The WG will compile decadal-scale length at age datasets for large marine ecosystems experiencing differential rates of warming or cooling or no overall trend (e.g., upwelling regions). A standardized statistical approach for modelling average somatic growth will be developed to specifically test whether there is a component of the total variation in growth rates that can be attributed to temperature. This knowledge could provide an empirical foundation for forecasting the impacts of future climate warming on yields.

The unique spatial and temporal scale of length-at-age data are a valuable resource for ecological research. The WG will also develop a strategic plan for archiving length-at-age data similar to how ICES archives data for European waters (Datras) or how global data on recruitment and catch are reported and maintained (e.g., RAM Legacy). This strategic plan will require active and considered engagement with a range of agencies (ICES, EMODnet, FAO, universities, tech specialists) and national fisheries laboratories as well as potential funding sources. In addition, contribution of PICES WG-43 (Joint PICES/ICES Working Group on Small Pelagic Fish) is expected.

Terms of Reference:

- 1) Assess the capacity of statistical models to incorporate temperature-dependency of growth, and compare their predictions of growth variation across specific warming scenarios and locations. **Output/deliverable expected is a paper suitable for a peer-reviewed fish journal.**
- 2) Analyse long-term growth patterns across multiple large marine ecosystems that are experiencing different trends in temperature, including the direct comparison of empirical length at age data for specific species across their range, and the application of a common modelling approach. **Output/deliverable expected is a peer-reviewed paper in a high impact journal.**
- 3) Assess the impacts of warming on past yield per recruit of commercial fisheries, and forecast trends in future yield under plausible warming scenarios. **Output/deliverable expected is a peer-reviewed paper in a high impact journal.**
- 4) Identify options for expanding scientific community access to global length-at-age data that are routinely collected by fisheries agencies worldwide. **Output/deliverable expected is a strategic plan assessing options for enhancing access to length-at-age data collected routinely.**

The ToRs describe a program of coordinated research to be undertaken by a global network of scientists. The ToRs have been developed jointly through discussions at an earlier workshop on fish growth and distribution, held in Aberdeen, Scotland in November, 2018 (<https://fiscot.org/wp-content/uploads/2019/07/FIS028.pdf>). Given the specific nature of the ToRs it is the intention of the

co-chairs to minimize the need for face-to-face meetings. Progress on the ToRs will be accomplished by audio-video conference calls supplemented by email and skype. WG meetings will be scheduled to coincide with other international meetings that the co-chairs are attending. Meetings will use video conferencing to allow other WG members to participate remotely. This has several practical advantages. It minimizes the requirement for WG participants to secure the substantial funding required for international travel. Secondly, it reduces carbon emissions of the WG thereby constituting a more climate-friendly program of research. This working practice will be a challenge but is logical given that the WG concerns climate impacts.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2019	September	ICES ASC, Sweden		Information meeting was held with co-chairs and prospective members attending the ASC. Strategy for securing participants meeting WG needs was discussed
Year 2020 (Year 1)	September	TBA		(ICES ASC- progress reporting on ToR activities; chairs attend, optional attendance by member)
Year 2021 (Year 2)	October	TBA		(PICES ASC- progress reporting on ToR activities; chairs attend, optional attendance by member)
Year 2022 (Year 3)	September	TBA		(ICES ASC- progress reporting on ToR activities; chairs attend, optional attendance by member)
Year 2022	November	Seattle, Washington (proposed)		Final meeting to complete publications (ToRs a,b,c) and strategy document (ToRd)
Final report by December 2023				

Proposed membership:

Members of the WG will come from both ICES and PICES communities as well as a broader array of global scientists from regional seas experiencing warming, cooling or upwelling who hold longterm length-at-age data (e.g., Australia). Bold font in the list below indicates people who have confirmed their interest in participating in the Working Group.

Canada: Joanna Bernhardt (PICES/ICES, University of British Columbia), William Cheung (PICES/ICES, University of British Columbia), **Rick Rideout (PICES/ICES, Department of Fisheries and Oceans, St. Johns)**, **Sean Anderson (PICES/ICES, Department of Fisheries and Oceans, Nanaimo)**

China: **Yongjun Tian (Ocean University of China)**, **Yue Jin (Yellow Sea Fisheries Research Institute)**

Japan: **Shin-ichi Ito (PICES, University of Tokyo)**, **Kunihiro Fujiwara (Japan Fisheries Research and Education Agency)**, **Takeshi Tomiyama (Hiroshima University)**

Korea: **Sukgeun Jung (PICES, Jeju National University)**, **Jung Jin Kim (National Institute of Fisheries Science)**

Russia: Yury Zuenko (PICES)

USA: Tim Essington (PICES/ICES, University of Washington), Alan Haynie (PICES/ICES, NOAA-Alaska Fisheries Science Center), Christine Stawitz (PICES/ICES, NOAA-Office of Science and Technology), James Thorson (NOAA-Alaska Fisheries Science Center), Melissa Haltuch (NOAA-Northwest Fisheries Science Center), Tim Miller (NOAA-Northeast Fisheries Science Center), Robert Allman (NOAA-Southeast Fisheries Science Center), Tom Helser (NOAA-Alaska Fisheries Science Center), **Paul Spencer (NOAA-Alaska Fisheries Science Center)**, Malin Pinsky (Rutgers University)

ICES countries: **Alan Baudron (Marine Scotland Science, United Kingdom)**, **Tara Marshall (University of Aberdeen, United Kingdom)**, Bryony Townhill (CEFAS, United Kingdom), John Pinnegar (CEFAS, United Kingdom), Einar Hjørleifsson (Marine Research Institute, Iceland), Myron Peck (University of Hamburg, Germany)

Non-PICES and non-ICES countries: **John Morrongiello (University of Melbourne, Australia)**, Asta Audzionyte (University of Tasmania, Australia)

Proposed leadership: C. Tara Marshall (UK, ICES), Paul Spencer, (USA, PICES), Alan Baudron (ICES), Shin-ichi Ito (Japan, PICES) and John Morrongiello (Australia, Guest).

List of potential members from PICES countries for Joint ICES/PICES Working Group WGGRAFY

Name	Country	Email	Current member of ICES WGGRAFY? (if yes, role and affiliation recognized by ICES)
Paul Spencer	USA	paul.spencer@noaa.gov	Yes – (co-chair, PICES)
Alan Haynie	USA	alan.haynie@noaa.gov	Yes – (member, PICES)
Christine Stawitz	USA	christine.stawitz@noaa.gov	Yes – (member, PICES)
James Thorson	USA	james.thorson@noaa.gov	Yes – (member, PICES)
Melissa Haltuch	USA	melissa.haltuch@noaa.gov	Yes – (member, PICES)
Robert Allman	USA	robert.allman@noaa.gov	Yes – (member, PICES)
Tim Miller	USA	timothy.j.miller@noaa.gov	Yes – (member, PICES)
Malin Pinsky	USA	malin.pinsky@rutgers.edu	Yes – (member, ICES)
Tim Essington	USA	essing@uw.edu	Yes – (member, ICES)
Tom Helser	USA	thomas.helser@noaa.gov	No
William Cheung	Canada	w.cheung@oceans.ubc.ca	Yes – (member, PICES)
Johanna Bernhardt	Canada	joey.bernhardt@biodiversity.ubc.ca	Yes – (member, PICES)
Sean Anderson	Canada	Sean.Anderson@dfo-mpo.gc.ca	No
Rick Rideout	Canada	Rick.Rideout@dfo-mpo.gc.ca	No
Yongjun Tian	China	yjtian@ouc.edu.cn	No
Yue Jin	China	jinyue@ysfri.ac.cn	No
Shin-ichi Ito	Japan	goito@aori.u-tokyo.ac.jp	No
Kunihiro Fujiwara	Japan	fujikuni@affrc.go.jp	No
Takeshi Tomiyama	Japan	tomiyaama@hiroshima-u.ac.jp	No
Yury Zuenko	Russia	Zuenko_yury@hotmail.com	No
Sukgeun Jung	South Korea	sukgeun.jung@gmail.com	No
Jung Jin Kim	South Korea	king.jungjin@korea.kr	No

List of current non-PICES members of ICES Working Group WGGRAFY

Name	Country	Email	Current member of ICES WGGRAFY? (if yes, role and affiliation recognized by ICES)
Tara Marshall	United Kingdom	c.t.marshall@abdn.ac.uk	Yes – (co-chair, ICES)
Alan Baudron	United Kingdom	Alan.Baudron@gov.scot	Yes – (co-chair, ICES)
Bryony Townhill	United Kingdom	bryony.townhill@cefas.co.uk	Yes – (member, ICES)
John Pinnegar	United Kingdom	john.pinnegar@cefas.co.uk	Yes – (member, ICES)
Einar Hjorleifsson	Iceland	einar.hjorleifsson@gmail.com	Yes – (member, ICES)
Myron Peck	Germany	myron.peck@uni-hamburg.de	Yes – (member, ICES)
John Morrongiello	Australia	john.morrongiello@unimelb.edu.au	Yes – (co-chair, external)
Asta Audzijinyte	Australia	asta.audzijonyte@utas.edu.au	Yes – (member)

References:

Baudron, A.R., Needle, C.L., Rijnsdorp, A., Marshall, C.T. 2014. Warming temperatures and smaller body sizes: synchronous changes in growth of North Sea fishes. *Global Change Biology* 20: 1023-1031.

Cheung, W. W. L., et al. 2012. Shrinking of fishes exacerbates impacts of global ocean changes on marine ecosystems. *Nature Climate Change*, 3:254–258.

Forster, J., Hirst, A.G., Atkinson, D. 2012. Warming-induced reductions in body size are greater in aquatic than terrestrial species. *PNAS* 109:19310 LP-19314.