2022 Science Board Meeting Report

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

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Agenda item 1: Welcome, adoption of agenda

→ SB to review agenda, note revisions and additions

The Science Board Chair, Dr. Vera Trainer, called the meeting to order, welcome participants, and make introductions. The agenda will be reviewed, and any adjustments/amendments will be made before the meeting commences. The list of participants follows (five participants joined remotely).

List of Participants

Science Board	
Vera Trainer	Science Board Chair
Igor Shevchenko (online)	Science Board Vice-Chair
Steven Bograd	FUTURE SSC Co-Chair
Sukyung Kang	FUTURE SSC Co-Chair, Science Board Chair-Elect
Akash Sastri	BIO Chair
Xianshi Jin (online)	FIS Chair
Mitsutaku Makino	HD Chair
Andrew Ross	MEQ Vice Chair
Emanuele Di Lorenzo	POC Chair
Sung Yong Kim	MONITOR Chair
Jeanette Gann (online)	TCODE Chair
*Governing Council	
Enrique Curchitser	PICES Chair
Tetsuo Fujii	PICES Vice-Chair
PICES Secretariat	
Sonia Batten	Executive Secretary
Sanae Chiba	Deputy Executive Secretary
Lori Waters	Communication Officer
Invited Guests	
Robin Brown	BECI
Janelle Curtis	NPFC, WG47 Chair
Jörn Schmidt (online)	ICES
Tatsuki Oshima	F&A
Hannah Lachance	AP-ECOP
Hana Matsubara	AP-ECOP
Raphael Kevin Roman	AP-ECOP
Taewon Kim	Project SEAturtle
Seiichi Saitoh	WG39 Chair
Lis Lindal Jørgensen	WG39 Chair

Agenda Item 2: Reports of PICES Strategic Partners

2.1. North Pacific Fisheries Commission (NPFC)

The chair of the NPFC Scientific Committee and WG47, Dr. Janelle Curtis, updated the working relationship and activities currently underway between PICES and the NPFC, as part of the PICES–NPFC Framework for Enhanced Scientific Collaboration in the North Pacific (link).

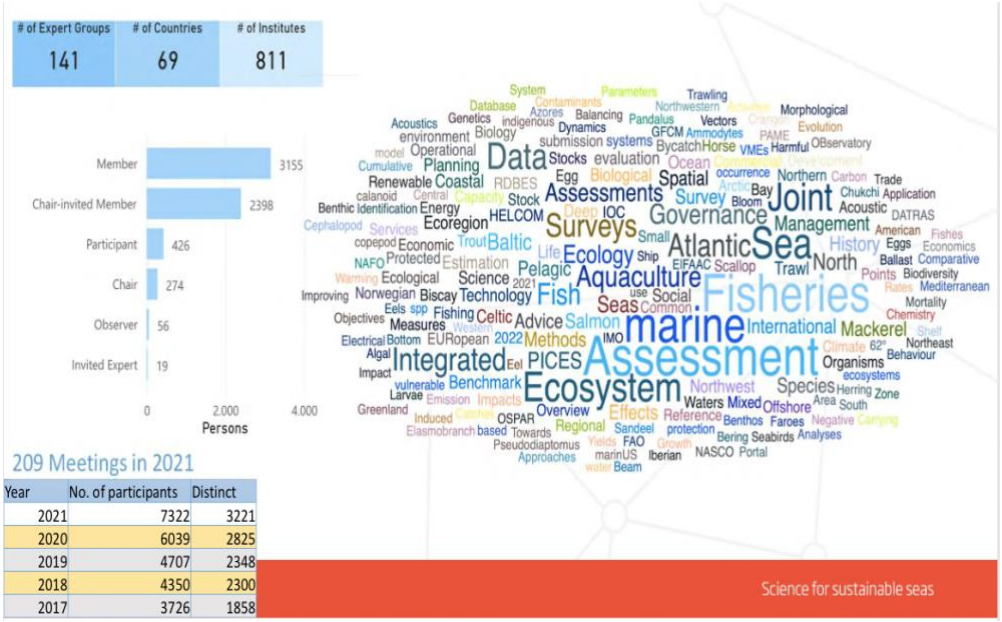
The collaboration includes Joint Expert Groups, WG-43: Small Pelagic Fish. NPFC and PICES regularly co-sponsor international symposia and sessions and workshops at each other's meetings. In 2022, NPFC co-sponsored PICES-ICES-FAO Small Pelagic Fish Symposium in Lisbon, and the topic session "Environmental variability and small pelagic fishes in the North Pacific: exploring mechanistic and pragmatic methods for integrating ecosystem considerations into assessment and management" at PICES-2022. They also submitted a joint Topic Session and Workshop on the biodiversity of seamounts (*SB recommended merging these proposals to develop one Topic Session, see **Agenda item 15**).

The planning of the joint Capacity Development event: international workshop on Vulnerable Marine Ecosystem (VME) indicator taxa identification, for which each organization committed to fund US$15K, was postponed to 2023.

2.2. International Council for the Exploration of the Sea (ICES)

ICES Science Committee Chair, Dr. Jörn Schmidt, remotely participated in SB. He reviewed the organizational structure and science plan of ICES and updated its major activities in 2022 - 2024.

ICES and PICES organized/will organise multiple International Symposia including ECS Conference in Newfoundland in July 2022, Small Pelagic Fish Symposium (Lisbon, November 2022), Effect of Climate Change on the World's Ocean (Bergen, May 2023), Marine Socio-Ecological System Symposium (Yokohama in 2024), and Zooplankton Production Symposium (Hobart, March 2024). Under the scope of SmartNet, ICES and PICES further promote joint research on common interests such as climate-fisheries nexus and SEES, and develop strategies for facilitating cross-cutting themes, such as early career promotion, capacity development and engagement of local and traditional knowledge, e.g. of the circumpolar indigenous community. ICES, as well as PICES, expands its partnership beyond the conventional North Atlantic ecoregions including Southern Hemisphere countries.



ICES Science network in 2022

Dr. Schmidt encouraged PICES scientists to co-convene Sessions of ICS Annual Science Conference which will be held in Bilbao for Sept 11-14, 2023.

Agenda Item 3: Proposal of collaboration with PICES strategic partners

3. 1. Basin Scale Events to Coastal Impacts (BECI) Project

Summary:

The PICES ex-officio and the BECI project liaison, Mr. Robin Brown, updated the current status of BECI, to seek continuous support of and collaboration with PICES. At PICES-2022, Mr. Brown made presentations to various expert groups besides Science Board and Governing Council. Science Board reviewed the status and progress of the BECI project and recommended PICES's support for the continued collaboration with BECI in the development of a new PICES Special Project. Whilst agreeing with the concept and scientific value of the project, some members questioned the uncertainty of its funding status as BECI cannot become a PICES Special Project without the funding secured.

Background:

at SB 2021, Science Board Recommends that PICES support the continued development of the BECI project proposal, and that NPAFC/BECI be requested to submit a full proposal for PICES consideration as a PICES Special Project. GC approved the continued development of the NPAFC/BECI program, and that NPAFC/BECI be requested to submit a full proposal for consideration as a PICES Special Project (**GC 2021/S/5)**

Brief Status Report:

BECI is a UN Decade of Ocean Science-endorsed Project submitted by the North Pacific Anadromous Fish Commission (NPAFC) and the North Pacific Marine Science Organization (PICES). BECI aims to develop an ocean Intelligence system for a changing North Pacific Ocean.

BECI builds on the recent successes of the International Year of the Salmon project (link) but extends to a much larger community of partners/interested parties and a larger "chunk" of marine ecosystems.

In the last year, a small BECI team supported by Fisheries and Oceans Canada, PICES, NPAFC, the Pacific Salmon Foundation and Long Live the Kings has been consulting broadly across intergovernmental organizations, NGOs, government agencies, academics, Indigenous organizations, and private sector partners to get input to the B ECI science plan, gauge interest and build support. A series of successful expert virtual workshops were conducted to get expert advice on what we know, what we don't know and how to bridge this gap in four areas:

1. Climate and ocean modelling
2. Linking ocean and fish production
3. Technology and tools for monitoring
4. Data mobilization and synthesis

3. 2. Asia-Pacific Network for Global Change Research (APN)

Summary:

PICES Executive Secretary and Co-chair of the Joint APN-PICES Study Group on Scientific Cooperation in the Pacific Ocean (SG-PICES-APN), Dr. Sonia Batten, presented the collaborative framework developed by the Study Group. Science Board reviewed the framework and recommended that PICES enhance collaboration with APN in the areas of joint interest to both organisations in the next five years. Dr. Batten also reported the first in-person meeting with two APN representatives during the PICES-2022 which was held to further discuss the implementation plan of the prioritized areas of collaboration.

APN-PICES Collaborative Framework for Scientific Cooperation

SG-PICES-APN developed a framework that strives to enhance collaboration between the two organizations. This collaborative framework identifies several broad areas of joint interest to PICES and APN on which progress could be made over the next five years, which included extreme climate events and their impact on coastal communities,

marine plastic pollution and incorporation of local and traditional knowledge. The framework identifies various mechanisms for implementing enhanced collaboration between PICES and APN including workshops and joint working groups, topic sessions at PICES Annual Meetings, and representation at each other's meetings and/or workshops. See the Framework (**Appendix 1**) for more details.

3. 3. Pacific Salmon Commission (PSC)

Summary:

FIS Committee Chair, Dr. Xianshi Jin, presented the Framework for Enhanced Cooperation in the North Pacific Ocean Between PSC and PICES, which was developed by the Joint PSC-PICES Study Group on Scientific Cooperation in the North Pacific Ocean (SG-SCPSC). Science Board reviewed the Framework for enhanced cooperation between PSC and PICES and recommended GC approve the **MOU** for implementation of the framework.

Framework for Enhanced Cooperation in the North Pacific Ocean between PSC and PICES

SG-SCPSC agreed on the need for a formal framework to guide, develop, implement, and monitor activities between PICES and PSC in the area of scientific cooperation. The framework describes various collaborative mechanisms that can be followed, including sharing of data, information and methodologies, access to training and education opportunities, joint expert group, joint workshops, seminars and symposia, theme sessions at PICES annual meetings, and joint strategic initiatives.

The SG-SCPSC recommended that the framework for enhanced collaboration be implemented immediately after approval of the **MOU** by both organizations. Any initiative pursued under the MOU and this framework must be approved by the respective governing bodies in each organization prior to initiation and/or expenditure of funds. See the Framework (**Appendix 2)** for the details.

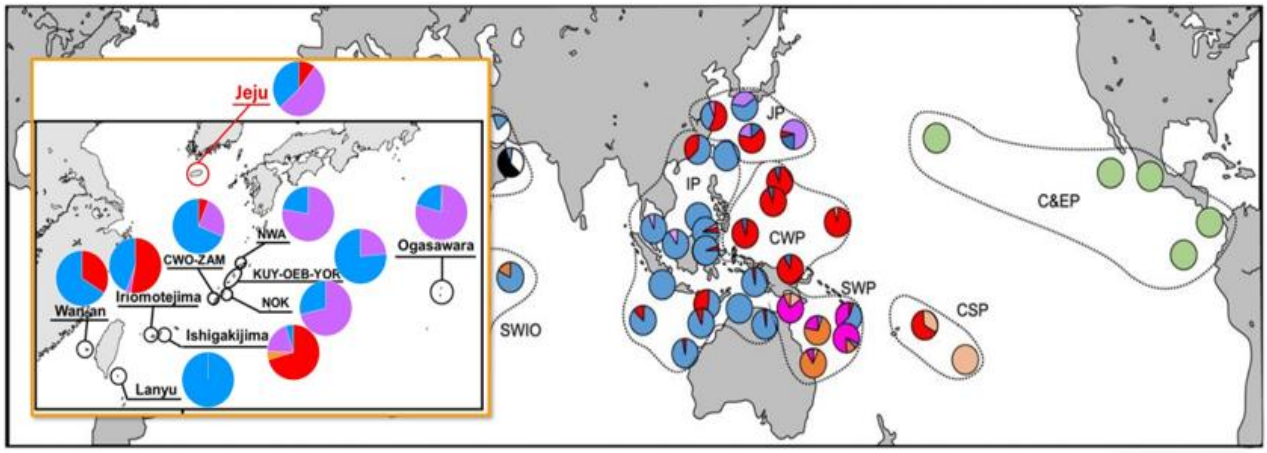
Agenda Item 4: Special Project Updates

1. SEAturtle: Sea turtle ecology in relation to environmental stressors in the North Pacific region

- **Term**: December 2018 – November 30, 2023 (one-year extension of the term was approved by the funder)
- **Project Science Team Co-Chairs**:
  Taewon Kim (Inha University, Korea)
  George Balazs (Golden Honu Services of Oceania, USA)
- **Funder**: the Ministry of Oceans and Fisheries of Korea
- **Parent PICES Committee**: Biological Oceanography Committee (BIO)
- https://meetings.pices.int/projects/SEAturtle

Dr. Taewon Kim, SEAturtle Science Team Co-chair, updated the progress of the project since ISB-2022. The project has been extended one year through November 2023 with additional funding.
They conducted tagging survey, genetic survey, stable isotope analysis, and the impact of marine plastic pollution. Tagging survey of a total of 16 turtles near Jeju island revealed their migration routes, diving physiology, and overwintering strategy. The genetic information of stranded turtles indicates their connection to Japanese and Southern China populations. From stable Isotope ratio of barnacles attached to turtle shells, water temperature of the migration routes of turtles. Observing the recreational fishing gear as a serious threat to the turtle population around the area, the project team conducted an educational campaign for local citizens.

SB recommended the team communicate with WG42 on the influence of marine microplastic on sea turtles.



Proportion of Population ancestry of green turtles

2. Ciguatera: Building Local Warning Networks for the Detection and Human Dimension of Ciguatera Fish Poisoning in Indonesian Communities

- **Term:** April 2020 – March 2023
- **Project Science Team Co-Chairs**:
  Mitsutaku Makino (Atmosphere and Ocean Research Institute, The University of Tokyo, Japan)
  Mark Wells (University of Maine, USA)
- **Project Coordinator**: Alexander Bychkov (PICES)
- **Funder**: Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA)
- **Parent PICES Committee**: Human Dimensions Committee (HD)
- https://meetings.pices.int/projects/Ciguatera

Project Science Team Co-chair and HD Chair, Dr. Mitsutaku Makino updated the progress of the project since ISB-2022. Though the team still could not visit the local partners in Indonesia due to the Covid travel restriction, they held an in-person meeting at PICES-2022.

The goal of the project is to build the capacity of local small-scale fishers in Indonesia using Smartphone applications to assess ecosystems and detect toxic dinoflagellates, to avoid Ciguatera intoxication of fisheries products. The team developed the mobile application in local languages for local fishermen to be able to share. However, due to the challenge in travel to and communicating with the local community, Indonesian research institutes teamed up to implement field data collection under the agreement on MOU between PICES and Institute Teknologi Indonesia (ITT). They have conducted field monitoring of toxic dinoflagellates and food safety surveys at local reef fish markets. In January 2023, they plan to organize a capacity development workshop in Indonesia for engagement of the local community to monitoring activities. See the "Interim Scientific progress report for Year 2-3 (April 1, 2021 – August 15, 2022)" (**Appendix 3**) for the details.

Agenda Item 5: Science and Technology Annual Report

Science Board (SB), FUTURE and Committees reported and reviewed scientific achievements and progress on Terms of Reference of the respective Children Expert Groups since PICES-2021 as shown in the Briefing Book. See **Appendix 4** for the Reporting Committee list. TCODE Chair, Ms. Jeanette Gann, updated the TCODE activities and planning on PICES data sharing strategies and protocols which were discussed during the **W10**: SB/TCODE/MONITOR/FUTURE Topic Workshop "Openly Discoverable, Accessible, and Reusable Data and Information in the U.N. Decade". The workshop outcome led to the proposal of the new Study Group on encouraging Data Awareness and increased Transmission and Accessibility (**SG-DATA**).

Agenda Item 6: FUTURE-SSC Report

FUTURE Co-Chair, Dr. Steven Bograd, updated activities and planning of FUTURE.

"Future of FUTURE" meeting
Following the recommendation at ISB-2022, FUTURE SSC held a joint online meeting with SB on August 8th, to discuss its strategic plan toward the end of Phase II (Future of FUTURE) and how to synergize its activities with SmartNet/AP-UNDOS. It was suggested to establish a scheme for enhancing cross-pollination with AP-ECOP and AP-SciCom. A new FUTURE science plan was suggested to develop around 2025 – 2027.

FUTURE SSC meeting
FUTURE SSC held a one-day hybrid business meeting during PICES-2022. Upon the appointment of Dr. Sukyung Kang as the new SB Chair at the end of PICES-2022, Dr. Hanna Na was elected as the new FUTURE Co-Chair. Dr. Kang stays as a FUTURE member. Dr. Vera Trainer joined FUTURE SSC. FUTURE-EGs liaison table will be revised according to member changes. The timeline for FUTURE Phase II Final Report was discussed. To finalise the peer-reviewed journal paper based on the FUTURE Product matrix, they plan to hold an intersessional meeting, preferably in person. SSC discussed the possibility of holding the FUTURE Open Science Meeting in conjunction with the MSEAS Symposium in June 2024 in Yokohama, or alternatively with the UNDOS Assembly in 2025 in China.

Agenda Item 7: SmartNet/IPOD Report

AP-UNDOS Co-Chair, Dr. Steven Bograd, updated activities and planning of SmartNet.
Major activities completed as of PICES-2022 are as follows.

- Participation in UNDOS 'Blue Foods' Community of Practice (**Jan 2022**)
- Participated in OSM-Ocean KAN Town Halls (**Feb-Mar 2022**) Co-Chair
- Update IPOD/SmartNet material on ICES and PICES websites (**Mar-Apr 2022**)
- Launch of PICES AP-UNDOS (**Apr 2022**)
- Coordination with Tula Foundation – Decade Collaborative Center (**Apr 2022**)
- Participate in Consortium for Ocean Leadership 'Workshop to Coordinate Biological Observing Programs in UNDOS' in DC (**Apr 2022**)
- SmartNet video for UNDOS Stakeholders (**May 2022**)
- Submitted resource needs assessment to UNDOS (**May 2022**)
- Organized UNDOS Satellite event "Productive Ocean" Town Hall (**May-Jun 2022**)

- Organize & conduct PICES-2022 SmartNet Workshop (**Sep 2022**)

Upcoming activities for 2022-2023 are as follows

- Review proposed Projects for UNDOS endorsement (**Oct 2022**)
- Prepare contribution to 'Food for Thought' article for *ICES Journal of Marine Science* (**2023**)
- Contribute to UNDOS National Surveys led by the HD group (**2022-2023**)
- Prepare ECCWO UNDOS co-design workshop (**Oct 2022-Apr 2023**)
- Planning and organization of Workshops on community engagement at PICES-2023 (**2022-2023**)
- Prepare SmartNet Implementation Plan (including Phase I action plan, products & deliverables) (**Dec 2022-**)

SmartNet Program Structural Landscape and Strategy

Dr. Bograd stressed SmartNet's aim to expand the network beyond the conventional PICES regions and existing partners including ICES. SmartNet has reached out to the Decade Coordination Centre at the Tula Foundation and APN on collaboration with indigenous communities in the eastern North Pacific and Asian/South Pacific countries and planned to hold a joint workshop at PICES-2023. SmartNet has expanded its network to other UNDOS-endorsed programmes/projects including GEOS, MarineLife2030 and SUPREME. Dr. Bograd also mentioned they started communication with Dr. Jhugree (Hakai Institute) on capacity development at Mauritius, one of the Small Island Developing states (SIDs).

AP-UNDOS and PICES EGs

SB members raised questions on the ambiguity of how AP-UNDOS, SmartNet SC on the PICES side, would facilitate and integrate UNDOS-relevant activities of PICES EGs though the role is stated on its TOR. SB discussed the need for the establishment of an effective framework and protocol for AP-UNDOS and EGs to catalyse PICES science to address UNDOS challenges and outcomes, e.g. establishment of joint EGs under SmartNet/AP-UNDOS, the appointment of EG liaisons and/or ex-officio members in AP-UNDOS. It was also suggested that SmartNet have an official protocol to report their activities to PICES Communities including GC. The discussion led to the following proposal to GC.

Proposal of SmartNet to become a PICES Program

Science Board members questioned the ambiguity in the status of SmartNet, the joint ICES/PICES UNDOS endorsed programme, in the PICES science scheme, including clarification of task sharing with FUTURE. SB discussed the measure and mechanism to enhance the visibility of SmartNet activities in the PICES community and synergise its activities with FUTURE and EGs. Given that there was currently no member representing SmartNet in SB, SB agreed to recommend SmartNet, be approved as a PICES Program. This will allow SmartNet to have representation including a vote on SB, and also facilitate:

1) EGs to become joint with SmartNet or other UN Decade programmes, under the advice of AP-UNDOS.

2) EGs to invite international members or institutions into the EGs as ex-officio members to expand the impact of their work. An example is WG49 on Climate Extremes and their desire to involve members from the South Pacific.

3) The EGs may consider developing specific UNDOS-endorsed projects, should they be able to secure national/international funds.

Note: At GC-2022, Governing Council did not accept the recommendation for SmartNet to be a PICES Program because its implementation plan is still premature to submit a proposal to be the Program. However, GC supported the PICES SmartNet chairs (AP-IPOD chairs) regularly to join SB as the observer(s). The protocol for AP-UNDOS to facilitate and integrate EGs' UNDOS-relevant activities must be developed.

Agenda Item 8: Election of SB Vice-Chair

Upon the appointment of the new SB Chair, Sukyung Kang (Korea) at the end of PICES-2022, the new SB Vice-Chair should be elected from amongst the SB members representing the eastern North Pacific side. The term of the SB Vice-Chair is one year until the end of PICES-2023. Science Board elected Ms. Jeanette Gann (TCODE Chair, USA) as the Science Board Vice-Chair and recommended GC approve her appointment (PICES Rules of Procedure 12.ii). Upon the current SB Vice-Chair, Dr. Igor Shevchenko stepping down, the Science Board requested GC appoint an SB member representing Russia according to the PICES Rules of Procedure 12.iii.

PICES Rules of Procedure 12: Science Board

ii. the Vice-Chair of the Science Board shall be elected from amongst the members of the Science Board for a term of one year and shall be eligible for re-election for a successive term. The Vice-Chair will normally reside on the opposite side of the Pacific to the Science Board Chair. The Vice-Chair shall act as Chair whenever the Chair is unable to act;

iii. should a Contracting Party have no representation on the Science Board via committee or program Chairship, it may appoint a suitably qualified member;

Agenda Item 9: Committee Chair Election Results

PICES Deputy Exceptive Secretary, Dr. Sanae Chiba reported the election of the new Committee Chairs and Vice-chairs which took place during PICES-2022 according to the PICES Rule of Procedure 17ii. Science Board reviewed the election results and recommended GC approve the appointment of the new chairs as listed.

PICES Rules of Procedure: Rule 17 ii (Link)
The Chair of a Scientific Committee or Technical Committee shall be elected by its members from among its members for a term of three years, shall assume office at the conclusion of the Annual Meeting at which elected, and shall be eligible for re-election for one consecutive term.

	Date of Election	New Chairs
BIO	28 Sept.	Dr. Akash Sastri (Canada) was re-elected for a second 3-year term as the Chair of BIO Committee Dr. David Kimmel (USA) was elected as the new Vice Chair of BIO Committee *interim until the Vice-chair fiom the western NP side is identified.
HD	28 Sept.	Dr. Mitsutaku Makino (Japan) was re-elected for a second 3-year term as the Chair of HD Committee Dr. Karen Hunter (Canada) was re-elected for a second 3-year term as the Vice Chair of HD Committee
POC	25 Sept.	Dr. Lei Zhou (China) was elected as the new Chair of POC Committee.
MONITOR	28 Sept	Dr. Sung Yong Kim (Korea) was re-elected for a second 3-year term as the Chair of MONITOR Committee Dr. Kym Corporon Jacobson was elected as the new Vice Chair of MONITOR Committee.
TCODE	15 Sept	Ms Jeanette Gann was re-elected for a second 3-year term as the Chair of TCODE Committee.

Agenda Item 10：EG Proposals for SB Recommendation - with a funding request

10.1. Support for Capacity Development event of partner organization

Science Board reviewed the funding support request and recommended GC approve the travel support of up to EUR 5000 for 2-3 ECOPs from PICES member countries to participate in the GOOD-OARS Summer School

GOOD-OARS Summer School (Appendix 5)
November 6 – 12, 2023, Coquimbo-La Serena, Chile
Sponsor: OARS (Global Acidification Research for Sustainability)
GOOD (Global Ocean Oxygen Decade)

10.2 Proposal for Capacity Development Event organized or co-organized by PICES EGs

AP-ECOP Co-chair, Dr. Hannah Lachance presented the proposal of the Virtual International Open Science Training proposed and requested the travel fund for the selected participants to attend at PICES-2023 to demonstrate the obtained skill though the training. Science Board suggested they seek matching fund to invite participants from non-PICES countries. Though the event is open to non-ECOP participants, too, SB agreed to support travel of ECOPs only. SB recommended GC approve the support of the implementation of the virtual International Open Science Training. SB suggested AP-ECOP seek funding sources of FUTURE SEES if needed.

Event title / Date / Location	Date/Location	Amounts and rationale of fund requested
EG (reporting Committee): AP-ECOP (FUTURE)		
Virtual International Open Science Training Goal: make work more accessible as a whole, through training on data sharing, communications, and collaborations between disciplines, sectors, and cultural contexts. This training aims to break down language and data sharing barriers. See **Full Proposal** for details	Spring/Summer2023 Virtual	CA$ 7000 support travel for 2 ECOP participants of this workshop to attend the PICES 2023 meeting to ensure that fruitful discussions and lessons learned can be shared and incorporated into other parts of PICES and that the training can continue through PICES 2023 co-sponsors (TBC): TCODE; AP-SciCom; ECOP Programme, HD (TBC), FUTURE (TBC)
EG (reporting Committee): AP-NIS (MEQ)		
Joint PICES-NOWPAP Training on eDNA * This is to confirm the formerly approved proposal (GC 2020/S/10) The event has been postponed and no new date has been announced yet.	Japan?	CA$ 6000 Travel support for up to 2 ECS from eastern Pacific to participate in NOWPAP-led training course on eDNA.

Draft proposal - International Open Science Training
Building *effective international collaborations* for ocean sustainability

Co-Conveners: Hannah Lachance (AP-ECOP); Tammy Norgard (AP-SciCom); Jeanette Gann (TCODE); Emily Lemagie (AP-UNDOS); Evgeniia Kostianaia and/or Raphael Roman (ECOP Programme); Aoi Sugimoto? (TBC) (human dimension committee); Leslie Smith (DOOS)

Objective: Open science and multilingual knowledge sharing is foundational to develop novel solutions to global environmental challenges. This is essential if we want to increase and strengthen transdisciplinary scientific cooperation and trust beyond national borders, by integrating culturally diverse perspectives and practices into our conventional work models. This proposed training series will provide discussion and training on how to ensure successful international collaborations from the start to the end. This training would be open to all career stages, countries, ocean disciplines and would include components on how to form and maintain a robust, diverse collaboration team, ensure best data/code practices are being used, and that the results are being communicated to the correct audiences. By drawing from existing trainings/resources and efforts (i.e. Openscapes; Journal publications; Open Science) we hope to create a unique and comprehensive training that would foster enhanced collaborative science between disciplines, sectors and cultural contexts. To ensure this training could be as accessible to all PICES member countries (and beyond!) as possible, this training aims to break down language and data sharing barriers at all steps from designing the training , advertising the training, implementing the training, and communicating the outputs of the training.

Time (approximate): TBD - Between annual meetings (Spring/Summer2023? Potentially during August-September before the PICES 2023 conference; needs to be confirmed with co-conveners)

Location: Virtual and at PICES 2023 (pre-Annual workshop)

Rough plan (what to do and how):

- Host one 3-hour session and two 2-hour sessions on each of the following topics:
    - International Collaboration/Science diplomacy (connect to UN Decade session/workshop at PICES 2023) *(extra hour for thorough roundtable introductions)*
    - International data best practices (connect to TCODE study group and the International Ocean Best Practices group)
    - Communications (how to highlight your work during and after the collaboration - connect to the PICES 2023 fact sheet workshop)
- Each session would include a panel made up of a PICES member from each member country and from one UN Decade program sharing the unique aspects of how collaborations, data best practices and communication work in their country. The second hour will be discussions amongst participants to allow for networking, brainstorming, etc. around how to break down barriers that PICES professionals face when trying to ensure that successful, interdisciplinary, international and open science is conducted.
- The panelists could be a mix of career stages to diversify the perspectives, methods and provide an excellent leadership opportunity for well qualified individuals.

Expected outcome: Participants will walk away with a new or refreshed set of skills to foster enhanced international collaborations within and beyond PICES EGs. The participants will also receive a certificate of completion. Additionally, a summary of key take-aways could be constructed and provided as guidance for future PICES collaborations (publicly accessible on the PICES website).

Expected participants:

- Interested PICES members from all career stages, backgrounds, countries, etc.
- Interested participants from beyond PICES could include SIDS, ICES, countries in the southern hemisphere, and other UN Ocean Decade Programmes (e.g., DOOS), etc.

How do you advertise the events to include diverse participants:

- Advertise through PICES listserve and be clear that this training is for all career stages (ECOPs - LCOPs); all backgrounds (beginners-experts); and all disciplines
- Advertise through UN Decade listserves/newsletters/stakeholder groups
    - ECOP Programme listserve & social media (Twitter, LinkedIn, Instagram, WeChat)
- Advertise through partner groups (i.e. ICES group, DOOS, APN?)
- Social media - share through PICES social media and have re-shared/re-tweeted by partner organizations (i.e. ICES; Deep Ocean Observing Strategy DOERs Program, ECOP Programme and other UN Decade Actions, Global Stakeholder Forum)
- Targeted outreach to specific partners (i.e. SIDS, Traditional knowledge holders)
- Other professional networks/societies (e.g., TOS, Black in Marine Science)

Amount of the fund to request: CA$7,000; funding to support travel for 2 participants of this workshop to attend the PICES 2023 meeting to ensure that fruitful discussions and lessons learned can be shared and incorporated into other parts of PICES and that the training can continue through PICES 2023.

Breakdown of the fund to request: CA$ 3,500 per person for 2 participants' travel (this won't cover everything but will help).

Agenda Item 10 (Continued)

10.3 Proposal for Travel Support

Science Board reviewed the proposed travel fund requests and recommended GC approve the funding for the travel below. To equitably allocate the travel funding among ECOPs, SB asked Secretariat to ascertain the name and eligibility of the candidate awardees provided by respective EGs.

Travel funding support for PICES scientist(s) who convene or be invited to the Sessions/Workshops relevant to EG's activities at the international meeting(s) etc. other than PICES Annual Meeting.

EG (reporting Committee): S-CC (POC)		
Conference information	**Recipient information**	**Amount and rational of fund request**
5th International Symposium on the Effects of Climate Change on the World's Oceans 17 - 21Apr. 2023, Bergen, Norway	Tsuneo Ono (tono@fra.affrc.go.jp) *Steering committee of this symposium, convene session	CA$ 2745 (flight: NRT-BGO 2345) (Accommodation 100CA$ x 4day) SB recommends securing his own funding if possible.
EG (reporting Committee): AP-UNDOS (SB)		
Conference information	**Recipient information**	**Amount and rational of fund request**
5th International Symposium on the Effects of Climate Change on the World's Oceans 17 - 21Apr. 2023, Bergen, Norway	Name (TBC) 2 ECOPs from PICES countries	CA$ 6000
EG (reporting Committee): AP-NIS (MEQ)		
Conference information	**Recipient information**	**Amount and rational of fund request**
PICES-ICES workshop on eDNA. Washington DC/May 2023 (before/after the ICMB-XI but a different meeting)	Name (TBC) 1 ECOP from PICES countries and/or Session /Workshop convenor	CA$ 3000 SB recommended partial support for 1 ECOP participant (originally requested for 2)
EG (reporting Committee): S-HAB (MEQ)		
Conference information	**Recipient information**	**Amount and rational of fund request**
IOC bi-annual meeting of the Intergovernmental Panel on Harmful Algal Blooms (IPHAB) Spring, 2023, IOC Headquarters, Paris	TBD (1 S-HAB member)	(CA$) $3,000
EG (reporting Committee): AP-NIS (MEQ)		
Conference information	**Recipient information**	**Amount and rational of fund request**
International Conference on Marine Bioinvasions ICMB-XI, Washington DC/ May 2023. The event has been postponed, but a new date is confirmed.	Name (TBC) 1 ECOP or Session /Workshop convenor	CA$ 3000 * this is to confirm the formerly approved proposal (GC 2020/S/10)

Agenda Item 11: EG Proposals for SB Recommendation - without funding request

11.1. Membership Needs/Change

Science Board acknowledged the membership requests of each EG and asked the national delegates to consider accelerating the membership appointment process. SB requested that GC appoints EG members ***within one month*** of this request to avoid delays and EG progress. To accelerate the process, SB Vice Chair, Dr. Igor Shevchenko suggested EGs identify the new members and receive their agreement to join the groups before submitting the membership request to the national delegates, and SB appreciated the suggestion.

Issues on the delay of EG membership appointment.

When SB recommends the establishment of new EGs with a suggested list of members, the official appointment of the members by member countries often takes a long time, sometimes even more than 6 months despite repetitive requests for a membership decision by the Executive Secretary. This has caused serious delays in the launch of EG activities and stagnation in their implementation plan. SB request the GC and national delegates consider this situation seriously and accelerate the decision-making process of the submitted membership requests.

EG (Reporting Committee)	Country	Name/Organizations if identified
AP-ECOP (FUTURE)	Russia	1-2 members
AP-NPCOOS (MONITOR)	China	1-2 members. No Chinese members have participated in AP-NPCOOS meetings since 2019
AP-UNDOS (SB)	China Canada Korea Russia	Li Li, First Institute of Oceanography Raphael Roman (ECOP), IOC-UNESCO Sukyung Kang, NIFS, Hanna Na, Seoul National University, Sinjae Yoo, KIOST Evgenia Kostianaia (ECOP), UNDOS, Igor Shevchenko, TINRO
S-CCME (FIS)	Canada	Patrick O'hara replacing Jackie King
AP-NIS	China	Aibin Zhen
AP-SciCom	Japan	Natsuko Nakayama, FRA
S-HAB (MEQ)	Canada	Charles Trick, U Toronto, to replace Dr. Andrea Locke. Dr. Trick has participated in S-HAB on behalf of Canada for over a decade without formal recognition or travel support. Svetlana Esenkulova from the Pacific Salmon Foundation to replace Nicola Haigh.
SG-GREEN	Canada Japan USA Korea Others	1 member (TBC), DFO (TBC), FRA Erin Satterthwaite, UCSD, Mark Wells, Univ. Maine Jae-Hyoung Park, Sung Yong, Kim Lori Waters, PICES Secretariat, Robin Brown, Emeritus
WG48	USA Canada	Sabrina Groves, University of Maryland, ECOP (PhD student) Joe Needva Paul Covert,
WG47	Canada	Patrick O'hara, Canadian Wildlife Service, to replace Dr. Cherisse Du Preez
WG49	Canada Ex officio:	Jennifer Jackson, Hakai Institute Antonietta Capotondi, CLIVAR
MEQ	Russia USA	1-2 members, Matt Savoca
MONITOR	China	1-2 members
FUTURE	USA	Vera Trainer, NOAA

Agenda Item 11 (Continued)

11. 2. Change of EG Chairs

Science Board reported the changes of Expert Group chairs and recommended GC approve the appointment of new chairs as listed.

EG (Reporting Committee)	Current Chair to replace	New Chair Name/Country/Organization
SG-GREEN	New Chair	Vera Trainer, USA, Vera.L.Trainer@noaa.gov
AP-ECOP (FUTURE)	Additional chair (4th chair)	Hana Matsubara, Japan, hmatsubara@g.ecc.u-tokyo.ac.jp
AP-SciCom (SB)	Additional chair (represent WNP)	Natsuko Nakayama, Japan, nnakayama@affrc.go.jp *Upon her membership appointment
AP-UNDOS (SB)	New chairs	Steven Bograd, USA, steven.bograd@noaa.gov Sanae Chiba, Secretariat, sanae.chiba@pices.int
AP-NIS	2nd Chair (represent WNP)	Aibin Zhan, China, Chinese Academy of Fisheries Science, azhan@rcees.ac.cn *Upon her membership appointment
S-MBM (BIO)	Kaoru Hattori, Japan	Miran Kim, Korea seabirds.lab.korea@gmail.com
WG48 (BIO)	Additional chairs (2nd and 3rd)	Xuemin Cheng, China, chengxm@sz.tsinghua.edu.cn David Kimmel, USA, david.kimmel@noaa.gov
WG49 (FUTURE)	New Chairs (currently no chairs)	Karen Hunter, Canada, karen.hunter@dfo-mpo.gc.ca Helen Killeen, USA, ECOP, hjkilleen@ucdavis.edu Chan Joo Jang, Korea, cjjang@kiost.ac.kr Hiroki Wakamatsu, Japan, ECOP, hwakamatsu@affrc.go.jp Antonietta Capotondi, CLIVAR *Upon her membership appointment
WG50 (POC)	New Chair (2nd Chair)	Yisen Zhong, China yisen.zhong@sjtu.edu.cn
FUTURE	Sukyung Kang	Hanna Na, Korea, hanna.ocean@snu.ac.kr
*upon approval of the new EGs and EG membership		
WG-Human Network	New Chairs	Shion Takemura, Japan,takemura_shion01@fra.go.jp Karen Hunter, Canada, karen.hunter@dfo-mpo.gc.ca
SG-ARC	New Chairs	Sei-Ichi Saitoh, Japan, ssaitoh@arc.hokudai.ac.jp Hyoung Chul Shin, Korea, hcshin@kopri.re.kr Alison Deary, USA, Alison.Deary@noaa.gov Sarah Wise, USA, Sarah.Wise@noaa.gov
SG-DATA	New Chairs	Hernan Garcia, USA, Hernan.Garcia@noaa.gov

Agenda Item 11 (Continued)

11.3 Extension of the WG Term

MEQ Vice-Chair, Dr. Andrew Ross and HD Chair, Dr. Mitsutaku Makino requested one-year extension of the term of WG42: Indicators of Marine Plastic Pollution and Joint ICES/PICES WG44: integrated Ecosystem Assessment for the Northern Bering Sea - Chukchi Sea, respectively. Science Board reviewed the proposals and recommended GC approve the extensions.

EG (Reporting Committee)	Duration	Rationale
WG42 (MEQ)	1 year	• To complete the deliverables defined in TOR (2-3 review papers) • To keep momentum of Marine Plastic Pollution science in PICES and promote collaboration with PICES partner organizations. • To develop the proposal of a new EG on Marine Plastics Pollution
WG44 (HD)	1 year	• The WG started late due to delays in establishing membership. In addition, the WG has been functioning under the restrictions and difficulties related to the COVID-19 pandemic. • We have developed a Work Plan that accomplishes Years 1 and 2 Activities and Deliverables as detailed in our ToR. A one-year extension will be requested to complete Year 3 activities and deliverables in our ToR.

Agenda Item 12: Proposal from ECOP

AP-ECOP Co-chairs, Drs. Hannah Lachance, Hana Matsubara and Raphael Kevin Roman presented the proposals of new PICES ECOP definition and the measured for the promotion of PICES ECOP engagement and activities as follows.

12.1. New PICES ECOP Definition

In response to GC-2021 request to include PICES ECOP definition in AP-ECOP TOR, AP-ECOP co-chairs suggested PICES adopt a new, more internationally **aligned and inclusive ECOP definition**, which recognizes ECOPs coming from different sectors and career backgrounds. This general ECOP definition is aligned with the standard one used by the Ocean Decade ECOP Programme.

Science Board discussed and recommended the proposed definition:

> An ECOP is someone who self-identifies as an early career professional in the beginning of their career, with ten years or less of professional experience.

SB confirmed the new definition will be applied for eligibility of the ECOP presentation award and travel support request including FUTURE SEES scheme at PICES annual meetings, but recognized that the PICES Zhu-Peterson award should be based on different rules because it is for scientific achievement.

12.2. Proposal of measure for PICES ECOP Promotion

AP-ECOPS proposed PICES to consider a couple of measures for the promotion of ECOP activities: 1) demographic data collection and assessment for ECOPs, 2) upgrade of ECOP membership information and 3) mentorship platform on PICES website (see below for the details), all of which would be built on and/or need

additional functions of the current PICES website. Science Board agreed on the initial ideas and suggested AP-ECOP and Secretariat communicate to develop the website design for 1) and 2), but recommended the AP have a further discussion to develop a clearer idea for 3).

12.2.1 Demographic data collection and assessment for ECOPs.

To add data entries for ECOPs when registering to Annual Meetings on the PICES online portal. Beyond simply indicating whether or not they are early career scientists (by checking a box), other valuable information that could be collected, e.g.,

- Are you a **student**?
  - If **YES**, which degree are you currently pursuing or enrolled in
    - Undergraduate, Master or PhD
  - If **NO**, please indicate your current position or profession (multiple-choice)
    - PostDoc, Research Associate/Assistant, Research Scientist, Policy Analyst, Economist, Government Scientist, Civil servant, Consultant, Other(s) [open-ended answer]
  - If **NO**, when did you last graduate from University? [insert YEAR]
  - If **NO**, what is the highest education level you have obtained?
    - Undergraduate, Master or PhD
- Which **sector(s)** do you belong to? (check all that apply)
  - Science & Research (or Academic), Government/Policy, NGO/Non-Profit, UN Agency, CSO, Private business/company, Other(s) [open-ended answer]
- For how many years have you been **attending PICES events**? [numeric answer ranging from 0 to 10+]

12.2.2. Upgrade of ECOP membership information

To append a new "tag", "label" or "color-code" to identify ECOPs across the membership of all Expert Groups within PICES. Specifically, this "tag", "label" or "color-code" would be associated with the name of EG members on the PICES website. That way, AP-ECOP would gain a better sense of ECOP representation across the PICES structure.

12.2.3. Mentorship Platform on PICES website

To request assistance in the creation and maintenance of a dedicated webpage for the future mentorship platform we are envisioning within PICES. We are aware of the efforts to overhaul the entire PICES website and would be interested in brainstorming how a new mentorship section or webpage could look like.

Agenda Item 13: Proposed New Expert Groups

HD Committee Chair, Dr. Mitsutaku Makino, and TCODE Committee Chair, Ms. Jeanette Gann, presented the proposals for new EGs, Working Group on Exploring Human Networks to Power Sustainability, and Study Group on encouraging Data Awareness and increased Transmission and Accessibility (SG-DATA). Science Board reviewed the proposals and accepted both EGs as proposed.

The chair of WG39: Joint PICES/ICES/PAME Working Group on an Integrated Ecosystem Assessment for the Central Arctic Ocean, Dr. Seiichi Saitoh presented the proposal for new Advisory Panel on the Arctic Ocean and the Pacific Gateways (AP-ARC). The AP planned to be established upon the accomplishment of WG39 which ended its term at the end of PICES-2022 and WG44: Joint PICES/ICES Working Group on Integrated Ecosystem Assessment for the Northern Bering Sea - Chukchi Sea which requested a one-year extension of its term (see **Agenda 11**). Whilst SB admitted the scientific and socio-economic importance of the Arctic Region and having an ICES/PICES joint EG dealing with diverse issues around the Arctic Ocean, it agreed that the proposal was needed

to clarify its advisory role in and relevance to the PICES Science. SB suggested revising the proposal as SG-ARC for the development of the implementation plan of AP-ARC to be ready to submit at PICES 2023.

Science Board recommended GC approve the establishment of these groups listed below.

Name	Parent Committee	• Linkages to other PICES EGs and/or other organizations/programmes. • Background and Goals
WG on Exploring Human Networks to Power Sustainability (**Full Proposal**)	HD	• To contribute to implementation of SmartNet (with AP-UNDOS, FUTURE, WG49) in Human Dimension aspects. Collaborator: UNDOS Regional Collaborative Center for NE Pacific.
SG on encouraging Data Awareness and increased Transmission and Accessibility (SG-DATA) (**Full Proposal**)	TCODE	• Seek the way to promote and coordinate data and information exchange within PICES and beyond.
SG on the Arctic Ocean and the Pacific Gateways (SG-ARC) (**Full Proposal revised following SB suggestionAgenda12ARC)**	(proposed) SB, FIS, MONITOR	• Develop a strategic plan on how to coordinate and promote the joint scientific activities of PICES to further advance the understanding the Central Arctic Ocean and its interaction and linkage with its Pacific Gateways.

WG Human Networks to Power Sustainability Proposal

Proposal for a Working Group on 'Exploring Human Networks to Power Sustainability' (WG-XXXXX)

Parent Committees: HD
Requested Term: October 2022 – October 2025
Potential co-chairs (from East and West of the Pacific)
Shion Takemura (Japan Fisheries Research & Education Agency)
Karen L. Hunter (Fisheries and Oceans Canada)
Collaborator organization:
Rebecca G. Martone (Ocean Decade Regional Collaborative Center for the NE Pacific)

Background
For more than 30 years, PICES has initiated international research projects that provide a link between various institutions, countries, and cultural spheres in the North Pacific Ocean. This leadership position gives PICES an advantage to make progress towards the goals outlined for the UN Decade of Ocean Science (2021-2030). Principally, the knowledge and experience of across the PICES research community offers a unique opportunity to design and deliver 'Transformative Ocean Science' for UNDOS with leadership by the Human Dimensions Committee (HDC). The HDC began research in 2020 to conduct a preliminary assessment of the PICES human network towards understanding how the organization may already be addressing a variety of UNDOS goals. The research team assembled and analysed research products created within PICES since 1992. The application of modern text and correspondence analysis techniques supported the use of these materials as a rich data source

for exploring the PICES' human network and its linkages to UNDOS. We established that although PICES research has a broader focus than ever, including globally relevant and more human dimensions-oriented investigations, the scope of work that has been undertaken provides significant inputs for almost all UNDOS goals and considerable gaps in others. We see promise in how the evaluation of the human networks can power our understanding of the pathways and tools we use to achieve sustainability and other ocean science goals. We aim to expand our initial work on the PICES organization to by studying linkages among research activities and their social networks within PICES nations and other significant marine science organizations around the globe.

Expected goals

1. Increase our understanding of characteristics and gaps in ocean science between northeast and northwest Pacific Ocean.
2. Facilitate PICES activities supporting UNDOS within PICES nations and other significant marine science organizations from around the globe.
3. Develop methodology to evaluate how the human networks can power 'Transformative Ocean Science'.

Tentative TORs

1. Summarize data availability of the database for research activities in PICES nations (Yr 1)
2. Compare similarity and difference of research topics between PICES nations and UNDOS goals based on case studies using text and correspondence analysis as per (Takemura et al. in prep). (Yr 1-2)
3. Identify key human networks and research focuses to bridge gaps in north Pacific
4. Ocean. (Yr 1-2)
5. Evaluate human networks data sets with network analysis to map linkages for achieving "Transformative Ocean Science" (Yr 2-3)
6. Outline successes and gaps in 'Transformative Ocean Science' within PICES nations and other major marine science organizations from around the globe. (Yr 2-3)
7. Publish final report. (Yr 3)

Tentative member

Shion Takemura (Japan Fisheries Research & Education Agency)
Karen L. Hunter (Fisheries and Oceans Canada)
Mitsutaku Makino (AORI, University of Tokyo) (Japan)
Rebecca G. Martone (Ocean Decade Regional Collaborative Center for NE Pacific) (Canada)
Individual from any formalized UNDOS group from PICES nations

SG-DATA Proposal

Proposal for a Study Group on encouraging Data Awareness and increased Transmission and Accessibility (SG-DATA)

The UN Decade of Ocean Science singles out the importance of Data, metadata, and information management and practices across the globe. However, recent reviews by TCODE of PICES data policy, and discussion from the workshop on Openly Discoverable, Accessible, and Reusable Data and Information in the U.N. Decade, have revealed shortcomings in data flow, awareness, and management structures and IT within PICES. The UNDOS is data and IT driven, and outcomes demand a 'digital ecosystem' for all ocean-related data, metadata, information, and products and services. In order for this data and information to be considered reliable and usable, it must adhere to certain standards and quality assurances (some standards are still being developed within the UN Decade data framework). In order for PICES records, data, and information to be maintained and relevant within the UN Decade digital ecosystem, significant focus and effort must be applied to

ensure proper data and information management and connectability with UN Decade digital infrastructure.
Additionally, connections between TCODE and other programs both within PICES and beyond, need to be strengthened. In order to improve PICES 'data culture', motivation for sharing of data needs to also change. This study group will work to explore practical ways in which to make this happen.
PICES data and information flow needs to be identified and bolstered. Development of data flow protocols may help each project and expert group maintain proper data and information management. Metadata catalogs are to become core elements of data management. Additionally, further investigation is warranted to fully understand the potential for PICES data, information and management and integration with UN Decade digital platforms.
Terms of Reference:

- To assess existing best practices;
- To gather lessons learned from past, ongoing and planned projects, programs and initiatives;
- To identify solutions for known problems and bottlenecks regarding sharing of data within PICES and beyond;
- To facilitate harvesting of PICES metadata catalog records by UN Decade data platforms (like ODIS);
- To draft a checklist of questions to promote data sharing and the reproducibility of results for paper/report submissions;
- To consider what kind of infrastructure would be sufficient to enable those with "small" and "besides" science data who wished to contribute to a digital commons environment;
- To consider how to make FUTURE, IPOD organic parts of the future UNDOS digital ecosystem;
- To increase collaboration between TCODE and other PICES programs like Smartnet, in addition to external collaborations (ICES DIG).

Proposed SG members
Igor Shevchenko (Russia)
Tim van der Stap (Canada)
Shelee Hamilton (Canada)
Brett Johnson (Canada)
Wan FangFang (China)
Han Chunhua (China)
Jeanette Gann (USA)
Jill Prewitt (USA)
Hernan Garcia (USA) – Chair

SG-Arctic Ocean and the Pacific Getaways Proposal

PICES Study Group on the Arctic Ocean and the Pacific Gateways
（SG-ARC）

Acronym: SG-ARC
Potential Parent Committee: Science Board (SB), FIS, MONITOR
Term: PICES-2022 – PICES-2023

Background
The Central Arctic Ocean (CAO), that is in between the North Pacific and North Atlantic, is in rapid transition, in interaction with and impacting these waters. It has become more accessible to a range

of activities. For example, rapid loss of sea ice cover has opened up the CAO for potential fishing opportunities. In this context, the agreement to Prevent Unregulated High Seas Fisheries in the CAO has been signed and entered into force which will necessitate joint research and monitoring. The Pacific gateway to the CAO, i.e., the Northern Bering Sea-Chukchi Sea (NBS-CS) is also experiencing unprecedented warming and loss of sea ice as a result of climate change. Declines of seasonal sea ice and warming temperatures have been more prominent in the northern Bering and Chukchi seas than in the European Arctic. Chronic and sudden changes in climate conditions in this Arctic gateway are clearly reshaping the system and its food-webs, and enlarging opportunities for commercial activities (shipping, oil and gas development and fishing), with uncertain and potentially wide-spread cumulative impacts.

PICES took upon responsibilities in the CAO issues when it joined the WGICA (Joint PICES/ICES/PAME Working Group on an Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean (CAO)) by establishing WG39 in 2017. In 2019, PICES also established WG44 (Joint PICES/ICES Working Group on Integrated Ecosystem Assessment for the Northern Bering Sea - Chukchi Sea) in efforts to understand the Arctic system and its impacts to the sub-Arctic and mid-latitude North Pacific. An integrated ecosystem assessment (IEA) is a useful approach that is shared by these two Working Groups, particularly relevant with substantial science and policy needs emerging for the sustainable Arctic. This renders a coordinated IEA of the CAO and NBS-CS as a priority task. In addition, it is of particular significance to developing future approaches for The United Nations Decade of Ocean Science for Sustainable Development in the Arctic Ocean (UNDOS-Arctic), where science for resilience and sustainability is more important than anywhere else in the world oceans. Despite this continuing significance and unfinished commitment to WGICA and also WGIEANBS-CS, WG 39 and 44 will end the term with the closure of PICES 2022 Annual Meeting. In this context, we propose PICES establish SG-ARC to coordinate and integrate PICES scientific activities on the Arctic issues and to further advance the understanding of the Arctic system and linkages and impacts to the North Pacific.

Proposed Terms of Reference (ToRs)

1. Develop a strategic plan on how to coordinate and promote the joint scientific activities of PICES to further advance the understanding the Central Arctic Ocean and its interaction and linkage with its Pacific Gateways. The plan may include:

- Propose workshops/sessions to engage those involved in IEA and monitoring of the Arctic Ocean and its Gateways;

- Represent and coordinate responses of PICES concerning the Arctic Ocean and the connected waters in cooperation with partners and other international organizations, including WGICA (Joint PICES/ICES/PAME Working Group on an Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean (CAO)), and WGIEANBS-CS (Joint PICES/ICES Working Group on Integrated Ecosystem Assessment for the Northern Bering Sea - Chukchi Sea) ;

- Draft recommendations for better collaboration within PICES and with larger international initiatives relevant to the Arctic Ocean including the UN Decade of Ocean Science;

2. Propose new EGs or AP that can advance the ARC strategic plan

Proposed Co-chairs (Two west and two east)
Sei-Ichi Saitoh (WG39) (Japan) - ssaitoh@arc.hokudai.ac.jp
Hyoung Chul Shin (WG39) (Korea) - hcshin@kopri.re.kr
Alison Deary (USA) - Alison.Deary@noaa.gov
Sarah Wise (WG44) (USA) - Sarah.Wise@noaa.gov

Proposed Membership
Andrea Niemi (WG-44) (Canada)
Nadja Stefanie Steiner (WG-44) (Canada)
Zhongyong Gao (CC-S, WG-39, WG-44) (China)
Guangshui Na (FUTURE-SSC, MEQ, SB, WG-35, WG-39) (China)
Fang Zhang (WG39) (China)
Hyoung Chul Shin (WG39) (Korea)
Hyoung Sul La (WG-44) (Korea)
Sei-Ichi Saitoh (WG39) (Japan)
Fujio Ohnishi (WG39) (Japan)
Takafumi Hirata (WG-44) (Japan)
Yury I. Zuenko (CREAMS-AP, POC, S-CCME, SG-UNDOS, WG-35, WG-40, WG-44) (Russia)
Kirill Kivva (WG-44) (Russia)
Alison Deary (USA)
Sarah Wise (WG44) (USA)
Elizabeth A. Logerwell (FIS, WG-44) (USA)
Lisa B. Eisner (MONITOR, WG-44) (USA)
David L. Fluharty (WG-39) (USA)

References
Skjoldal, H. R. (Ed.). 2022. Ecosystem assessment of the Central Arctic Ocean: Description of the ecosystem. ICES Cooperative Research Reports Vol. 355. 341 pp. https://doi.org/10.17

Agenda Item 14: PICES-2023: Update

Dr. Chiba updated the PICES-2023 information including its tentative timeline. Science Board review the schedule and recommended having one of two Committee business meetings virtually in advance of the PICES-2023 instead of having two in-person meetings during the Annual Meeting. This is to make the decision-making process from EGs to SB smoother and make the half-day time slots available for other meaningful events including topic sessions and specific workshops. EGs are requested to virtually hold a business meeting or two prior to the Annual meeting. The optional in-person business meetings would be approved upon request. The proposal will be submitted to ISB-2023. With the UNDOS focus of the meeting scope, Secretariat and AP-UNDOS proposed for PICES-2023 to apply **UNDOS endorsement** as a one-off UNDOS activity, and SB agreed to the proposal.

Conference Title: Connecting Science and Communities for Sustainable Seas
Date: October 23-27, 2023 (core conference dates) **Location:** Seattle, USA
Local Organizer: NOAA National Marine Fisheries Service (NMFS)
Venue: Westin Seattle Hotel **Website:** TBA
Format: in-person (hybrid option is under consideration)

Tentative Timeline:

Preparation		
October 2022	Sessions/Workshop selected at PICES-2022	
Fall 2022– Win 2023	Website open	
Spring 2023	Invited Speakers & Travel support request identified	
Spring – June 2023	Abstract submission open - closed	
July-Aug 2023	Session, WS, Business meeting schedule identified	
September 2023	EG virtual Pre-PICES 2023 Business Meeting, reporting to Parent Committees	
Late Sept – early Oct	Committee Virtual Business Meeting	
PICES 2023		
Date	**Session and Workshop**	**Business meeting**
Oct 20-22	Workshops	In-person Committee BM
Oct 23	Opening / SB	
Oct 24-27	Topic & Paper Sessions, Poster Session	F&A Meeting
Oct 27-28	-	SB Meeting
Oct 28-29	-	GC Meeting

SCOPE: PICES-2023 occurs just a few years into the **United Nations Decade of Ocean Science for Sustainable Development** and is a chance to assess PICES progress to date and set a path for the rest of the Decade. The meeting will focus on developing and strengthening PICES diverse partnerships, building on existing joint activities and promoting cross-fertilization. Priorities for PICES within the Decade focus on climate change, fisheries and ecosystem-based management, social, ecological and environmental dynamics of marine systems, coastal communities, traditional ecological knowledge and human dimensions. Opportunities to engage new partners, especially around the cross-cutting themes of Early Career Ocean Professionals, diverse communities, and engaging with local and Indigenous communities are especially encouraged.

Agenda Item 15: PICES-2023: Session/Workshop selection

Committee Chairs reviewed and ranked the proposals based on their relevance to the conference scope, the quality of the proposal, and each Committee's interest to sponsor prior to the SB meeting. Science Board made the decision considering the evaluation of the Committee and other factors and recommended some proposals

with a common theme merge. To accommodate all of the qualified proposals, Science Board discussed the session/workshop schedule and agreed to hold up to 4 parallel sessions/workshops per day, and the possibility of change in the structure of the Science Board symposium which is normally scheduled during full Monday afternoon.

List of the approved Session proposals

Submitter	Sponsor CMT	Title	Duration (day)
Dr. Hongsheng Bi	BIO, POC, TCD	Applications of Deep Learning Systems in Marine Science	1
Dr. Ryan Rykaczewski	FIS, TCD, FTR, POC, MNT	Responses of Small Pelagic Fish to Extreme Events in Pacific Ecosystems	1
Pengbin Wang	FTR, MEQ, MNT	The Oceanographic, Ecological and Societal Impacts Arising from Extreme Weather and Climatic Events in Coastal Regions	1
Dr. Yisen Zhong	POC, MNT	Multi-scale ocean processes and their impacts on marine ecosystems	1
Dr. Thomas Therriault	MEQ	The complex reality of managing Non-indigenous Species (NIS) in the North Pacific	1
Dr. Tsuneo Ono	BIO, POC, MNT	Ocean acidification and deoxygenation in ocean margin ecosystems: causes and consequences for ecosystems and fisheries	1
Dr. Guangshui Na	MEQ,	Session on the Occurrence and Ecological Impact of Emerging Pollutants in the Coastal Marine Environment	0.5
Prof. Shin-ichi Ito	BIO, FIS	Understanding the implications of body size change for stock productivity and fisheries management	1
Dr. David McGowan	MNT	Improved detection and understanding of factors affecting changes in North Pacific forage communities and implications to ecosystems	1
Dr. Patrick O'Hara	BIO	Anticipated and realized effects of climate change on predatory fish, birds, and mammals of the North Pacific	1
Dr. Kisei Tanaka		Shining Light on Essential Fish Habitat in Data-Limited Pacific regions	0.5
Kiva Oken		Operational forecasts to improve recruitment prediction in fish stock assessments * SB comments: add wNP co-convenors	0.5
Recommended to merge			
Dr. Janelle Curtis	BIO	Seamount biodiversity: pelagic, demersal, and benthic species associated with seamounts in the North Pacific Ocean	1
Dr. Janelle Curtis		The distribution of vulnerable marine ecosystems (VMEs) on seamounts in the North Pacific Ocean and factors influencing their distributions (proposed as a Workshop)	

Agenda Item 15 (Continued)

List of the recommended Workshop proposals

Submitter	Sponsor Committee	Title	Duration (day)
Ms. Tammy Norgard	TCD, FTR, HD	Creation of clear, crisp, concise fact sheets for PICES Expert Groups	1
Dr. Steven Bograd	TCD, FTR, HD	Sharing Capacity and Promoting Solutions for Marine Ecosystem Sustainability within the UN Decade of Ocean Science	1
Vera Trainer	TCD, MEQ	International Workshop on Solutions to Control HABs in Marine and Estuarine Waters	1
Vyacheslav Lobanov	FTR, HD, POC	Changing social-ecological-environmental system of the North East Asian Marginal Seas: new challenges for integrative marine science	1
Dr. Patrick O'Hara	BIO, MEQ	Bio-indicators of meso to global scale marine pollution: techniques for integration and standardization	1
Dr. Brian Hunt	MEQ	Developing an integrative conceptual framework of urban impacts on marginal ocean ecosystems	1
Dr. Josep Planas	FIS	Integrating biological research, fisheries science and management of flatfish species in the North Pacific Ocean in the face of climate and environmental variability	1
Dr. Sangchoul Yi		Nurturing future generation in fisheries and marine environment science: Collaboration with PICES and Asia Fisheries and Marine Environment Leaders Program (AFIMA Leaders Program) (proposaed as a Session)	0.5
Recommended to merge			
Dr. Sarah Wise	TCD, HD, GEOS?	Collaborative and knowledge sharing approaches to support climate change adaptation and social-ecological system resilience	1.5
Dr. Rebecca Martone		Indigenous and Community-Led Approaches to Coastal Ecosystem Resilience in the Pacific	
Recommended to merge			
Dr. Kirstin Holsman	FIS, BIO, POC,TCD, FTR	S-CCME/SICCME workshop : Towards climate-informed ecosystem-based fisheries management	1.5
Dr. Alison Deary		International collaborations to monitor and respond to changing Arctic Ecosystems	
Dr. Alison Deary		Standardizing indicators to monitor changing ecosystems (proposed as a Session)	

Agenda Item 15 (Continued)

Special Session Proposal from The International Pacific Halibut Commission (IPHC)

Dr. Chiba reported that one of PICES strategic partners (MOU), International Pacific Halibut Commission (IPHC) proposed to hold a one-day special session "100 years of science-based fishery management" to celebrate its centennial during PICES 2023, and SB accepted the proposal.

Session Proposal for the PICES 2023 Annual Meeting

Proposed PICES Committee: Fishery Science (FIS)

Proposed Workshop Title: *The International Pacific Halibut Commission: 100 years of science-based fishery management*

Duration: 1 day (09:00-17:00)

Convenors: Dr. David T. Wilson (International Pacific Halibut Commission, USA; david.wilson@iphc.int; corresponding), Dr. Josep Planas (International Pacific Halibut Commission, USA; Josep.Planas@iphc.int).

Corresponding convenor: Dr. David T. Wilson (Proposal submitter)

Session description: In 1923, the Convention for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea was signed by Canada and the United States of America (U.S.A) in response to conservation needs. The International Pacific Halibut Commission (IPHC), initially named the International Fisheries Commission, was established as an intergovernmental organisation by this Convention that came into effect on 21 October 1924, constituting the first international agreement for joint management of a marine resource. Therefore, for the last 100 years, the IPHC has been successfully managing the Pacific halibut resource for Canada and the U.S.A. through the application of rigorous science, innovation, and the implementation of international best practice. This session is intended to celebrate the first 100 years of the IPHC by highlighting past and current scientific activities that have supported the management of the Pacific halibut fishery in the Northeastern Pacific Ocean.

Co-sponsoring organizations: PICES, IPHC

Names of invited speakers: TBD

Publication requirements: review paper.

Agenda Item 16: PICES-Sponsored Conferences / Symposia

Dr. Chiba updated information on PICES-Sponsored International Conferences and Symposia which took place or are upcoming from 2022 to 2025.

1. 4th ICES/PICES Early Career Scientist Conference, **July 2022**, Newfoundland, Canada
2. International Year of the Salmon Synthesis Symposium, **Oct. 2022**, Vancouver, Canada
3. ICES/PICES/FAO International Symposium on Small Pelagic Fish, **Nov. 2022** Lisbon, Portugal
4. Effects of Climate Change on the World's Ocean (ECCWO), **Apr. 2023**, Bergen, Norway
5. 7th International Zooplankton Production Symposium, **Mar. 2024**, Hobart, Australia.
6. MSEAS: Marine Socio-Ecological Systems Symposium, **May/June 2024**, Japan
7. Expo 2025, **2025** Osaka, Japan

16. 1. 4th ICES PICES Early Career Scientist Conference 2022

"Ocean Science for the Future We Want"

- Date: July 18-21 (Postponed from May)
- Local Host: DFO, Canada
- Venue: Delta Hotel, St John's, Newfoundland, Canada
- Convenor from PICES: Sonia Batten (PICES Executive Secretary)
- SSC from PICES: Paul Covert (Canada), Heejoong Kang (Korea), Hannah Lachance (USA), Rashael Roman (Japan/Canada)
- PICES received funding from SCOR to support the travel of PICES ECSs (US$ 6000).

Residence of ECS participants (total 117 from 20 countries)

Country	Number of participants	Country	Number of participants
Australia	1	Mexico	1
Canada	33	Netherlands	1
Denmark	5	Norway	7
France	1	Poland	4
Germany	3	Portugal	4
Iceland	1	Republic of Korea	4
Ireland	1	Spain	3
Italy	3	Sweden	3
Latvia	2	United Kingdom	10
Lithuania	5	United States	25

NOTE: The conference has been held every 5 years with ICES and PICES as the lead organizer alternatively. PICES will lead the 5th conference in 2027. Considering the location of the previous events (2007: USA, 2012: Spain, and 2017: Korea), either Japan or China will be the candidate local host country.

Agenda Item 16 (Continued)

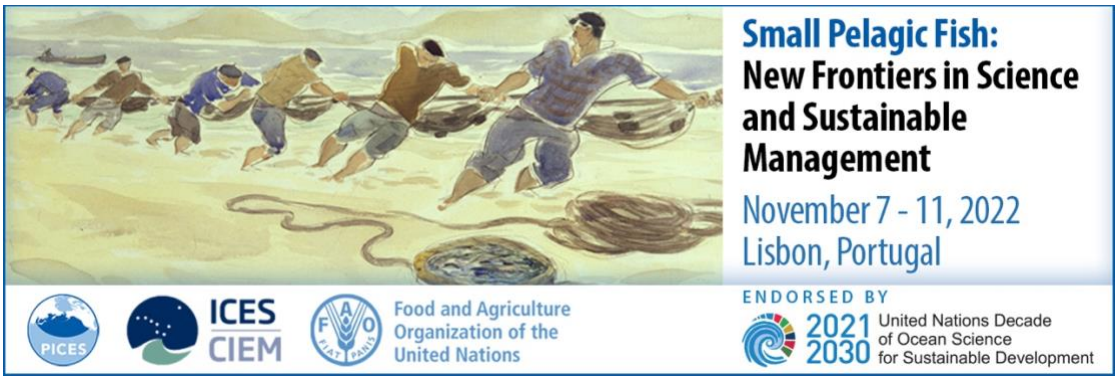
16. 2. IYS Synthesis Symposium *PICES is not a sponsor

"Synthesis of the International Year of the Salmon (IYS) and Roadmap to 2030: Salmon in a Rapidly Changing World"

- Date: October 4th - 6th 2022
- Location: The Westin Bayshore, Vancouver, Canada
- Host: The North Atlantic Salmon Conservation Organization (NASCO)
  The North Pacific Anadromous Fish Commission (NPAFC)

The International Year of the Salmon (IYS): 2018- 2022.
IYS themes: 1. Status of Salmon, 2. Information Systems, 3. Salmon in a Changing Salmosphere, 4. New Frontiers, and 5. Human Dimensions.

16. 3. ICES/PICES/FAO International Symposium on Small Pelagic Fish (SPF) 2022



- Local Organizer: Portuguese Institute of Sea and Atmosphere (IPMA), Calouste Gulbenkian Foundation
- Venue: Calouste Gulbenkian Foundation

PICES Member involvement:
WGSPF/WG43**:** ICES/PICES Working Group on Small Pelagic Fish (WGSPF/WG 43)
** 3-day meeting of WGSPF is planned immediately after the symposium*
Symposium Convenor: Ryan Rykaczewski (USA), Akinori Takasuka (JPN)
SSC: many PICES Scientists
Coordinator: Alexander Bychkov

Agenda Item 16 (Continued)

16. 4. ECCWO5

- Primary Sponsor: ICES, PICES, IOC, FAO,
- Venue: Radisson Blu Royal Hotel
- Local host: Institute of Marine Research, Norway
- Session/Workshop information (link)
- Abstract and Financial Support request submission: November 1st
- PICES requested funding from SCOR to support the travel of PICES ECSs (US$ 6000).

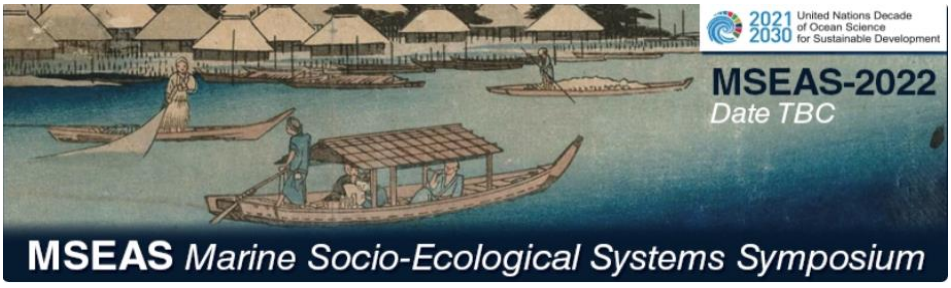
PICES Member involvement:
Symposium Convenors: Sonia Batten (Executive Secretary)
SSC: Emanuel Di Lorenzo (USA), Mitsutaku Makino (Japan), Tsuneo Ono (Japan), Erin Satterthwaite (USA)

16. 5. 7th ICES/PICES Zooplankton Production Symposium 2024

- March 16-21, 202, Hobart, Australia
- Venue: Hotel Grand Chancellor, Hobart
- Local Host: CSIRO

The Symposium website will be open closely.

16. 6. MSEAS Symposium: *"Managing for Sustainable use of the Earth's marine and coastal system"*



The local host confirmed that they will host the symposium in Japan in 2024.

- Local Host Chair / Vice Chair: Toyomitsu Horii / Mitsutaku Makino
- Venue: Yokohama Port Opening Memorial Hall (Jack's Tower), Japan (TBC)
- Date: May/June 2024 (TBC)
- Primary Sponsors**:** PICES, ICES, NOAA Fisheries
- Another teaser event (webinar) to be planned in 2022/2023

Agenda Item 16 (Continued)

16. 7. PICES Event associated with Expo 2025

Expo 2025 date: April 13 – October 13, 2025
Location: Osaka Japan
Host: Japanese government Bureau International des Expositions
Theme and Focus: Designing Future Society for Our Lives: Saving Lives, Empowering Lives, Connecting Lives.
PICES Correspondent: Alex Bychkov, Sanae Chiba (Secretariat)

Background
PICES was invited to participate in the 2025 World EXPO, to be held in Osaka, Japan in 2021. SB and GC agreed at PICES 2021 to explore the possibility for PICES to showcase its scientific achievements in conjunction with Expo including setting a PICES display at a pavilion and holding one day Science event.
Update => No update since ISB-2022
PICES representatives (incl. Batten, Bychkov, Chiba, and Fujii) had a meeting with Expo organizers in December 2021. We concluded holding space for display through the Expo period was not feasible in terms of budget. We will continue the discussion with organizers to explore the possibility of holding one day PICES Science event with a temporal (a few days ~ a week?) displays. Preferable date of the Science event will be the last week (or near the very end) of the Expo as the PICES Japanese delegate also seeks the possibility to hold PICES 2025, which will be hosted by Japan, near the Expo venue soon after the end of Expo, mid-October, so that PICES participants can be engaged in the one-day event at Expo.

Agenda Item 17: Upcoming Capacity Development Events

17. 1. PICES Organizing Events

MONITOR Committee Chair, Dr. Sung Yong Kim reported two virtual Summer Schools which were organized by AP-NCOOS and AP-CREAMS and held in August 2022.

17.1.1. PICES Virtual Summer School – Ocean Big Data (organizer: AP-NCOOS)

Date: August 8-19, 2022
Co-organizer: Ocean Network Canada
Participants: up to 30
Approved PICES fund: CA$ 15K (max)

Activities

- Pre-recorded lectures introducing datasets and their oceanographic context
- Data analysis assignments and online access to datasets and statistical tools
- Virtual tutorial and Q&A access to instructors
- Presentations by participants on the results of their analyses

17.1.2 PICES Summer School – Ocean turbulence: from observing to research (organizer: AP-CREAMS)

Date: August 22-26, 2022

Co-organizer: Institute of Oceanology, CAS, China
Application call: April (due: April 30)
Successful application notified: - May 31
Participants: graduate students and early-career scientists
Approved PICES fund: CA$ 11K
See **Appendix 6** for the report

17. 2. Partner Organizations' Activities and Events

Dr. Chiba reported the activities of SCOR Capacity Development Committee and announced upcoming Capacity Development events organized by other PICES partner organizations.

17.2.1. SCOR Capacity Development (link)

PICES Deputy Executive Secretary, Dr. Sanae Chiba has served as SCOR CD Committee member (July 2021~). She encouraged SB participants to advertise the various opportunities provided by SCOR.

Opportunities for PICES Scientists

- Visiting Scholars Programme
- Fellowship Programme (with POGO)
- Travel support for Conference (proposal must be submitted by Organization)
  - Funded US$ 6K for participants of 2022 International ECS Conference (July 2022)
  - Requested US$ 6K for participants of 5th ECCWO (Apr. 2023)
  - Fund available for application (NSF fund US$ 75K / year for 2020-2023)

17.2.2. SOLAS Summer School (Date: TBD, in-person)

Application open in summer/fall 2022
Registration fee: 650 Euro
Venue: OSCM (Ocean Science Centre Mindelo), Cape Verde, Senegal
Eligible applicants: post-graduate students and post-doc researchers with multidisciplinary air-sea interaction background
*NOTE: At PICES-2020, SB Recommended funding in the amount of **$10K** for travel fee support for ECOPs for SOLAS Summer School in 2021, and SB recommended deferring the **funding support to 2023** at ISB 2021,*

17.2.3. SOLAS Open Science Conference 2022

September 25th - 29th, 2022, Cape Town, South Africa (Hybrid)
Sponsor: SCOR, Future Earth, WCRP etc.

PICES funded US$4500 to partially support the attendance of 2 early career scientists and co-sponsor the Early Career Scientist Day (approved by **IGC-2022**)

17.2.4. IMBeR ClimEco8 Summer School

July 24-28, 2023 *No other information is available
* PICES's support: TBD

Designed for 60-70 post-graduate students and early career researchers are led by an interdisciplinary group of scientists which includes leaders in their respective fields.

17.2.5. GOOD-OARS Summer School

November 6 – 12, 2023, Coquimbo-La Serena, Chile
Website: under development
Sponsor: OARS (Global Acidification Research for Sustainability)
GOOD (Global Ocean Oxygen Decade), etc.
S-CC (BIO/POC) recommends PICES support (up to EUR 5000) for ECOPs from PICES member countries to participate in the summer school (See **Agenda item 10.1**).

Agenda Item 18: Proposal for PICES Science Intern Scheme

In a need for support of SmartNet implementation and professional development for the coordination of UNDOS-related activities in PICES and partner organizations, Dr. Trainer and AP-UNDOS chair Dr. Bograd proposed the establishment of the PICES Science Intern Scheme. This idea was initially proposed and discussed at ISB-2022 and SB recommended further developing the idea. At SB-2022, SB recommended GC support the proposal and seek measures and mechanisms to enable the recruitment of two PICES UNDOS Interns, representing both the eastern and western NP.

Proposal for a PICES UNDOS intern

Background
The existing PICES Intern Program allows early career individuals from PICES member countries to gain experience in operations of intergovernmental scientific organizations and coordination of multidisciplinary international ecosystem research programs by working in the PICES Secretariat for periods of up to one year. The PICES Secretariat supervises up to one intern at any point in time and it is a very successful program that contributes essential human resources to the running of the organization.

The UNDOS is an exciting opportunity for PICES, but for the organization to be truly effective in addressing the ambitious challenges it has posed, there is a need for an increased coordination capability. The PICES UNDOS intern will be jointly supervised by the PICES Secretariat and the chairs of the AP-UNDOS (remotely). PICES would benefit from the UNDOS intern directly through the presence of an additional professional in the secretariat with designated responsibility for coordinating the UNDOS activities and indirectly, over a period of years, by strengthening the capacity of member states to coordinate their involvement in PICES programs, and especially their collaborations with other organizations and entities in UNDOS projects.

Objectives
The PICES Intern Program has two goals:

- Professional development of marine scientists and managers from PICES member countries (Canada, China, Japan, Korea, Russia, USA);
- Increasing the capacity of the PICES secretariat to support the work of PICES by facilitating accomplishments during the UNDOS (2021-2030).

Nature of the UNDOS Internship

Under the supervision of PICES Secretariat and the AP-UNDOS Chairs, the intern will work on UNDOS projects of the Organization relevant to their professional interests and skills. The intern may be given a wide variety of tasks relevant to UNDOS activities which will involve liaising with: PICES expert groups, national UNDOS points of contact, the IOC and other UNDOS programs and projects in the PICES area, Tasks will include:

- organizing scientific meetings and sessions at meetings, including virtual meetings;
- preparing information for, and providing administrative support to, PICES expert groups
- organizing and editing various PICES publications and outputs related to UNDOS and;
- coordinating PICES UNDOS activities with the efforts of other relevant organizations and national committees.

The UNDOS internship could have a flexible duration, but would not be less than one year for each intern. We envision that several interns would participate during the period of the UNDOS.

Qualifications of candidates

Applicants must be staff of the academic or government sector of PICES member-countries (Canada, China, Japan, Korea, Russia, USA), have a university degree (M.Sc. or Ph.D. will be an asset), the ability to read, write and speak English, basic IT skills including using online cloud and communication tools, and demonstrated personal initiative. The PICES UNDOS intern should demonstrate an interest in furthering the objectives of the UN Decade of Ocean Science for Sustainable Development, and facilitating PICES leadership in UNDOS.

Financial support of the UNDOS intern program

- The intern stipend is $3000 per month for an annual total of $36,000.
- Additional associated costs for travel of the intern to the Secretariat at the start of the internship, and their return home at the end.
- Voluntary contributions for this program could be from one country or multiple countries with an interest in increasing PICES capacity.

Agenda Item 19: PICES Committee Action Plan review

At ISB-2022, Science Board and Standing Committees were recommended to review and revise their outdated Action Plans according to the term of the PICES Rule: Guidelines for Chairs and Convenors: III. Scientific and Technical Committees. BIO, FIS, MEQ and TCODE have submitted the revised Action Plan while SB and HD would work on theirs in due course.

The list of the latest Action Plans

SB: 2012-2015 Action Plan => To be updated
BIO, FIS, MEQ, TCODE updated (**Appendix 7**)
HD: under development
POC: 2019-2022 Action Plan
MONITOR: 2020-2025 Action Plan

PICES Rule:

Guidelines for Chairs and Convenors: III. Scientific and Technical Committees

Chair of a Scientific/Technical Committee is responsible for;

- maintaining an up-to-date Action Plan to indicate how the Committee's activities are, or will, achieve goals under the PICES Strategic Plan (2016~);
- reviewing regularly the performance of the Committee with respect to its Action Plan;

Agenda Item 20: Publications update

20.1 Peer-Reviewed Papers (published)

SB reviewed and recommended these papers as PICES EG products to be posted on the PICES webpages.

EG	Citation	Comment
MONITOR	Batten, S.D., Ostle, C., Hélaouët, P. and Walne,A.W, (2021) Responses of Gulf of Alaska plankton communities to a marine heat wave. Deep Sea Research Part II: Topical Studies in Oceanography,105002,ISSN 0967-0645, https://doi.org/10.1016/j.dsr2.2021.105002.	Product of NP CPR Project
S-CCME	IPCC AR6 WKII : Climate Change 2022: Impacts, Adaptation and Vulnerability https://www.conservation.org/blog/ipcc-report-climate-change-could-soon-outpace-humanitys-ability-to-adapt	Authors include Drs. Shin-ichi Ito & K. Holsman and many PICES members.
WG42	Uhrin, A.V., Hong, S., Burgess, H.K., Lim, S. and Dettloff, K., 2022. Towards a North Pacific long-term monitoring program for ocean plastic pollution: A systematic review and recommendations for shorelines. https://doi.org/10.1016/j.envpol.2022.119862	These 3 papers are the products of WG42 activities.
WG42	Shim, W.J., Kim, S.K., Lee, J., Eo, S., Kim, J.S. and Sun, C., 2022. Toward a long-term monitoring program for seawater plastic pollution in the north Pacific Ocean: Review and global comparison. Environmental Pollution. https://doi.org/10.1016/j.envpol.2022.119911	
WG42	Savoca, M.S.,et al.., 2022. Towards a North Pacific Ocean long-term monitoring program for plastic pollution: A review and recommendations for plastic ingestion bioindicators. Environmental Pollution. https://doi.org/10.1016/j.envpol.2022.119861	
WG46	Cai, W. J., & Jiao, N. (2022). Wastewater alkalinity addition as a novel approach for ocean negative carbon emissions. The Innovation, 3(4), 100272, https://doi.org/10.1016/j.xinn.2022.100272	These 3 papers are the products of WG46 activities.
WG46	WANG, Y., LU, Y., LIU, J., & ZHANG, C. (2022). Advocating eco-engineering approach for ocean carbon negative emission. Bulletin of Chinese Academy of Sciences (Chinese Version), 36(3), 279-287. https://doi.org/10.16418/j.issn.1000-3045.20210308001	
WG46	Liu, J., Robinson, C., Wallace, D., Legendre, L., & Jiao, N. (2022). Ocean negative carbon emissions: A new UN Decade program. The Innovation, 3(5), 100302. https://doi.org/10.1016/j.xinn.2022.100302	

20.2. PICES Official Publication (Science & Technical Reports etc.)

SB reviewed and recommended this report be published as WG36's final project and endorsed the disbandment of the WG.

EG	Type of publication & Title	Stages
WG36 (FUTURE) To be disbanded	**PICES Science Report** Common Ecosystem Reference Points across PICES Member Countries	Endorsed by FUTURE and submitted to Secretariat for editing.

20.3. Products of collaboration with other organizations (published)

SB reviewed and endorsed this report be published as the product of the joint study of PICES/ICES/PAME.

EG	Citation	Comment
WG39 (SB)	Skjoldal, H. R. (Ed.). 2022. Ecosystem assessment of the Central Arctic Ocean: Description of the ecosystem. ICES Cooperative Research Reports Vol. 355. 341 pp. https://doi.org/10.17895/ices.pub.20191787	PICES/ICES/PAME cooperative report

20.4. EG Final Report in Progress

Dr. Chiba reported the status of the WG final reports which were at various stages: 1. In preparation, 2. Being reviewed by parent Committee, 3. submitted to Secretariat, 4. previously approved by SB and nearly completion

EG	Type of publication & Title	Stages	comments
WG30 (MEQ) disbanded	**PICES Science Report** Assessment of Marine Environmental Quality of Radiation around the North Pacific	4. **Approved** PICES 2013 final formatting	
WG35 (MONITOR /TCODE)	**PICES Special Publication NPESR III: online supplemental materials** NPESR III Regional Reports (R11 – R24)	4. **Approved** PICES 2017 Under editing & formatting (except R19)	R11, R18, R20 published online
WG37 (BIO) disbanded	**PICES Science Report** Zooplankton Production Methodologies, Applications and Measurements in PICES Region	4. **Approved** PICES 2021 Under final editing & formatting	
WG36 (FUTURE) To be disbanded	**PICES Science Report** Common Ecosystem Reference Points across PICES Member Countries	3. Submitted to Secretarata	
WG38 (POC)	**Journal Review Paper** WG synthesis paper, Progress in Oceanography	2. Being reviewed by Parent Committee	
WG40 (POC/FUTURE)	**Journal Review Paper** WG Topic Issue, Frontiers in Marine Science	1. In preparation	Will be published in 2022/2023
WG41 (HD/FUTURE)	**PICES Science Report** Marine Ecosystem Services	1. In preparation	Draft submission Feb 2023

Definition: WG disbands upon the submission of its Final Report to Secretariat after review and approval of Parent Committee(s). (Approved at **IGC-2022**)

Agenda Item 21: Other issues

21.1. PICES New Website Progress

Dr. Trainer reported the request from AP-SciCom on the development of the new PICES website. Dr. Chiba explained the current progress of the website development and confirmed Secretariat would take the most appropriate and reasonable measures to put it forward. Science Board recommended that GC endorse the construction of the new PICES website by PICES-2023.

Request from AP-SciCom

The PICES website changes require funding for an audit (to determine the best platform to be used for the new website) and implementation (a website specialist contractor who can assist with coding, etc.). We request the Secretariat provide a website audit by the end of 2022, and hire the needed specialist for website changes, using the recommendations provided by the audit, before ISB2023. The end goal is for the website changes to be completed by PICES-2023. AP-SciCom also offered their assistance for EGs to produce short videos on their activities to be shared via the PICES YouTube Channel.

21.2. ISB-2023 Date

Dr. Chiba announced that A 3-day ISB-2023 meeting would be held virtually from late April to mid-May. Secretariat will set the date depending on the SB members' availability by January 2023.

Appendices

Appendix 1

APN-PICES Collaborative Framework for Scientific Cooperation

September 14, 2022

APN-PICES Collaborative Framework for Scientific Cooperation

Executive Summary

The Asia-Pacific Network for Global Change Research (APN) and North Pacific Marine Science Organization (PICES) are Intergovernmental Organizations with shared goals, particularly in terms of supporting international cooperation in research and capacity development, and partly overlapping geographic regions of focus. The joint APN-PICES Study Group for Scientific Cooperation in the Pacific Ocean (SG-PICES-APN) developed a framework that strives to enhance collaboration between the two organizations. This collaborative framework identifies several broad areas of joint interest to PICES and APN on which progress could be made over the next five years. Research areas relating to climate change (for example; sustainable fisheries, ecosystem services and food security, impacts of extreme events on coastal communities and the need for adaptation and disaster risk reduction) as well as marine plastic debris and microplastics, and downscaling of regional climate models are current foci for both organizations. Two common types of activity that spanned these research areas were also identified, one being the capacity development of early career professionals and the second being the engagement of Local and Traditional Ecological Knowledge (LTEK), a cross-cutting theme for the climate change research areas, in particular.

The framework identifies various mechanisms for implementing enhanced collaboration between PICES and APN including workshops and joint working groups, topic sessions at PICES Annual Meetings, representation at each other's meetings and/or workshops. As areas of interest and priorities change over time, the joint areas for collaboration may be updated.

Following approval from both organizations, routine monitoring of the progress of activities will be completed jointly by the Secretariats of PICES and APN and reported to the PICES Science Board annually, and APN's Intergovernmental Meeting (IGM) and Steering Committee (SC) on a regular basis, respectively.

Background

The Asia-Pacific Network for Global Change Research (APN) and North Pacific Marine Science Organization (PICES) are Intergovernmental Organizations with shared goals, particularly in terms of supporting international cooperation in research and capacity development, and partly overlapping geographic regions of focus.

APN was established in 1996 as an intergovernmental network working towards an Asia-Pacific region that is successfully addressing the challenges of global change and sustainability. A list of the member countries of APN can be found here.

APN's mission is to support a cohesive and interactive community of global change researchers, policymakers, practitioners and civil society across the Asia-Pacific region through innovative and transdisciplinary approaches that draw upon the extensive network of science-policy practitioners. An integral part of its mission is to support and promote the scientific investigations of changes in the Earth's life support systems and their implications for sustainable development in the Asia-Pacific region. The APN contributes to the realization of these investigations through:

1. Supporting research and science-based response strategies.
2. Effectively linking scientific outcomes with policy mechanisms applicable to all levels of governance and societal sectors in each country.
3. Scientific capacity development within and beyond governments, including affected communities and other members of civil society.

PICES was established in 1992 to:

I. promote and coordinate marine scientific research in order to advance scientific knowledge of the area concerned and of its living resources, including but not necessarily limited to research with respect to the ocean environment and its interactions with land and atmosphere, its role in and response to global weather and climate change, its flora, fauna and ecosystems, its uses and resources, and impacts upon it from human activities;

II. promote the collection and exchange of information and data related to marine scientific research in the area concerned.

The Organization receives recommendations on the science program from the Science Board Executive Committee, which is supported by a number of permanent scientific and technical committees, along with an assemblage of "expert groups" with various life-spans. The PICES Convention Area is defined as "the temperate and sub-Arctic region of the North Pacific Ocean and its adjacent seas, especially northward from 30 degrees North Latitude, hereinafter referred to as the "area concerned". Activities of the Organization, for scientific reasons, may extend farther southward in the North Pacific Ocean."

The present PICES members are Canada, Japan, People's Republic of China, Republic of Korea, the Russian Federation, and the United States of America. All PICES countries, except Canada, are currently also members of APN.

Development of Collaboration

Reciprocal participation in annual meetings of both organizations in 2020 prompted the recognition of shared priorities and that closer ties, and planning of joint activities, would be mutually beneficial. A joint Study Group (SG) to develop a Framework for Scientific Cooperation was developed and approved by PICES Governing Council in 2021 [GC Decision 2021/S/3] with a Terms of Reference that can be found here: study-groups - PICES - North Pacific Marine Science Organization. Identification and approval of members was hampered by the COVID-19 pandemic, which prevented any in-person meetings and took some time, however, the Study Group had its first online meeting in February 2022. The SG met virtually three more times through 2022 and corresponded online to draft the present Collaborative Framework which was presented to PICES Science Board and Governing Council at PICES-2022. Representatives of both organizations also met in-person at PICES-2022 to discuss next steps. The present Collaborative Framework will be presented for consideration and approval to the APN Steering Committee either via email or on the occasion of its 51st Meeting in early 2023.

Collaborative Framework

APN Science Priorities

September 14, 2022

Through support of regional and international cooperation in research on inter- and transdisciplinary global change and sustainability issues particularly relevant to the Asia-Pacific region, APN aims to produce policy–relevant scientific knowledge that can contribute to the implementation of international agendas, such as the UNFCCC's Paris Agreement, Sustainable Development Goals, Sendai Framework for Disaster Risk Reduction, Post-2020 Global Biodiversity Framework, UN Decade of Ocean Science (2021-2030), and the accumulation of scientific knowledge in science-policy assessment bodies such as IPCC, IPBES, etc.

Global change affects all countries, and its impacts and the ability to measure and understand these impacts intersects different disciplines. Therefore, APN strives to address global change and sustainability in a holistic manner that involves active participation of all member countries across a broad spectrum of thematic areas under the global environmental change umbrella, including:

- Climate;
- Biodiversity and ecosystems;
- Air, land, coasts and oceans;
- Food, water and energy;
- Risk and resilience; and
- Human dimensions.

Capacity development of early-career scientists and professionals, and members of other societal groups is vital to enable APN member countries to formulate scientific evidence-based policies. Therefore, APN continuously stives to improve its capacity development agenda through:

- Enhancing efforts in providing support to early-career professionals through tailored research activities;
- Enhancing efforts in providing capacity development to early-career professionals that meet their specific needs, for example, by training them in developing high-quality scientific proposals;
- Continuing to strengthen APN's capacity development programme, CAPaBLE.
- Creating holistic and transdisciplinary capacity development activities on topics of relevance in the Asia-Pacific region.

PICES Science Priorities

PICES promotes transdisciplinary, multi-national collaborations to further collective understanding of the North Pacific's natural systems. As part of its vision, PICES aspires to be a leading contributor to global marine science and to be sought as a valued collaborator in addressing current and future management issues. The first goal of the 2016 PICES Strategic Plan is to "*Foster collaboration among scientists within PICES and with other multinational organizations, particularly with those that have common goals*".

PICES activities have been further guided by its current 10+-year integrated research program FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems). FUTURE is an integrative science program with a goal to understand and communicate the future of North Pacific ecosystems and the potential impacts from human use. More specifically, the

program seeks to understand how marine ecosystems in the North Pacific respond to climate change and human activities, to forecast ecosystem status based on contemporary understanding of how nature functions, and to communicate new insights to its members, governments, stakeholders, and the public. FUTURE is in its synthesis phase and is due to end in 2024.

In January 2021 the United Nations launched a Decade of Ocean Science for Sustainable Development (UNDOS), which was seen as a valuable opportunity for PICES to expand its horizons, building on FUTURE's achievements and providing a new iteration of integrated activities. A joint program proposal (SmartNet) was submitted with our sister organization, ICES, in the Atlantic, and was endorsed by the Intergovernmental Oceanographic Commission. SmartNet now forms a major focus within PICES which will last until 2031. It will establish a global knowledge network (GKN) for ocean science by strengthening and increasing the collaboration of ICES/PICES and partner organizations. It will support and leverage ICES/PICES member countries' activities related to UNDOS, by emphasizing areas of mutual research interest including climate change and ecological forecasting, fisheries and ecosystem-based management, and the social, ecological and environmental dynamics of marine systems, including coastal communities. It also incorporates strategies to facilitate UNDOS cross-cutting inclusivity themes relating to gender equality, early career engagement, and involvement of indigenous communities and developing nations in the planning and implementation of joint activities. The governance structure and implementation plan for Smartnet is currently being developed and will develop recommendations for new and existing Expert Groups.

Scientific Areas of Joint Interest

The criterion used to determine topics that are of mutual interest and which to focus on in the short-term was a shared relevance to both Organization's objectives or priority areas. Research areas and activities where collaboration would be desirable were identified (**Table 1**) together with the priority for each organization.

Collaboration Mechanisms

Potential mechanisms for enhancing collaboration between APN and PICES include:

1. Workshops or Topic Sessions at PICES annual meetings

Joint sessions at PICES annual meetings, typically held in October, are an excellent potential mechanism for cooperation between PICES and APN. Most past annual meetings include examples of sessions that PICES has co-convened with other organizations, such as CLIVAR (Climate and Ocean: Variability, Predictability and Change), ICES (International Council for the Exploration of the Sea), IMBER (Integrated Marine Biogeochemistry and Ecosystem Research), NOWPAP (Northwest Pacific Action Plan), and SOLAS (Surface Ocean Low Atmosphere Study), among others. The benefits of sharing research findings in a theme session or sharing expertise in workshops have been demonstrated by these examples.

Topic session proposals from PICES scientists and co-sponsoring organizations should be submitted to the PICES website by the deadline, typically September 1 of the calendar year before the Annual Meeting of interest. Proposals should include: a title, duration (full or half day), session description, list

of conveners, sponsoring PICES Scientific Committee(s), co-sponsoring organizations (if any), and whether (and where) a publication is intended. At the Committee meetings at the Annual Meeting in the fall (the year before the meeting of interest), recommendations for which session proposals to support are finalized. The Committee Chairs then present the recommendations to the Science Board (SB) who will evaluate and agree on co-sponsoring of sessions. The agreement will consider not just the scientific excellence and appropriateness of the proposals, but also the financial constraints of funding such sessions. The final list is then submitted to PICES Governing Council for final approval.

2. Joint Working Groups

Similar to the current joint APN-PICES Study Group on Scientific Cooperation in the North Pacific Ocean to develop the present Collaboration Framework, there may be a need to form other joint expert groups to address research priorities. Joint working groups represent one of the most effective mechanisms for collaboration and cooperation when there is a need to focus on a specific topic with specific deliverables defined by terms of reference. In general, joint working groups would be formed following one or a series of meetings and/or workshops that are organized on a common theme. Thus, effective planning is a crucial element in successfully establishing a new and productive working group. Typically, in PICES, a working group has a duration of three years. A proposal for a new working group should be submitted by one of the Committees to PICES Science Board for their review.

3. Conferences and Symposia

Normally, PICES organizes one major symposium per year in addition to its annual meeting. Typically, this symposium is jointly sponsored because of the financial commitments required to organize a major symposium. Organizations seeking co-sponsorship of a symposium by PICES should direct a letter of invitation to the Executive Secretary of PICES that describes the scientific rationale, other co-sponsoring organizations and a summary of roles and financial/in-kind contributions expected of PICES. Significant commitments of resources typically require 2–3 years advance planning. A potential example that may be an opportunity for co-sponsorship by APN is the next in the series of Early Career Scientist conferences (these alternate between ICES and PICES leadership), which would be expected to take place in a PICES country in 2027.

4. Representation at meetings and/or workshops

PICES and APN have a history of having representatives from other organizations participate in the annual meeting, including business meetings of relevant expert groups and workshops, where they can report on their organization's activities of interest and so foster collaboration. It is recommended that both organizations consider inviting one or more representatives from the other organization to participate in the meetings of, for example, the Steering Committee and Subregional Committee for the Pacific (for APN) and Science Board (for PICES) to update those bodies on ongoing research activities and research priorities for the future.

While hindered by the COVID pandemic, APN conducts at least one in-person subregional workshop to train early-career professionals on how to develop and submit effective proposals to APN for funding. In its current round of 2021 proposals, early-career professionals are leading 69% of projects funded by APN. This is a good indicator of its success. As APN's Pacific subregional Proposal Development Training Workshop (PDTW) is expected to be held in the coming year or two and as PICES and APN collaboration

is engaging Pacific subregional members of APN, there is a potential opportunity to have a joint Proposal Development Training Workshop on one or more of the topics identified in the introduction. A similar opportunity may also be relevant for North Pacific Countries as well as APN and PICES members overlap. This is an area worth exploring further.

Monitoring and Reporting

Following the approval and implementation of this collaborative framework by the respective bodies of PICES and APN (i.e., the Science Board and the Steering Committee), this framework will continue for a period of five years at which time it will be reviewed to assess the progress on the areas identified in Appendix 1, and to identify new areas for collaborations. The review should also assess the collaboration mechanisms by identifying which ones were employed, the utility of those mechanisms in achieving desired results, and identify new mechanisms for future joint collaboration.

On an annual basis, there will be a progress report prepared by the Secretariat of each organization that is available for its members. This progress report should be common for both organizations, be a summary of joint activities between PICES and APN (including status and actions required to make progress on objectives), and be prepared in collaboration by both Secretariats. Further, this progress report will be presented annually at the PICES Science Board and the APN ~~annual~~ Steering Committee meetings as part of a standing item on their agendas. If modifications/alterations are required to joint activities to enable enhanced productivity and success, these recommendations will be approved by both the PICES Science Board and APN Steering Committee (via correspondence if necessary). For any joint activity that is completed, the co-convenors will prepare a summary report of the activity and it will be available for all members of both organizations.

September 14, 2022

Table 1. Recommended joint PICES-APN focus areas with associated rankings and mechanism to achieve progress within 5 years.

Activity or Research Area	PICES Rank	APN Rank	PICES Focus	APN Focus	Mechanism and potential platforms	Priority in next 5 years
Activity: Capacity Development of ECOP. i. UNDOS cross-cutting theme	High	CD of ECPs: high	Major objective of SmartNet (UNDOS program). Major focus area for PICES recently with Advisory Panel on ECOP advisory-panels - PICES - North Pacific Marine Science Organization approved in 2021	One of the goals of APN's 5th Strategic Plan is capacity development, particularly that of early career professionals (ECPs)	1. APN – Capacity development programme (CAPaBLE) is one of the two main pillars of APN's activities; 2. APN's Proposal Developing Training Workshop (PDTW) in the Pacific region may benefit from PICES input if there is a marine theme. 3. Next ICES-PICES ECS Symposium planned for 2027	High, Relevant to UNDOS
Activity: Engaging Local and Traditional Ecological Knowledge i. UNDOS cross-cutting theme ii. Indigenous knowledge in the context of adaptation and disaster risk reduction iii. Indigenous Knowledge in the context of food and water security	High	High (for the Pacific SRC)	Major objective of SmartNet. Some activity at PICES-2022 (W6 for Bering Sea), Also planned for PICES-2023	"Global and indigenous knowledge" was one of the high priority topic areas of P-SCR for the 2021 call for proposals.	Workshops at upcoming events Will be discussed at PICES-APN side meeting in Busan, Sept 2022	High, relevant to UNDOS

Research area: Climate change; sustainable fisheries	High	Climate Change: high	Major objective of SmartNet, and several PICES Expert Groups	1. Food security (and habitat value) 2. Ecosystem services (non-food related) including cultural services		High, priority research area
Research area: Climate change; impacts of extreme events on coastal communities	High	High	New Working Group (WG49)	Adaptation and disaster risk reduction	Review WG plans as they develop. Look for opportunities to share outputs. Add an APN Ex-officio member	High, priority research area
Research Area: Marine plastic debris and microplastics	High	High	WG42 working-groups - PICES - North Pacific Marine Science Organization will end in 2022 but have indicated there should be a follow-on expert group (possibly a Section) to continue the work and link to Global initiatives	Marine plastic debris and microplastics are one of the focused areas under Goal 1 "Research" of APN's 5th Strategic Plan.	Include APN members in a new Expert Group? Review WG plans as they develop. Look for opportunities to collaborate and share outputs.	Med-high, awaiting outcome of PICES Science Board recommendation on new EG
Research Area: Regional climate model downscaling in the Pacific	High	High	Active area of research in PICES nations; theme of S-CCME; theme of SUPREME and BECI (UNDOS Program/Project)	"Regional climate downscaling in the Pacific" was one of the high priority topic areas of P-SCR for the 2021 call for proposals.	"Regional climate downscaling in the Pacific" will remain a high priority topic of P-SRC for the APN FY 2022 Call for Proposals	High
Research Area: Circular and Ecological Economy	Med	High	Likely of interest to PICES Human Dimensions Committee.	CEE is one of the focused areas under Goal 1 "Research" of APN's 5th Strategic Plan. Circular and Ecological Economy (CEE) is an initiative to enhance sustainable socio-		Med-high

				economic activities by drawing on locally available energies, natural resources, infrastructure, industrial conglomerations, as well as the indigenous culture, particularly in rural areas.		

Appendix 2

DRAFT

Framework for Enhanced Cooperation in the North Pacific Ocean between

the Pacific Salmon Commission (PSC) and the North Pacific Marine Science Organization (PICES)

2 August2022

Executive Summary

The joint PSC-PICES Study Group on *Scientific Cooperation in the North Pacific Ocean* (SG-SCPSC) agrees on the need for a formal framework to guide, develop, implement, and monitor activities between PICES and PSC in the area of science cooperation.

The framework identifies three major scientific topics of joint interest to PSC and PICES, but does not prioritize these topics, nor provides a timetable for their investigation:

- enhancing the current understanding of Pacific Salmon status and trends, and climate change impacts and associated management implications;
- promoting the collection of, and access to, data, models and other information while respecting confidentiality and domestic statutes; and
- identifying information and research needs and priorities.

The framework describes various collaborative mechanisms that can be followed, including sharing of data, information and methodologies, access to training and education opportunities, joint working group, study group or expert group, joint workshops, seminars and symposia, theme sessions at PICES annual meetings, and joint strategic initiatives. The framework will be discussed by PICES at the annual meeting of the Science Board in October 2022 and at the October 2022 Fall Meeting of the PSC.

The SG-SCPSC recommends that the framework for enhanced collaboration be implemented immediately after approval of the MOU in Appendix 1 by both Organizations, and that two persons from each Organization provide annual updates to the PICES Science Board and the PSC Committee on Scientific Cooperation concerning the implementation of this framework. Any initiative pursued under the MOU and this framework must be approved by the respective governing bodies in each organization prior to initiation and/or expenditure of funds.

1.0 Background

The PSC and PICES are inter-governmental organizations with overlapping geographical areas and common interests in the North Pacific Ocean. Both organizations promote and coordinate marine scientific research and the collection and exchange of information and data on Pacific salmon and their ecosystems. It is also anticipated that experiences and lessons learned in Pacific salmon research from the western North Pacific will be relevant to the eastern North Pacific governments, and vice versa. Cooperation and consultation are just as significant as data/information sharing for North Pacific Rim countries striving to conserve and manage Pacific salmon.

In recognition of shared interests and a desire by both organizations to facilitate and enhance cooperation between them, they will sign a Memorandum of Understanding (MOU) in 2022 that provides a mechanism for implementing this framework on scientific cooperation (*Appendix 1*).

To prepare the MOU and framework, the joint PICES/PSC Study Group on *Scientific Cooperation in the North Pacific Ocean* (SG-SCPSC) was established in 2021 to review each organization's information and research needs and identify where similar key questions or research issues might be explored jointly by both organizations.

The following are the terms of the reference (TOR) of the joint PSC-PICES Study Group (hereafter, SG):

1. Review information on each organization's governance structure, mandates and research interests;
2. Develop a list of potential areas of cooperation;
3. Convene one or more meetings to:
    a. improve understanding of the data and research activities of each organization
    b. review data and research topics from TOR (1) to identify areas of common interest
    c. develop a framework for cooperation between PSC and PICES that lists categories of joint activities and the rationale for each, including the benefits to each organization from the joint activity, and identify priorities for joint activities within categories;
    d. recommend processes for implementing TOR (3c)
    e. recommend approaches to develop a strategic plan for cooperation and mechanisms to periodically update that plan.
4. The Co-Chairpersons will prepare a final Study Group report for distribution by September 2022.

The SG consists of:

Dr. Sonia Batten (PICES Executive Secretary)

Ms. Diana Dobson (DFO)

Dr. Edward Farley (NOAA/NMFS)

Mr. John Field (SG Co-Chair, PSC Executive Secretary)

Dr. Satoshi Honda (Japan FRA)

Dr. Jackie King (SG Co-Chair, DFO)

Dr. Catherine Michielsens (PSC Secretariat)

Mr. Anjum Mutakabbir (DFO)

Ms. Cara Fogliato (DFO)

Dr. Scott Rumsey (NOAA/NMFS)

Mr. Bill Templin (Alaska Dept. of Fish and Game)

Dr. Sang Seon Yun (Korea; Nereus Laboratories)

At the initial SG meeting, members provided brief overviews of PICES and PSC organizational structures and scientific missions. They also discussed scientific needs and overlapping issues that might be explored jointly by both organizations.

Members also reviewed a draft of this framework at their initial meeting and continued discussion, consideration, and drafting by email.

1.1 PSC organizational structure and procedures

The PSC is a regional fishery management organization created under the 1985 Treaty between the Government of Canada and the Government of the United States Concerning Pacific Salmon (the Pacific Salmon Treaty). As a treaty organization, the PSC facilitates implementation of the Treaty through research and regular meetings between national, provincial/state, First Nation, and U.S. tribal delegates to manage commercial, sport, and subsistence fisheries in both countries.

It has responsibility for all Pacific salmon originating in the waters of one country that are subject to interception by the other, affect management of the other country's salmon or biologically affect the stocks of the other country. In addition, the PSC takes into account the conservation of steelhead trout while fulfilling its other functions. This biological description of Treaty coverage translates geographically to coastal waters and spawning rivers of the Yukon, Southeast Alaska, British Columbia, and the Northwest United States.

A group of sixteen commissioners represent environmental interests, commercial and recreational fisheries, as well as federal, state and Indigenous governments. There are five regional Panels, four of which report to the PSC Commissioners. The PSC and Panels carry out their responsibilities aided by data, modelling and scientific advice provided by a number of bilateral Technical Committees. The Committee on Scientific Cooperation includes members from each Party, the Executive Secretary, and the PSC's Chief of Fisheries Management Science. It is charged with addressing broad scientific issues affecting salmon management in the two countries, and engages with a steering committee of four Commissioners throughout the year. However, the PSC does not have an organizational science or research plan. See Figure 1 for the PSC's organizational chart.

The PSC is administered through a Secretariat in Vancouver, Canada. The 31 Secretariat staff members include administrative and scientific professionals who facilitate meetings, run field programs, collect and analyze data, provide scientific assessments and maintain extensive archives dating back to the early 20th century.

1.2 PICES organizational structure and procedures

The North Pacific Marine Science Organization (PICES) is the international, inter-governmental organization that is responsible for coordinating and promoting marine scientific research and scientific information exchange among its Contracting Parties (Canada, Japan, People's Republic of China, Republic of Korea, the Russian Federation, and the United States of America). The primary area of interest to the Organization is the northern North Pacific Ocean, bounded at the south by 30°N latitude and in the north by Bering Strait. PICES was established by international convention in 1992, with a Secretariat hosted by Fisheries and Oceans Canada at the Institute of Ocean Sciences, Patricia Bay, Canada.

Two delegates from each Contracting Party plus a Chair elected by the delegates form a Governing Council that is responsible for policy, general direction, decision-making, and priority setting (Figure 2). The scientific activities of PICES are established by a network of 300 scientists, appointed by the members to serve on standing committees and various thematic expert groups. Governing Council is advised by its Science Board on scientific priorities. The Science Board is formed by the Chairs of the permanent Scientific Committees and Technical Committees. Should any Contracting Party not be represented on Science Board by virtue of not having a chair, it can appoint a representative to serve its scientific interests.

The scientific work of PICES is conducted primarily by ephemeral working groups and study groups with 1- to 3-year lifespans to achieve the results described in their terms of reference (Figure 2). Advisory Panels and Sections provide longer-lived expert groups to maintain specific expertise within PICES. Chairship for expert groups is often shared by Asian and North American scientists.

The Scientific and Technical Committees are responsible for the planning and direction of major disciplinary themes. They provide general supervision to the expert groups and report their activities to Science Board.

From time to time, Science Board has provided formal scientific advice to a Contracting Party, but it is not a major activity. Scientists in PICES have focused on reporting status and trends in the North Pacific and understanding the nature and consequences of global climate change. New initiatives will seek to communicate this understanding to society.

The work of PICES is determined primarily by the scientists of the Contracting Parties. They are supported by a Secretariat that is responsible for organizing their international meetings and workshops, publishing their work, fundraising, maintaining and developing the PICES website, maintaining and enhancing relations with other international organizations, and for the day-to-day running of the Organization. When called upon, the Secretariat leads the development of major scientific products.

The PICES Strategic Plan describes how the organization will implement its mission to promote and coordinate marine scientific research (PICES-Strategic-Plan-Oct-2016.pdf). The plan lists several goals, the first five of which are especially relevant to this framework:

> (1) Foster collaboration among scientists within PICES and with other multinational organizations;
>
> (2) Understand the status and trends, vulnerability and resilience, of marine ecosystems;
>
> (3) Understand and quantify how marine ecosystems respond to natural forcing and human activities;
>
> (4) Advance methods and tools;
>
> (5) Provide relevant scientific information pertinent to North Pacific ecosystems that is timely and broadly accessible.

PICES activities are further guided by its current integrated research program FUTURE: *Forecasting and Understanding Trends Uncertainty and Responses of North Pacific Marine Ecosystems*. FUTURE is an integrative science program undertaken by the Contracting Parties and affiliates of PICES to understand

how marine ecosystems in the North Pacific respond to climate change and human activities, to forecast ecosystem status based on a contemporary understanding of how nature functions, and to communicate new insights to its members, governments, stakeholders and the public. (www.pices.int/members/scientific_programs/FUTURE/FUTURE-main.aspx).

2.0 Major research topics of joint interest to PSC and PICES

PICES has a much broader scientific mandate than PSC. As described above, PICES is tasked with understanding how marine ecosystems respond to climate change and human activities. Climate change is a focus of PSC scientific dialog, but solely in the context of sustainable salmon management in coastal waters and spawning rivers in the Yukon, Southeast Alaska, British Columbia, and the Northwest United States.

Improved collaboration should allow PSC and PICES researchers to add value to their scientific programs, provide synergies on regional and global issues, and enhance the visibility of both organizations. This strategy should be adaptive to allow the organizations to respond to changing priorities of each organization's Contracting Parties and of the scientific community.

The SG identified three broad research areas of mutual interest, each with various subtopics. The following list is not prioritized, and there is some overlap among items listed:

- enhancing the current understanding of Pacific Salmon status and trends, and climate change impacts and associated management implications;
- promoting the collection of, and access to, data, models and other information; and
- identifying information and research needs and priorities.

2.1 Enhancing the current understanding of Pacific Salmon status and trends, climate change impacts and associated management implications

Climate change will likely result in increases in ocean temperature that could impact the survival of many marine organisms, including salmon. Furthermore, climate change could result in changes to many characteristics of an ecosystem, such as species biomass, community species composition, and seasonal dynamics of prey and predators. These changes could result from increasing ocean temperature, increasing stratification, increased mixed layer depth, and/or decreases in nutrient concentration.

There are many areas of possible collaboration between PSC and PICES, particularly with the PICES/ICES Section on *Climate Change Effects on Marine Ecosystems* (S-CCME). Some focused research topics include the following:

(1) Key climatic and oceanographic factors affecting long-term changes in food production and salmon growth rates, for example:

- Linkages between salmon marine survival and climate and ocean change;

(2) Environmental factors that affect salmon ocean distribution (*e.g.*, temperature, salinity, prey biomass, *etc.*) and how distribution (including winter in the open ocean) may be affected by climate change, for example:

- Impacts of climate change on available salmon habitat and salmon production;

(3) The human dimension of ecosystem change (a key element of its FUTURE research initiative).

Although PSC's mission is the management of salmon, the Secretariat and domestic agency scientists may be able to collaborate on specific research questions.

2.2 Promoting the collection of, and access to, data, models and other information;

In general, sharing data, information, models, and methodologies is essential to promote scientific collaboration. The PSC has access to large data sets on Pacific salmon and regional fisheries, and PICES has access to expansive information on North Pacific ecosystems and high seas research relevant to Pacific salmon. Canada and the United States send scientific experts to both organizations. . Nonetheless, there is limited domestic and international communication about each organization's initiatives, priorities, archives, and public data availability. While data and information sharing would facilitate collaboration and advance research, it can add a considerable burden to researchers, and needs to be planned carefully and facilitated.

Given the need to share data among PICES member countries, the PICES Technical Committee on Data Exchange (TCODE) is responsible for PICES data inventory and identifies data to be included in the PICES data inventory. For any data provided to PICES, PICES respects the ownership rights and any restrictions placed on these data by the provider. The data include data products and model outputs as well as meta data.

Moving forward, the PSC could be both a data provider as well as an end user of the PICES data in view of the protections in place for ownership and confidentiality. The PSC has numerous publications, research priorities, and data that it makes publicly available via its website, but this information is not always in the most accessible format for other users (e.g., data spread over a series of annual reports in PDF format). The PSC's grant programs have provided substantial funding for high seas and coastal marine research over the last several years that could be relevant to PICES interests. It is also undertaking an organization-wide inventory of how environmental factors are (or could be) incorporated into its salmon assessments. Such an effort could a) be informed by marine ecosystem information held by PICES; and b) inform PICES deliberations on other fisheries issues in the North Pacific.

Once initiated under the MOU in Appendix 1, this framework could help improve connectivity and communication between scientists engaged in PICES and PSC to a) match expertise with specific problems or issues; b) reduce redundancy in funded research initiatives; c) expand awareness of each organization's information/data holdings; and d) initiate mutually beneficial workshops/symposia/theme sessions endorsed by the respective governance systems. Such efforts, elaborated in Section 3 below, would also benefit from cost-sharing between the two organizations where appropriate and approved.

2.3 Identifying gaps in knowledge and needs that should be addressed.

Climate change is changing the abundance, productivity and distribution of North Pacific salmon species. Given the complex nature of environmental impacts on Pacific salmon stocks, PSC Technical Committees

have increasing difficulty inappropriately accounting for climate change in assessments and the selection of management goals. Increased interaction and collaboration between PSC and PICES may better inform the PSC family to the availability of data and methods to appropriately incorporate climate change in assessments and would inform the PICES community better on the high-quality salmon data available and research priorities based on fisheries management considerations.

3.0 Implementation procedures

Potential mechanism`s for enhancing cooperation between NPAFC and PICES include:

1. Sharing of data, information and methodologies

2. Access to training and education opportunities

3. Theme sessions at PICES annual meetings

4. Joint working group, study group or other expert group

5. Seminars and symposia

6. Workshops at PICES annual meetings or other events

7. Strategic initiatives

8. Other

3.1 Sharing of data, information, and methodology

Both PICES and the PSC share the belief that the sharing of data, information and methods are essential to advance the knowledge and understanding of ecosystem changes in the North Pacific Ocean and how this may impact different species such as Pacific salmon. The websites of both organizations are important means for sharing information and publications.

The sharing of data among PICES countries is currently organized by TCODE (Technical Committee on Data Exchange) which is the committee responsible for the development of communication networks for exchange of data and information. For any of the data provided, PICES respects the ownership rights and any restrictions placed on these data by the provider. TCODE is among others responsible for managing the PICES data inventory and assisting Expert Groups to identify data that are to be included in the data inventory. They also assist the Expert Groups in the development of data management options and strategies.

Inclusion of Pacific salmon fisheries and assessment data from the PSC in the PICES data inventory could be discussed with TCODE and a relevant Expert Group established that would include relevant PSC representatives to ensure appropriate confidentiality and other protections are in place, inter alia.

3.2. Access to training and education opportunities

Given the overlapping interests of the PSC and PICES in the North Pacific Ocean, the increased need to account for ecosystem changes in assessment methodologies and the continuous need of both organizations to improve the knowledge and skills of both experienced as well as early career researchers and biologists, it would be beneficial for both organizations to provide the PICES/PSC

community access to PSC or PICES-wide training opportunities. Past PSC-wide training included training workshops on leading technical meetings, the use of SharePoint, and Bayesian assessment methods.

Currently training and education opportunities are an area that is underexplored for both organizations. This framework and MOU could help to build mutual awareness of training needs among delegates and means to address them via cost-sharing.

3.3 Theme sessions at PICES annual meetings

Joint topic sessions at PICES annual meetings held normally in October are an excellent potential mechanism for cooperation between PICES and PSC. There are numerous past examples of sessions that PICES has co-convened with other organizations, such as the International Year of the Salmon/NPAFC, ICES (International Council for the Exploration of the Sea), IMBER (Integrated Marine Biogeochemistry and Ecosystem Research), NOWPAP (Northwest Pacific Action Plan), Ocean Network Canada, SOLAS (Surface Ocean Low Atmosphere Study), and many others.

The benefits of sharing research findings and expertise have been demonstrated by these examples. Cross-cutting or interspecific discussion of PSC science is typically achieved through workshops, seminars, and symposia often held in the margins of the organization's two large winter meetings (January and February).

PICES – Topic session proposals by scientists working under the PICES umbrella should be submitted to the PICES website by the deadline, typically September 1 of the calendar year before the Annual Meeting of interest. Proposals should include: a title, duration (full or half day), session description, list of conveners, sponsoring PICES Scientific Committee(s), co-sponsoring organizations (if any), and whether (and where) a publication is intended. The proposals are then ranked by all Committee members online. At the Committee meetings at the Annual Meeting in the fall (the year before the meeting of interest), recommendations for which session proposals to support are finalized. The Committee Chairs then present the recommendations to the Science Board (SB) for final decision. The PICES SB will evaluate and agree on co-sponsoring of sessions. The agreement will consider not just the scientific excellence and appropriateness of the proposals, but also the financial constraints of funding such sessions.

PSC – The PSC has hosted numerous scientific/technical sessions in the margins of its winter meetings in January and February. These have addressed updates on oceanographic conditions in the North Pacific, stock assessment modelling, variation in environmental indicators, and other topics of interest to salmon managers. Participation has typically been limited to national delegates, but the pending PICES/PSC MOU could broaden invitations to PICES scientists with the respective approval and planning from each organization. Proceedings for such sessions can be video recorded and posted to the PSC's YouTube channel for public use, and written reports or abstracts can be published via the PSC's Technical Report series. Seeking PSC approval of such sessions is straightforward and could be accomplished via the Committee on Scientific Cooperation or the new PSC-PICES Study Group on *Scientific Cooperation in the North Pacific Ocean* (SG-SCPSC) submitting short written proposals under the auspices of the PICES/PSC MOU at least one year in advance. Venues for such events would be limited to Vancouver, B.C. or Portland, Oregon for in-person attendees, but online participation is broadly available.

3.4 Joint working group, study group or Expert Group

Both PICES and the PSC have the ability, following the necessary approvals, to create a working group, study group or other expert group depending on the perceived need. Similar to the current joint PSC-PICES Study Group on Scientific Cooperation in the North Pacific Ocean (SG-SCPSC) to develop this framework for enhanced scientific cooperation, there may be a need to form other joint groups to operationalize other collaborative mechanisms described in this framework. For example, a joint PSC-PICES Expert Group may be needed to identify data that may be included in the PICES data inventory.

It may be of interest for both organizations to initiate new cross-cutting activities that require the engagement and participation of several organizations. The initiatives would be aimed at multi-disciplinary topics that could benefit from additional coordination.

PICES – Cross-cutting initiatives can be addressed by forming a new Section in PICES. A "Section" represents a sub-committee under a scientific committee that has a longer lifespan than a working group. Its purpose is to provide input to the parent scientific committee on specific issues for which expertise may be lacking on the parent committee. Sections should be reviewed periodically to ensure they continue to meet their objectives. An example is the joint ICES-PICES Section (Strategic Initiative) on *Climate Change Effects on Marine Ecosystems* (S-CCME), which aims to ensure that "*ICES and PICES will become the leading international organizations providing science and advice related to the effects of climate change and variability on marine resources and ecosystems*".

PSC – Launching cooperative initiatives with other organizations is a new possibility for the PSC, and warrants further discussion via the PSC-PICES Study Group on *Scientific Cooperation in the North Pacific Ocean* (SG-SCPSC), the Executive Secretaries, and the relevant scientific bodies within the two organizations.

3.5 Symposia

PICES – Proposals generated internally within PICES for jointly sponsored symposia are generally brought to the attention of Science Board by Committee Chairs at one of its two meetings during the year. The nature of the discussion often depends on whether PICES is asked to be the organizer. Normally, PICES organizes one major symposium per year. Typically, this symposium is jointly sponsored because of the financial commitments required to organize a major symposium. Organizations seeking co-sponsorship of a symposium by PICES should direct a letter of invitation to the Executive Secretary of PICES. In addition to the scientific imperative, the letter should include the names of other co-sponsoring organizations and a summary of role and financial/in-kind contributions expected of PICES. The Executive Secretary will circulate the invitation to the relevant Committees. Significant commitments of resources typically require 2–3 years advance planning. Potential jointly organized and co-sponsored symposia may require more lead time.

3.6 Seminars

The PSC is hosting a monthly seminar series for its national delegates, begun in early 2022. The goal is to develop an actionable strategy to help prepare and support the ability of the PSC family to contend with environmental challenges. The series steering committee is comprised of volunteers from the PSC family so as not to interfere with other responsibilities and obligations. It would be desirable to include membership from PICES given the expertise and connections to speakers focusing their research on

environmental challenges. PSC seminar topics thus far included: heat waves and ocean blobs, new salmon habitat: from glacial retreat to spawning in the Arctic.

3.7 Workshops

New emerging issues often demand innovative and multidisciplinary approaches. The ability to deal with and resolve new concepts is likely to be enhanced by bringing together PSC and PICES expertise in co-sponsored workshops.

PICES – Proposals for jointly sponsored workshops are generally brought to the attention of Science Board by Committee Chairs. For the most part, a proposal for a workshop should resemble a proposal for a scientific session, with some additional information depending on whether it is associated with a PICES or PSC annual meeting, local host/organizer, institute/location, dates, financial expectations of PICES (commonly for invited speakers from PICES and/or PICES conveners). Proposals for workshops to be held at the PICES annual meeting are submitted the same way as for theme sessions (see 3.1 above).

PSC – The PSC has hosted various workshops on topics ranging from orca survival and salmon predation, and use of environmental indicators in stock assessment. These are supported either through national financial contributions, in-kind donations, or grants from the PSC's Northern and Southern Restoration and Enhancement Funds. The formality for seeking such support varies by mechanism, but typically involves 1-2 years planning ahead of the event.

3.8 Other

Other mechanisms for cooperation between PSC and PICES include regular representation at each other's annual meetings and mutual contributions to selected reports.

3.8.1 Representation at annual meetings

Invitations to respective annual meetings can be organized via the two secretariats, with scope of the invitation (i.e., Secretariats, national delegates, etc.) designed as appropriate.

3.8.2 Contribute to reports

PICES produces a number of scientific reports, special issues in peer review journals, the newsletter PICES Press, etc. Many reports are the products of Expert Groups but PICES also produces periodic North Pacific Ecosystem Status reports and there may be opportunities for salmon-related contributions in future editions.

In general, scientific publications from the PSC take the form of

a. Technical Reports: results of completed or ongoing investigations carried out by the PSC that are deemed of sufficient interest to be made available to the scientific community and the public. Reports in this series are published on an irregular basis, and are not peer-reviewed.
b. Technical Committee Reports: reports issued by its nine joint Technical Committees. These typically address annual tasks and model output required under the Pacific Salmon Treaty or accepted practice, and are not peer-reviewed.
c. Endowment Fund Reports: provide results from projects financed by the PSC's Northern and Southern Endowment Fund programs, with each project typically spanning 1-2 years.

d. Special Reports: relay results from PSC-hosted workshops/seminars, consultants' findings on specific topics prioritized by the PSC, and work of the Committee on Scientific Cooperation. These are not usually peer-reviewed.

Further collaboration, as appropriate, on reports led by either organization would advance the cause of increased cooperation. Such collaboration will be defined and decided on a case-by-case basis by the governing bodies in each organization.

4.0 Monitoring/steering cooperation

The SG concludes that this framework should provide sufficient guidance to the PSC and PICES communities to develop bottom-up joint activities, with clear procedures for approval and implementation (see section 3.0). The implementation of these activities needs to be agreed upon by the organizations' respective bodies: the Science Board in the case of PICES and the Commissioners in the case of PSC.

When considering cooperative proposals, these bodies also need to take into account their own scientific priorities as determined by their respective processes. Additional considerations are the financial and structural constraints under which the organizations operate, and the balance of cooperative activities in their own profiles.

A mechanism is needed to monitor and steer PSC – PICES collaborations, and to act as an interface between the two organizations and the proponents of joint activities. It is proposed that this role be filled for PSC by a representative of the Secretariat and a member of the Committee on Scientific Cooperation and for PICES by a representative of the Science Board and FIS Committee.

This group of four would ensure a responsive structure with a light footprint and minimal additional costs, and with the mandate to implement specific cooperative activities, such as joint meetings, working groups, and strategic initiatives, identified in this framework and when approved by each organization's governing bodies. In addition, it is suggested that a strategic analysis be conducted every 3–5 years, and that this includes an additional 2–5 members of each organization.

5.0 Conclusions and next steps

In conclusion, the SG recommends this framework be adopted by both organizations. The framework identifies three broad areas of joint scientific interest to PSC and PICES, but does not prioritize them:

- enhancing the current understanding of Pacific Salmon status and trends, climate change impacts and associated management implications;
- promoting the collection of, and access to, data, models and other information; and
- identifying information and research needs and priorities.

The SG recognizes that topics of interest will change over time and does not provide a timetable for their investigation.

The framework identifies various mechanisms for implementing enhanced cooperation between PSC and PICES, including theme sessions at PICES annual meetings, joint working groups, symposia,

workshops, strategic initiatives, and representation at each other's meetings. Procedures for other collaborations (*e.g*., publications, training) may require further development.

Both organizations require lead time to identify, evaluate, and formulate ongoing commitments as next steps toward enhancing cooperation. When given opportunities for co-involvement by scientists of both organizations through the implementation mechanisms identified in this framework, enhanced cooperation in areas of mutual scientific interest should expand.

The framework will be considered by the inter-sessional meeting of the PICES Science Board in September at PICES-2022 and at the October 2022 Meeting of the PSC. Final approval by PICES will be required by Governing Council at their October 2022 Annual Meeting. Assuming the framework is approved by both Organizations, the Study Group recommends that the framework be implemented immediately and that two persons from each Organization provide annual updates to the PICES Science Board and the PSC Commissioners concerning the framework's implementation.

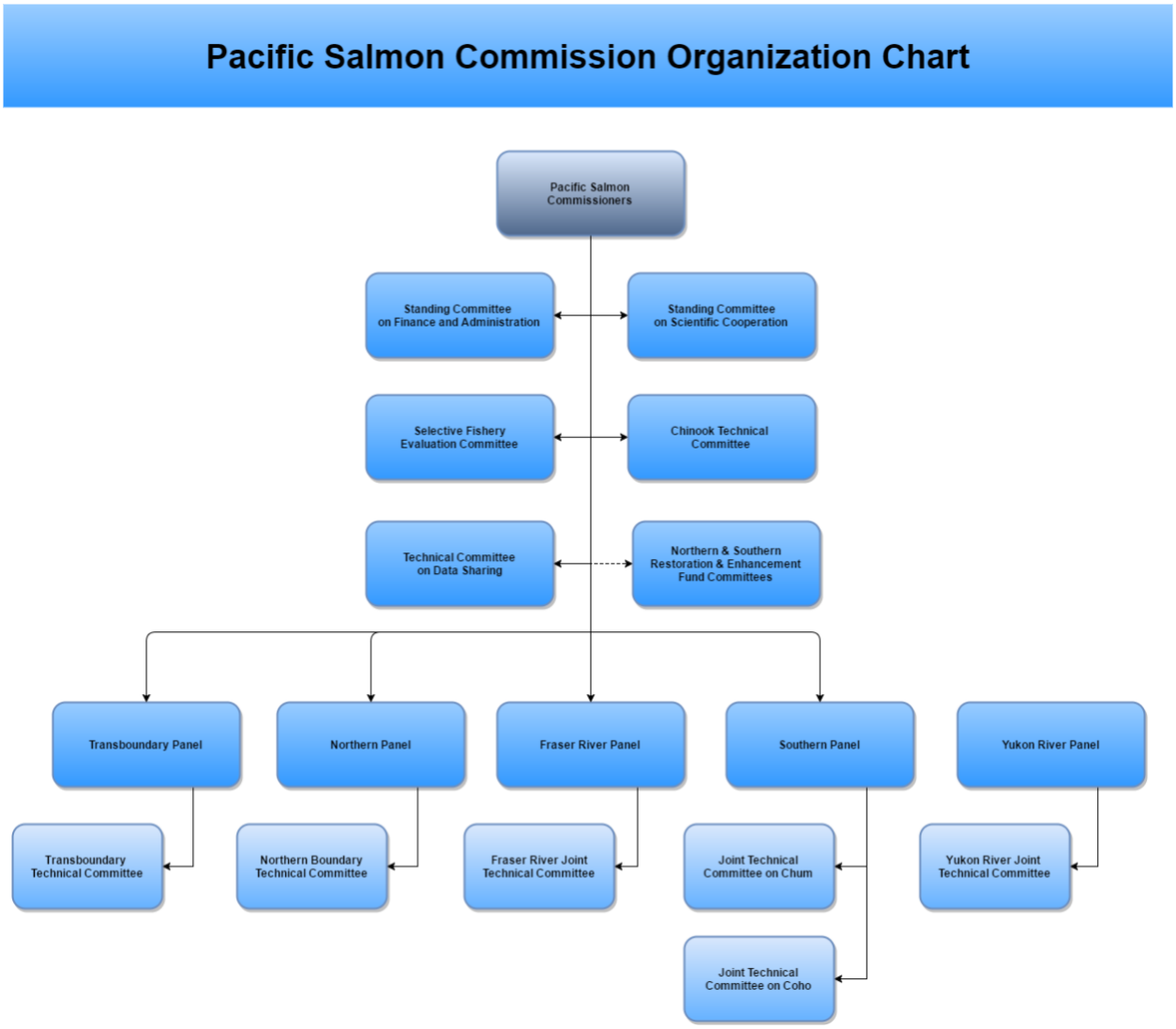


Figure 1. Organizational structure of the PSC in 2022

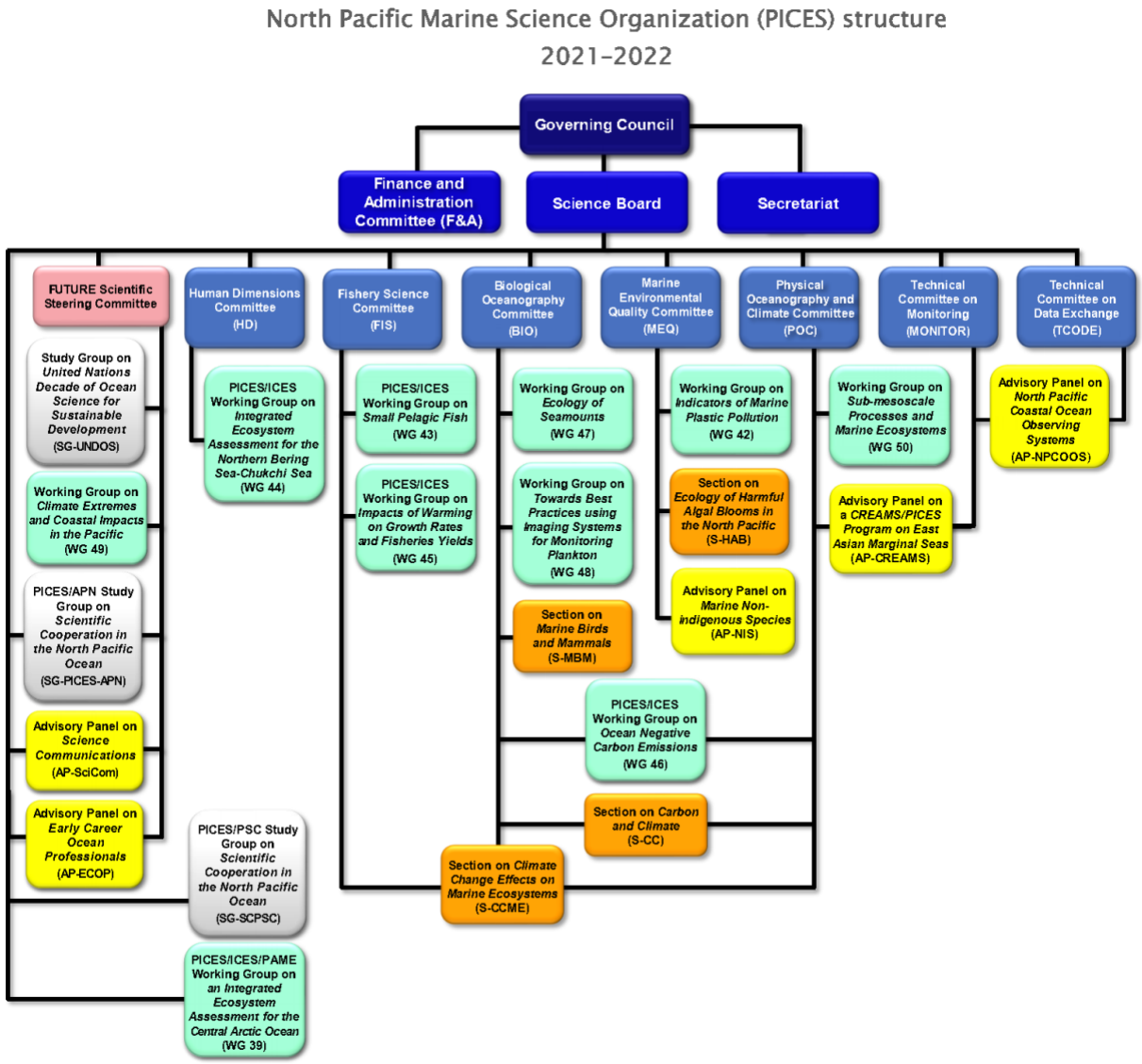


Figure 2. Organizational structure of PICES in 2022. The uppermost rows are the executive and standing committees. Expert groups under them are generally ephemeral, with their lifespan determined by the nature of their duties.

***Appendix 1*: Draft Memorandum of Understanding between the North Pacific Marine Science Organization and the Pacific Salmon Commission**

Recognizing that the North Pacific Marine Science Organization (PICES), exists to: (a) promote and coordinate marine scientific research in order to advance scientific knowledge of the area concerned and of its living resources, including but not necessarily limited to research with respect to the ocean environment and its interactions with land and atmosphere, its role in and response to global weather and climate change, its flora, fauna, and ecosystems, its uses and resources, and impacts upon it from human activities; and (b) to promote the collection and exchange of information and data related to marine scientific research in the area concerned;

Recognizing that the Pacific Salmon Commission (PSC) exists to: a) prevent over-fishing and provide for optimum production, and b) ensure that both countries receive benefits equal to the production of salmon originating in their waters, and further that the Parties shall conduct research to investigate the migratory and exploitation patterns, the productivity, and the status of stocks of common concern and the extent of interceptions while noting the Commission may make recommendations to the Parties regarding the conduct and coordination of research;

Recognizing the mandatory powers, constraints and obligations under which PICES and PSC respectively operate;

Desiring to provide a framework for mutual cooperation;

PICES and PSC, hereinafter called "the Parties", have agreed to the following:

1. To maintain reciprocal consultations and appropriate contacts on matters of common interest in the field of marine scientific research;

2. To regularly exchange data, information, documents, and publications relating to program and project plans and the results of activities agreed by the Parties to be of mutual interest, joint or otherwise;

3. To invite each other to be represented, in an observer capacity, at meetings of common interest, to the extent that this is possible within their respective working procedures;

4. When appropriate, to provide access to workshops, seminars, training opportunities organized by the Parties;

5. To undertake joint activities, as appropriate, including when agreed, the establishment of joint subsidiary bodies or other suitable arrangements, to study and report on matters of common interest;

6. To consult, as appropriate, on ways in which cooperation between them can be further improved and extended. Specific joint programs and activities may be defined through addenda to this agreement;

7. This Memorandum of Understanding (Memorandum) shall enter into force upon signature of the person duly authorized by each Party and shall remain in force unless either Party withdraws pursuant to paragraph 9 below;

8. The terms of the Memorandum may be revised by the Parties if they both agree. The Memorandum shall continue on the basis of the existing terms until new terms have been agreed;

9. Either Party may withdraw from the Memorandum at any time subject to giving one year's written notice to the other Party.

[Signed by the Chairman (PSC) and Chair (PICES) in [year]

Appendix 3

NORTH PACIFIC MARINE SCIENCE ORGANIZATION (PICES)
PROJECT ON "*BUILDING LOCAL WARNING NETWORKS FOR THE DETECTION AND HUMAN DIMENSION OF CIGUATERA FISH POISONING IN INDONESIAN COMMUNITIES*"

INTERIM SCIENTIFIC PROGRESS REPORT FOR YEAR 2-3 (APRIL 1, 2021 – AUGUST 15, 2022)

The overall goal of the PICES/MAFF project, entitled "*Building Local Warning Networks for the Detection and Human Dimension of Ciguatera Fish Poisoning in Indonesian Communities*" (acronym Ciguatera), is to build the capacity of local small-scale fishers and community members to monitor their coastal ecosystems and coastal fisheries. This 3-year (April 1, 2020 – March 31, 2023) project is funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA), from the Official Development Assistance (ODA) Fund.

The project's focus is to detect and monitor *Ciguatera Fish Poisoning* (CFP) in tropical reef fisheries, which globally has the most significant human health and economic impacts of any algal-based poisoning syndromes. CFP stems from the human consumption of fish containing toxins produced by benthic microalgae of the genus *Gambierdiscus*, *Fukuyoa*, and other dinoflagellates. Ciguatoxin accumulates in fatty tissues and becomes concentrated up the food web. The major CFP symptoms are severe—vomiting, diarrhea, numbness of extremities, mouth and lips, reversal of the sensations of hot and cold, muscle and joint aches— and can last for days to weeks, resulting in substantial economic impacts, fear of using local seafood resources, and altered community cultural customs. CFP emergence in new regions, and intensification in others, often is associated with anthropogenic pressures. The primary concerns for local communities are first to identify reef regions where the causative organism is abundant and second, to manage their anthropogenic stressors to minimize increases in its presence and protect communities against this emerging health concern.

This project aims to adapt and further refine smartphone-based tools for fisheries and environmental observations and approaches/methodology developed during the 2017–2020 PICES/MAFF project on "*Building Capacity for Coastal Monitoring by Local Small-scale Fishers*" (acronym FishGIS) to:

- *Assess* the state of the local coral reefs, the common ecosystem for ciguatoxic fish;
- *Detect* the presence of the toxin-containing dinoflagellates in the reef environment;
- *Avoid* the transfer of contaminated fish from the damaged environment to the tables of families.

The onset the COVID pandemic severely impacted the on-site training and implementation plans, but significant progress has been made by utilizing zoom-based communications and existing resources of our Indonesian colleagues. Four Project Science Team (PST) meetings have been held over the review period (in July, August and September 2021 and in April 2022), with the participation of our Indonesian colleagues Drs. Suhendar I Sachoemar (BRIN and IIT) and Arief Rachman (BRIN). Topics included refinement of the smartphone application (FishGIS), development of a Project Design Matrix (PDM) and Plan of Operation (PO) to guide training and field programs, review existing data on benthic Harmful Algal Bloom (HAB) species in Indonesia, and establishing common understanding of the expected inputs from all PST members and the anticipated outcomes from the project. A separate set of virtual meetings was dedicated to exploring revisions to the project implementation plan under the Indonesian pandemic restrictions, and to discussing and initiating a new formal collaboration between PICES and the Indonesian Institute Technology (IIT) to augment project capabilities and to facilitate field surveys. A virtual PICES/IIT MOU (Memorandum of Understanding) Signing Ceremony took place on March 23, 2022 (JST).

The pandemic-related delays led to a decision to expedite project data collection by combining funding from the PICES/MAFF project and from BRIN (National Research and Innovation Agency of Indonesia) to allow carrying out the enhanced field program in the Gili Island region, with a total of five 6-day long sampling surveys in the period from May 2022 through February 2023, providing measurements across wet, dry and

transition seasons. The first two surveys have been completed in May and August 2022 (one funded by BRIN and one by this project). Community participation in these surveys was restricted due to pandemic regulations, so emphasis so far has been on oceanographic observations (with active use of the smartphone-based FishGIS and Hydrocolor tools), phytoplankton assemblage composition, and toxic benthic algae distributions. The field program is designed to compare human-impacted reef systems to those in a local marine conservation area. Preliminary results from the first survey identify the low level presence of toxic benthic dinoflagellate species related to CFP on both natural and synthetic sampling substrates. The detail report from the May 2022 survey will be available at the project website in early September. Three more surveys (two funded by this project) will be conducted after PICES-2022, with plans to incorporate community participation.

Considering that one of the main goals of the project is capacity building, the PST is supporting involvement of six undergraduate students from the University of Indonesia, Mataran University and ITI (two from each) to in the field sampling program by providing them partial tuition.

The next PST meeting will be in-person a day before the start of the 2022 PICES Annual Meeting in Busan, Korea, where two papers based the project findings will be presented. The final (in-person) PST meeting is tentatively planned in Indonesia in early 2023 as part of a development and implementation program of community training workshops that can be continued by BRIN and IIT past the project completion.

Appendix 4

Reporting Committee List

Reporting Committee List – SB2022

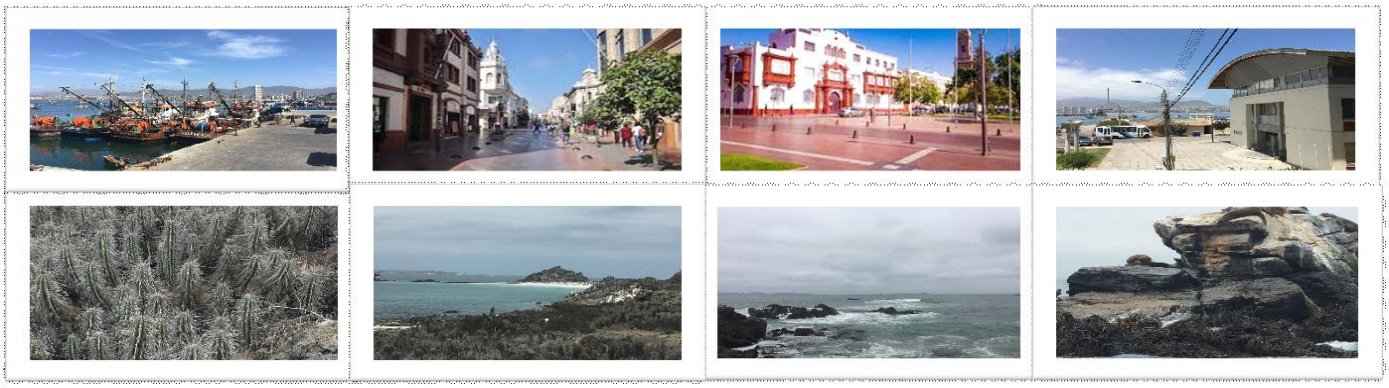
See each link for the information of Expert Group and contact information of EG and Committee chairs.
Shaded = Expert Groups with more than one parent Committees

Reporting Committee	Will Report on These EGs	Other Parent Committee(s)
FUTURE	SG-PICES/APN- Scientific Cooperation in the Pacific Ocean	SB
	AP-UNDOS: United Nations Decade of Ocean Science	SB
	AP-ECOP: Early Career Ocean Professionals	SB
	WG49: Climate Extremes and Coastal Impacts in the Pacific	
	*Final Report Progress only: WG36	
BIO	S-MBM: Marine Birds and Mammals	
	WG47: Ecology of Seamounts	
	WG48: Towards best practices using Imaging Systems for Monitoring Plankton (WGISMP)	
	*Final Report Progress only: WG37	
FIS	S-CCME: Climate Change Effects on Marine Ecosystems	BIO, POC
	WG45: PICES/ICES - Impacts of Warming on Growth Rates and Fisheries Yields (GRAFY)	
HD	WG44: PICES/ICES - Integrated Ecosystem Assessment for the Northern Bering Sea - Chukchi Sea	FIS
	WG43: PICES/ICES - Small Pelagic Fish	FIS
	*Final Report Progress only: WG41	FUTURE
MEQ	S-HAB: Ecology of Harmful Algal Blooms in the North Pacific	
	AP-NIS: Marine Non-indigenous Species	
	WG42: Indicators of Marine Plastic Pollution	
POC	S-CC: Carbon and Climate	BIO
	WG46: Ocean Negative Carbon Emissions (ONCE)	BIO
	WG50: Sub-mesoscale Processes and Marine Ecosystems	
	*Final Report Progress only: WG38, WG40	FUTURE (WG40)
MONITOR	AP-CREAMS: CREAMS/PICES Program in East Asian Marginal Seas	POC
	AP-NPCOOS: North Pacific Coastal Ocean Observing Systems	TCODE
TCODE		
SB	SG-SCPSC: PICES/PSC – Scientific Cooperation in the North Pacific Ocean	
	SG-GREEN: Generating Recommendations to Encourage Environmentally-Responsible Networking	FUTURE
	AP-SciCom: Science Communications	FUTURE
	WG39: PICES/ICES/PAME an Integrated Ecosystem Assessment for the Central Arctic Ocean	

Appendix 5

GOOD-OARS Summer School

GOOD-OARS SS2023:
GOOD-OARS Summer School
6-12 November 2023, Coquimbo-La Serena, Chile



Directors

Véronique Garçon, CNRS/LEGOS, France
Boris Dewitte, CEAZA/UCN, Chile
Camila Fernandez, CNRS/Univ. Concepcion, Chile

Scientific Committee (To be decided): Marilaure Grégoire , Véronique Garçon, José Martin Hernandez-Ayon, Kirsten Isensee, Diego Narvaez, Oscar Pizarro (TBC), Andreas Oschlies, Boris Dewitte, Camila Fernandez, Laura Farias

Organizing Committee : Kirsten Isensee, Véronique Garçon, Marcel Ramos, Boris Dewitte, José Martin Hernandez-Ayon, Camila Fernandez (UdeC), Victor Aguilera (CEAZA, Maria Valladares (CEAZA), Diego Narvaez (UdeC)

Local Secretariat : Monica Sorondo (COPAS-Coastal), Mitzi Santander (CEAZA)

Abstract

The last IPCC report states that climatic variability needs to be tackled in order to limit the effects of rising temperatures and decreasing pH and oxygen in the coastal and open ocean.
The GOOD-OARS Summer School 2023 is designed to prepare the next generation of ocean scientists that will engage in multidisciplinary research and increase our understanding on the response of marine ecosystems in the next decades.

A- Scientific content

About GO_2NE/GOOD

Oxygen is critical to the health of the planet. It affects the cycles of carbon, nitrogen and other key elements, and is a fundamental requirement for marine life from the seashore to the greatest depths of the ocean. It is therefore alarming that oxygen levels are rapidly decreasing in the coastal and open ocean, a process called deoxygenation. Deoxygenation is accelerating and getting more severe. This is mainly the result of human activities that are on the one hand increasing global temperatures (CO_2-induced warming) and on the other hand increasing loads of nutrients from agriculture, sewage, and industrial waste, including pollution from power generation from fossil fuels and biomass.

the **Global Ocean Oxygen Network GO_2NE**, established in 2016, is committed to providing a global and multidisciplinary view of deoxygenation, with a focus on understanding its multiple aspects and impacts. Through the participation of concerned scientists from across the world, the IOC expert group offers scientific advice to policy makers and stakeholders to counter alarming deoxygenation, and to preserve marine resources in the presence of declining oxygen levels. Currently, the members of the core working group represent 21 institutions in 11 countries around the world.

Besides its scientific work and outreach activities, the network aims at facilitating communication with other established networks and working groups (e.g. IOCCP, GOOS, IGMETS, GOA-ON, GlobalHAB, WESTPAC O_2NE), improving observations systems, identifying and filling knowledge gaps, as well as developing deoxygenation-related capacity development activities. GO_2NE has published a few review papers (Breitburg et al., 2018, Garçon et al., 2019, Pitcher et al., 2021, Grégoire et al., 2021) and an imminent summary on deoxygenation for policy makers (IOC-UNESCO Technical Series 137). An international conference on Ocean Deoxygenation: Drivers and Consequences - Past - Present - Future took place on 3-7 September 2018 in Kiel, Germany jointly organized by the German SFB754 program and the GO_2NE network (https://www.sfb754.de/o2conference2018) and a second one is planned at Liège in May 2022 (https://www.ocean-colloquium.uliege.be/cms/c_14229949/en/international-liege-colloquium-on-ocean-dynamics).

More information about GO_2NE can be found at https://en.unesco.org/go2ne.
In collaboration with the German SFB754 program, it initiated the news site **ocean-oxygen.org** to provide information on deoxygenation to scientists, stakeholders and the interested public. It submitted an UN Decade program named **GOOD for "Global Ocean Oxygen Decade"** (https://www.oceandecade.org/actions/global-ocean-oxygen-decade/) which was endorsed by IOC UNESCO in summer 2021.

About GOA-ON/OARS

As CO_2 dissolves in seawater, it changes its chemistry, resulting, among other changes, in an increase in seawater acidity (i.e., a decrease in pH). These changes are subtle yet sustained and have been shown to impact several biological processes, such as the construction of calcium carbonate shells and skeletons of many marine organisms.

The Global Ocean Acidification Observing Network (GOA-ON) a network of more than 900 experts from over 100 countries, is committed to achieving three goals related to ocean acidification: to document its status and trends in diverse locations around the world, to understand ecological impacts, and to enable forecasts and early warning capabilities. GOA-ON established a data portal that contains metadata, links to downloadable data, and near real-time data visualizations from ocean acidification monitoring platforms around the world. GOA-ON members contributed to the establishment of the SDG 14.3.1 Methodology, under the leadership of the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

GOA-ON's Ocean Acidification Research for Sustainability (OARS), was endorsed as a programme of the UN Decade of Ocean Science for Sustainable Development in 2021. The OARS programme aims at providing society with the observational and scientific evidence needed to sustainably identify, monitor, mitigate and adapt to ocean acidification; from local to global scales. It is building on the work of GOA-ON to further develop the science of ocean acidification by enhancing ocean acidification capacity, increasing observations of ocean chemistry changes, identifying the impacts on marine ecosystems on local and global scales, and providing society and decision makers with the information needed to mitigate and adapt to ocean acidification.

More information about GOA-ON can be found at http://goa-on.org.

About regional initiatives in South America

In recent years various countries in South America have spurred initiatives orientated towards fostering multidisciplinary science and leverage for impactful transformation of scientific knowledge into products useful for decision makers and society. In Chile, this has been concretized through long term research programs dedicated to improve the understanding of the impact of climate change on the ocean circulation and biogeochemistry of the South Eastern Pacific, in line with recommendations of international programs such as GO2NE and GOA-ON, and national public policies. The CLAP and COPAS-Coastal programs funded by ANID exemplify such multidisciplinary dynamics and the coupling of atmospheric and ocean science in order to provide climate information useful for decision-makers in the coastal zone of Central Chile. This goes along oceanographic technological development and operational oceanography that are emergent fields in Chile and that represents a necessary step for implementing NDC's (Nationally Determined Contribution) in the future. Besides developing cutting-edge researches in relevant fields, these programs are also dedicated to foster capacity building and train the next generation of researchers and technicians in ocean science, which motivates their participation to the organization of this Summer School.

Brief discussion of the subject and relevance

The Earth System has clearly moved far outside the range experienced over the last 700,000 years and is hence operating in a "no-analogue" state. The world's population is continuing to increase, probably reaching 10 billion inhabitants in 2050. Sustained use of resources (food, water, carbon, human health) must be achieved to ensure future prosperity. Simultaneously, greenhouse gas concentrations (CO_2, N_2O, CH_4) are increasing at an unprecedented pace that potentially brings us closer to climate tipping points. The last decades have been the warmest ones over the last 1000 years. Temperatures in the Earth's atmosphere increased of about 0.74 ± 0.2°C over the last century. Sea level rise is a dramatic reality for many inhabitants of our planet, Arctic sea ice and glaciers are melting faster than expected. The last IPCC Report AR5 states: "Climatic warming is unambiguous." And as the ocean absorbed about 90% of the extra heat since the industrialization, it is warming as well. Simultaneously ocean oxygen observations since 1960 indicate a decrease of about 2% of the global ocean oxygen inventory. Climate models predict continued deoxygenation of the global ocean in the future. But increased greenhouse gas concentrations not only result in warming and deoxygenation, they also cause ocean acidification, which has increased by 30% since the beginning of the Industrial Revolution. If the concentration of atmospheric CO_2 continues to increase at the current rate, the oceans will become corrosive to the shells of many organisms by the end of the century. Further, the ocean's capacity to absorb CO_2 from the atmosphere is being degraded by ocean acidification, which will make it more difficult to stabilize atmospheric CO_2 concentrations. How or if marine organisms may adapt to the changes to these changes at multiple levels is not known.

Declining oxygen in the world's ocean and coastal waters is reducing suitable habitat, altering biogeochemical cycles, and may cause feedbacks that further exacerbate deoxygenation and global warming (Isensee et al., 2016; Breitburg et al., 2018). Major advances have been made in understanding patterns, drivers and consequences of ocean deoxygenation, but there is a need to improve predictions at different spatial and temporal scales important to project the provision of ecosystem services provided by the ocean. Improved numerical models of oceanographic processes that control oxygen depletion and the large-scale influence of altered biogeochemical cycles are the basis to predict the magnitude and spatial patterns of deoxygenation in the open ocean, as well as its feedbacks to climate. Developing and verifying the next generation of these models will require increased *in situ* observations and improved mechanistic understanding at a variety of scales, including how changes in stratification and circulation might affect oxygen content in the water column. Models useful for managing nutrient loads can simulate oxygen loss in coastal waters with some skill, but their ability to project future oxygen loss is often hampered by insufficient data and climate model projections on drivers with an appropriate resolution. Predicting deoxygenation-induced changes in ecosystem services and human welfare needs information based on scaling effects that are measured on individual organisms to populations, food webs, and fish stocks, considering combined effects of deoxygenation and other ocean stressors, and increased research emphasis in developing nations. Reducing effects of other stressors may increase species resilience negatively affected by low oxygen conditions. Ultimately, though, limiting deoxygenation and its negative effects can be only achieved by a dramatic global decrease in greenhouse gas emissions as well as reductions in nutrient discharges to coastal waters (Isensee et al., 2016; Breitburg et al., 2018; IOC-UNESCO Technical Series 137).

New innovative research will be required to increase our understanding of ocean acidification and particularly its impacts. Since the establishment of GOA-ON many countries, organizations started to observe ocean acidification, however long-term commitments are required to detect the trends and changes of seawater chemistry. It is important to enable the scientific community to provide ocean data and evidence of known quality, via continuous capacity development, activities related to data quality. The design and implementation of ocean acidification observation must be done in collaboration with data/information producers and end-users. Furthermore, chemical and biological observation must be co-located to not only measure the chemical change but also its impacts. The implementation of the newly established framework for biological observation within the ocean acidification monitoring framework (Widdicombe et al., in review) will provide the possibility to improve predictions of vulnerability and resilience to ocean acidification at all temporal and spatial scales. Future research and observation ought to provide appropriate data and information necessary to the development of societally relevant predictions and projections, employing new technologies such as digital twins, for all ocean 'users' of the impacts of ocean acidification in order to implement adaptation and mitigation by 2030.

Both UN Decade programs GOOD and OARS place particular emphasis on international capacity building as the development of the current generation of young researchers is vital to make immediate significant progress in response to the pressing environmental and societal challenges.

The international school will be held from 6 to 12 November 2023 in Chile on the Universidad de la Serena /CEAZA Campus in La Serena and on the Universidad Católica del Norte (campus in Coquimbo) which hosts the Department of Marine Biology. This GOOD/OARS SS2023 summer school will connect these programs with local projects relevant to national research (CLAP and COASTAL). It will also link young researchers and students with leading scientists in different components of GOOS/OARS and CLAP/COASTAL research, and scientists from SMEs not only in a theoretical framework, but also through practical exercises, laboratory experiments and special sessions. The GOOD and OARS vision is to provide scientific knowledge and educate the younger generation of scientists for 'the Ocean we need for the Future we want' (IOC-UNESCO brochure – International Decade of Ocean Science for Sustainable Development').

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Scientific programme

For a mix of lectures and practical workshops, the school will be implemented as follows: two full days of lectures followed by two days of practical workshops, one day of stakeholder engagement activities and another two full days of lectures. The 2023 school will bring together between 30 and 40 PhD students and early career scientists and 16 world-leading international scientists. It will also be open to stakeholders willing to learn more about mechanisms and impacts of deoxygenation as well as monitoring strategies, potential adaptation and mitigation options. A balanced geographic representation together with a proper gender balance will be respected.

Days 1 and 2 will include lectures on the general issue of ocean deoxygenation and acidification:

- Open ocean deoxygenation,
- Closed seas and coastal waters acidification and deoxygenation,
- Causes of oxygen and pH decline,
- Nutrient enrichment of coastal waters,
- Climate change in coastal waters,
- Observing capacities and challenges,
- Introduction to modelling ocean physics,
- Introduction to modelling ocean biogeochemistry,
- Introduction to the Practical Workshops.

In addition, the first two evenings are devoted to Poster sessions so that all students get to know each other and the topic of research each one is carrying out.

Days 6 and 7 will include lectures on:

- Effects of ocean acidification and deoxygenation including biological responses,
- Multiple stressors, biogeochemistry,
- Reducing deoxygenation and acidification and its negative effects,
- Predicting future ocean pH and oxygen,
- Ocean Observing systems design in relation to the deoxygenation and acidification issues,
- Data management, and a broader picture of oceanographic observation/data from the local, regional up to the international/global perspective,
- How to connect individual measurements/studies/experiments to international efforts/networks will be proposed.
- Special sessions will be held on Ethics in science,
- How to interact with the press and social media, NGOs, and Stakeholders engagement activities.

During these last two days of the school, each student will give a 5 min presentation in front of the whole school as part of the Practical Workshop on Communication. We will deliver Rewards for the Best Poster and Best Oral Presentation at the end of the School.

Practical Workshops and stakeholder engagement

Days 3 and 4 of the summer school are devoted to practical workshops and participants will take part in each workshop.
During the hands-on practicals, participants are introduced to techniques used in modelling, laboratory work and cruise work on the Chilean vessel Stella Maris (Univ. Coquimbo) (or eventually Cabo del Horno, SHOA) where students will be introduced on how to use the most recent oxygen and pH sensors of the market.
The science communication workshop 'oral and written communication' gives the students guidance and constructive criticism on presenting their research via posters, manuscripts and oral presentations. It will take place on days 1, 2, 3 and 4 with rotating small groups of participants.

The participants will split in small groups and will rotate between the groups each day.

Day 3: Oxygen (including Winkler titration), carbonate system parameters and biogeochemical measurements in the laboratory in the morning, modeling workshops in the afternoon, and communication workshop in the evening.
Day 4: Full day field cruise with instruction on the use of pH and oxygen sensors and other basic oceanography instruments, *i.e.* CTD with Niskin bottles, plankton nets, deployment of gliders, etc. and communication workshop in the evening.

Day 5 will be devoted to stakeholder engagement activities with local fisheries/aquaculture farming and regional policy makers.

List of lecturers : TO BE DECIDED (below is the list from lecturers who volunteered and some others are TBC

Camila Fernandez (University of Conception, Chile)
Alexander Galan (University of Conception, Chile)
Jose Martin Ayon Fernandez (UABC, Mexico)
Oscar Pizarro (University of Conception, Chile) TBC
Yolande Serra (University of Washington, USA) TBC
Ivonne Montes (Institute of Geophysics of Peru, Peru)
Marilaure Grégoire (University of Liège, Belgium) TBC
Denise Breitburg (Smithsonian Environmental Research Center, USA)
Lisa Levin (Scripps Institution, USA)
Andreas Oschlies (GEOMAR, Germany)
Véronique Garçon (CNRS/LEGOS, France)
Gil Jacinto (University of the Philippines Diliman, Philippines)
Kirsten Isensee (IOC-UNESCO, France)
Boris Dewitte (CEAZA, Chile)
Caroline Slomp (Utrecht University, Netherlands) TBC
Sean Crowe (University of British Columbia, Canada)
Anders Tengberg (Aanderaa, Norway) TBC
Sergey Borisov (Technical University of Graz, Austria) TBC

Timeline and selection procedure

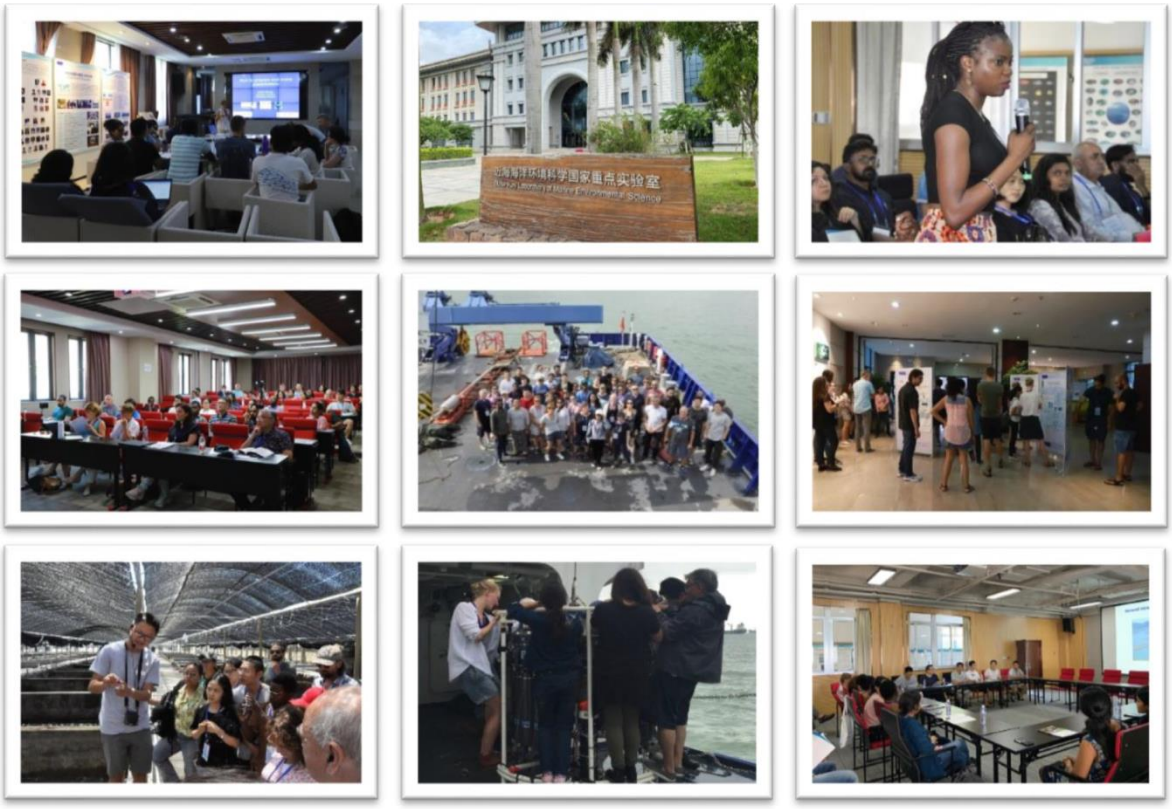
The application process will open in August 2022 and will close end of November 2022. Students are expected to download the pdf guidelines for application from http://XXXXX CEAZA website to set up…./GOOD-OARS/application.asp, prepare all

the information requested in the guidelines (a few pages) and then fill in the online form at the CEAZA website which will be created.
During the 1st half of December 2022, the review process will take place. Two or three reviewers will examine and mark each application based on the following three criteria 1) Level and suitability of qualifications; 2) Relevance of study and interests to GOOD/OARS themes and 3) Quality of personal statement.
Every applicant will be informed of the outcome of the review process by 15 February 2023.

Anticipated benefits

Lectures of the international scientists will be put with free access on the GOOD and OARS websites: XXXX http://www.unesco.org XXXXXXX.
The Early Career Scientists participating in this school will acquire in an ideal scientific environment the knowledge needed to better understand the future state of the oceans and environmental risks to marine habitats and ecosystems. The GOOD/OARS SS2023 thus will provide to a generation of young scientists the crucible for designing innovative approaches to achieve the societal transition towards the Sustainable Development Goals approved by the United Nations. They will be able to connect and interact very easily with world leading experts in the field in a friendly atmosphere. Practical workshops will allow them to get acquainted to experimental work. The future of the international GO_2NE/GOA-ON networks will be created there by setting up fruitful collaborations and interactions.

Below is a mosaic of pictures taken from the GO2NE SS2019 Summer school held in Xiamen, China to give an idea of practical workshops activities which will be held in Coquimbo.



B- Tentative budget

The budget is based on ***40 participants and 16 lecturers***. Summer schools are usually a smashing success, but they depend upon the generosity of international sponsors and national funding agencies.

Estimated budget

Students:
40 X 900 € (airfare*) + 40 X 70 € X 8 nights (accommodation) = 58.4 K €
Lecturers:
16 X 1200 € (airfare*) + 16 X 100 € X 8 nights (accommodation) = 32 K €
Shuttle buses (field trip and to and from La Serena airport) = TBC?
La Serena and UCN University facilities for free ? TBC
Ship time costs (2 full days of operation) = TBC?
Local organization

Total: 90.4 K€
*Based on an average plane ticket.

Expected funds/support : To be decided who does it and to which agency/institution

Registration fees:	14 K€	Granted
IOC-UNESCO	5-10 K€	TBC **Kirsten (GOOD+OARS)**
IOCCP	5-10 K€	TBC **Vero (waiting for IOCCP's answer)**
CLAP	5 K€	Granted **Boris OK**
IRD	5 K€	To do
SOLAS	3 K€	To do **Vero: Done OK**
EU JPI CE2COAST	5 K€	To do **Vero, Kirsten, Boris**
CNRS/INSU	5 K€	To do **Camila**
EGU	5 K€	To do **Marilaure :Done**
APN	25 K€	To do
SCOR	8 K€	To do **Ivonne**
PICES	5 K€	To do **Denise, Kenny, Mike, Lisa, Karin ?**
OCB	10 K€	To do **Denise Kenny, Mike, Lisa, Karin?**
NOAA	?	To do **Kirsten?**
NSF	?	To do
FNRS, Belgium	3.5 K€	To do **Marilaure**
ULiege, Belgium	1 K€	To do **Marilaure**
Aanderaa company	?	To do
Teledyne Marine	?	To do
YSI instruments company	5 K€	To do
COPAS	? K€	To do **Camila?**
ECLIPSE (V.Aguilera)	2 K€	Granted **Boris OK**
FutureMARES	5 K€	TBC **Boris?**
CEAZA?	?	TBC **Boris?**
UCN ?	?	TBC **Boris?**

Estimated total (taking the high values of the range): XX K€

The registration fee of 350 Euros includes:
- Lunches and coffee breaks
- Buffets and drinks during evening poster sessions
- Banquet dinner on the penultimate evening of the school
- Access to internet at the laboratory
- On-site transport required by the school programme
- Arrival and departure shuttles to and from La Serena airport and the school venue.

C- Short biographies of School Directors

Dr Véronique Camille GARCON graduated from University of Paris VII in Environmental Sciences (Energy and Pollutions) in 1981 and then became a post-doc fellow at MIT (Cambridge, USA) from 1982 to 1985. Recruited as an Early Career scientist at Centre National de la Recherche Scientifique (CNRS) in 1985, she worked at 'Institut de Physique du Globe de Paris' then moved down to Toulouse with a sabbatical stay at Princeton University in 1995 -1996. Her research themes at LEGOS aim towards understanding and quantifying processes governing fluxes of carbon, oxygen and associated biogeochemical elements in the ocean, using *in situ* tracers observations, remotely sensed data, coupled physical biogeochemical modeling and data assimilation technics. She is also involved in oceanic biogeochemical climatic monitoring via

electrochemical sensors development. She served in the JGOFS SSC, member of the French IFREMER Scientific Committee for 10 years, and in many national (CNRS, National Navy,..), European (ESF, EC, EGU, ERC,..) and international scientific instances. She served as Chair of the Scientific Committee of the SOLAS (Surface Ocean Lower Atmosphere Study) project (SCOR, ICACGP, WCRP, Future Earth). She also served as co-director of the International SOLAS Summer Schools in 2003, 2005, 2007 with C. Le Quéré and in 2013 with M. Dai and Director in 2009 and 2011. She was a co-Director of the 1St GO_2NE SS2019 summer school with M. Grégoire and G. Jacinto. She is a member of the Global Ocean Oxygen Network (GO_2NE) initiated by IOC-UNESCO in 2016 and co-Chair of the IOCCP SSG since 2021. She was awarded in 2017 the IOC-UNESCO Anton Bruun Medal.

Dr Boris DEWITTE graduated from University of Toulouse in 1998. His research areas include tropical climate variability, ocean and climate, climate change, air-sea interaction, multi-model analysis, regional biogeochemical coupled model development. While his early interest was on tropical Pacific climate dynamics (El Niño), his work has progressively evolved with a more regional focus, in particular in relation with eastern boundary upwelling systems. Over the past 15 years, he has been involved in various projects dedicated to the study of the Humboldt (Peru/Chile) current system, dealing with regional air-sea interactions and the physical forcing of Oxygen Minimum Zone. Since 2017, he is affiliated to CEAZA (Centre of Advanced Studies in Arid Zones), an interdisciplinary research centre located in La Serena (Chile) that promotes scientific and technological developments in earth and biological sciences. He has been a member scientific committee of CLIVAR (2015-2019), one of core project of the WCRP, and currently a full member of the SCOR Working group on Eastern Boundary system dynamics and the co-chair of the Eastern Pacific Task Team of the TPOS2020 program. Since 2021 he is the director of the CEAZA project entitled CLAP (Research Program for Climate Action Planning) that investigates of how climate, environmental, biogeochemical and socio-economic drivers affect the coastal marine ecosystems in the central Chile region.

Dr Camila FERNANDEZ graduated from Université de la Méditerranée in 2003 and was recruited at CNRS in 2008. She has led two international associated laboratories funded by CNRS in Chile and in this context she was appointed as visiting professor at Universidad de Concepción, Chile in 2012. Her research areas include marine biogeochemistry, nutrient cycles in the ocean, global change and anthropogenic impact on microbial activity and function. She began her research studying the biogeochemical aspects of mesoscale eddies in the Atlantic Ocean and Mediterranean Sea. She then studied the impact of UV radiation and other physical variables on the biological pump and microbial diversity. She contributed to unravel the importance of emergent habitats for microbial processes, by for instance evidencing biological N_2 fixation in the Peru-Chile Oxygen Minimum Zone and the uptake of N_2O, a greenhouse gas, in suboxic conditions in coastal marine waters. Recently she has studied the fate of anthropogenic pollutants in the ocean and their capacity to modify biogeochemical fluxes, a topic that can potentially have a strong social impact. She actively participated in the Chilean scientific working group of COP25 and contributed to the elaboration of several reports for policy makers and general public. In 2021, she co-founded the CEODOS Chile consortium of research institutions that will survey the Chilean coast during the Ocean Decade and co-organized the first CEODOS expedition in collaboration with the TARA Foundation. Since 2021, she is the head of the COPAS Coastal center (Center of Research in the Eastern South Pacific) at Universidad de Concepcion that focuses on the variability of the coastal ocean and its vulnerability to climate change while continuing her work as leader of the International Associated Laboratory LIA MAST which studies the adaptation strategies of marine communities from a multidisciplinary point of view.

Appendix 6

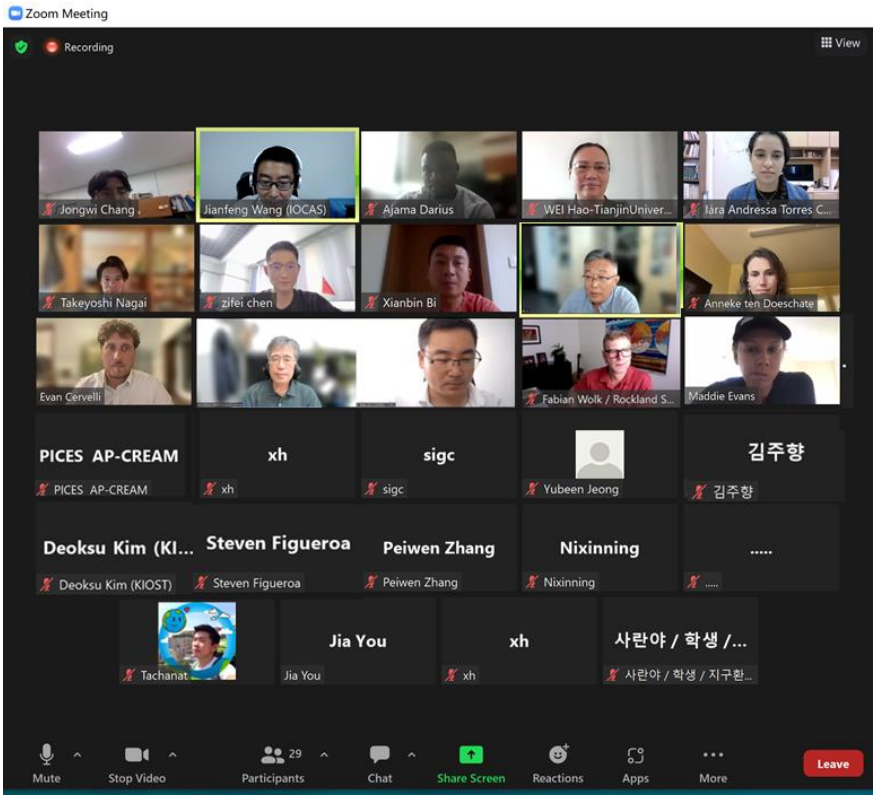
PICES 2022 AP-CREAMS ONLINE SUMMER SCHOOL

Ocean Turbulence: From Observing to Research

By Jianfeng Wang and Fei Yu

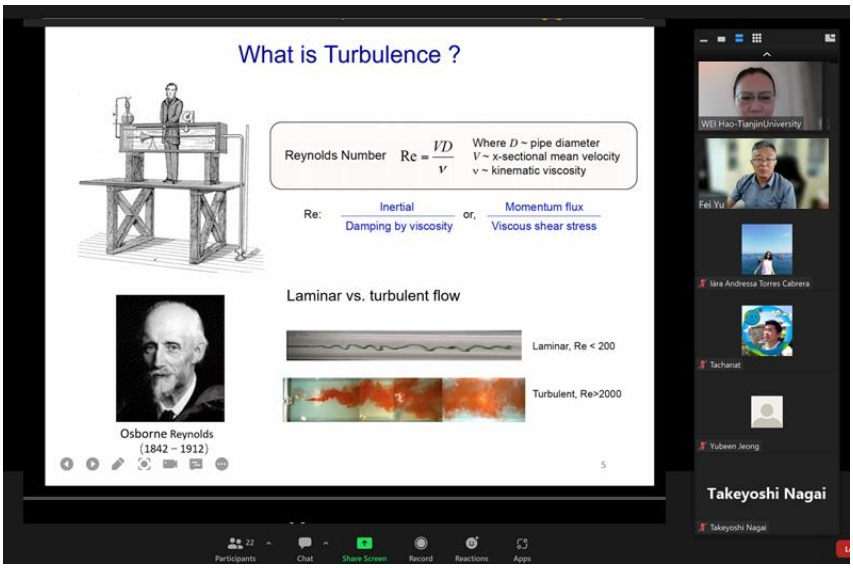
Turbulence occurs on small spatial and temporal scales which influences a wide range of oceanic motions, including the local ecosystem, global thermohaline circulation, and have broader implications for the Earth's climate. Locally, turbulent mixing controls mixed layer nutrient budgets, heat content, and sea surface temperature. Globally, turbulent fluxes affect the sequestration of carbon. Knowledge of ocean turbulence and its effects is crucial in understanding how the ocean works and in the construction of models to predict how the ocean will change, or how its interactions with the atmosphere will be altered in the future. Because the importance of turbulence, the study of ocean turbulence and mixing has largely increased in the past decades, especially in the field direct measurements. Modern development of fast response, high-resolution shear and temperature sensors allow directly estimate of diffusivities and associated irreversible mixing.

From 22 to 26, August 2022, AP-CREAMS on line summer school was taken placed in the Institute of Oceanology, Chinese Academy of Sciences (IOCAS) which hosted 25 early career scientists and students from 10 countries, including six PICES member countries, and Mozambique, Thailand, India and Peru for a PICES Summer School on "Ocean Turbulence: From Observing to Research" in Qingdao, Shandong, China.

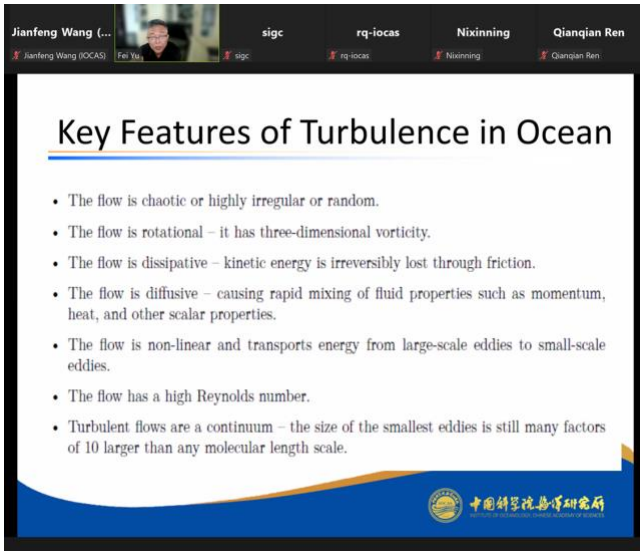


2022 PICES AP-CREAM Summer School participants and instructors.

By the influence by COVID-19, the international travel is inconvenient in 2022. The week-long summer school was carried out online through zoom meeting, which consist of lectures and interactive discussion. The summer school provided the participants with opportunities to learn about the basic theory and its significance of turbulence. The related observation method and instrument deployment, data processing technics were also introduced to help participants to learn how to observe, analyze and interpret field data.



Prof. Hao Wei lectures on introduction and understanding turbulence in the ocean

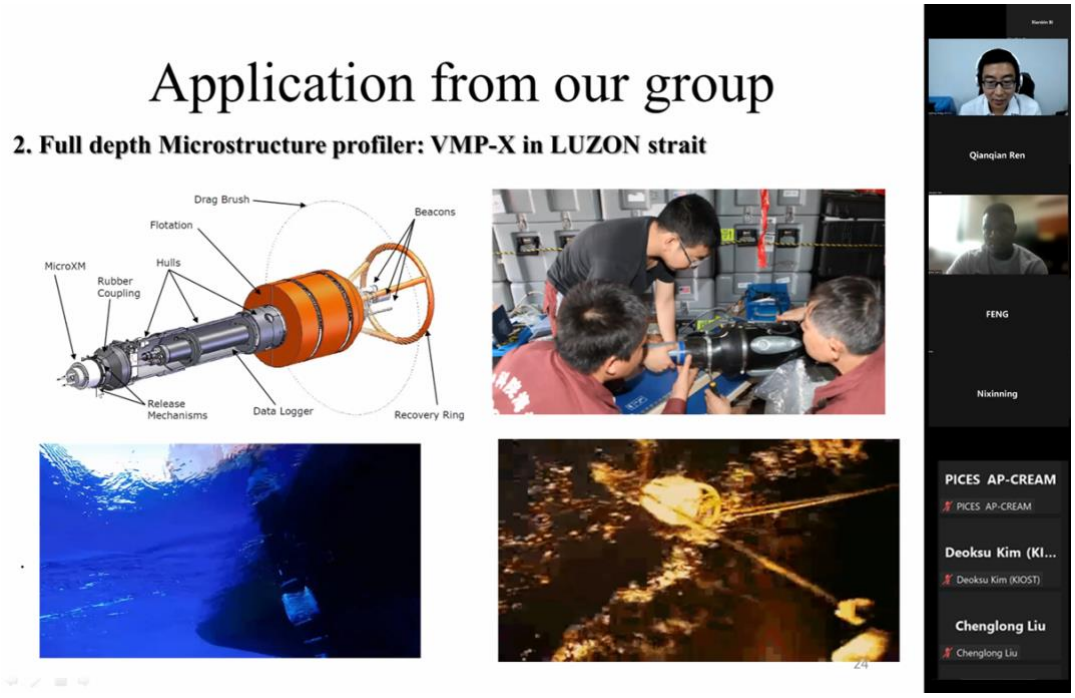


Prof. Fei Yu lectures the shear probe and the spectrum of turbulent shear

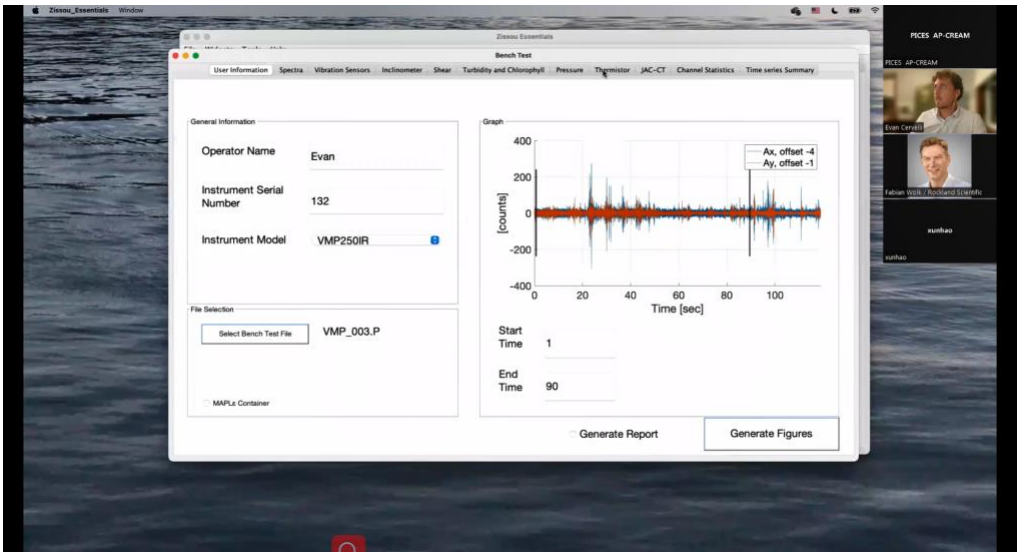
In this summer school, global experts lectured on the basic theory, field measuring, data processing and recent progressing of turbulence. Introduction and understanding turbulence in the ocean was reported by Prof. Hao Wei from Tianjin University (China). Prof. Wei introduced basic theories and feature of turbulence which showed the first insight of turbulence to participants. Turbulence

characters in different area and topographic feature was also introduced in the lecture.

Dr. Jianfeng Wang (IOCAS, China) introduced various ocean turbulence measuring instruments and techniques. The participants get the basic knowledge of the instruments and the application from Prof. Yu's group. The VMP Probes, sensors, deployment checks and Maintenance were introduced by Evan Cervelli (Rockland Scientific International, Canada). The shear probe and the spectrum of turbulent shear knowledge were presented by Prof. Fei Yu (IOCAS, China). Data processing technic of turbulent data was discussed by Dr. Zifei Chen (IOCAS, China) which let the participants learn about the skill to deal with turbulent data. The MATLAB codes were also shared within the summer school. Besides the basic knowledge, talks about recent progress of turbulence studies were given by Prof. Chuanyu Liu (IOCAS, CN) and Prof. Jae-Hak Lee (KIOST, KR) which titled "Physical Interpretation of the Observed Turbulence Mixing in the Eastern Equatorial Pacific Ocean" and " Turbulence in bottom boundary layer of shelf seas" respectively. The online summer school ended with experience exchange about the turbulence measurement organized by Prof. Fei Yu. Experts and participants present their experiences on field observations, and discussion on the future turbulence study also took place.



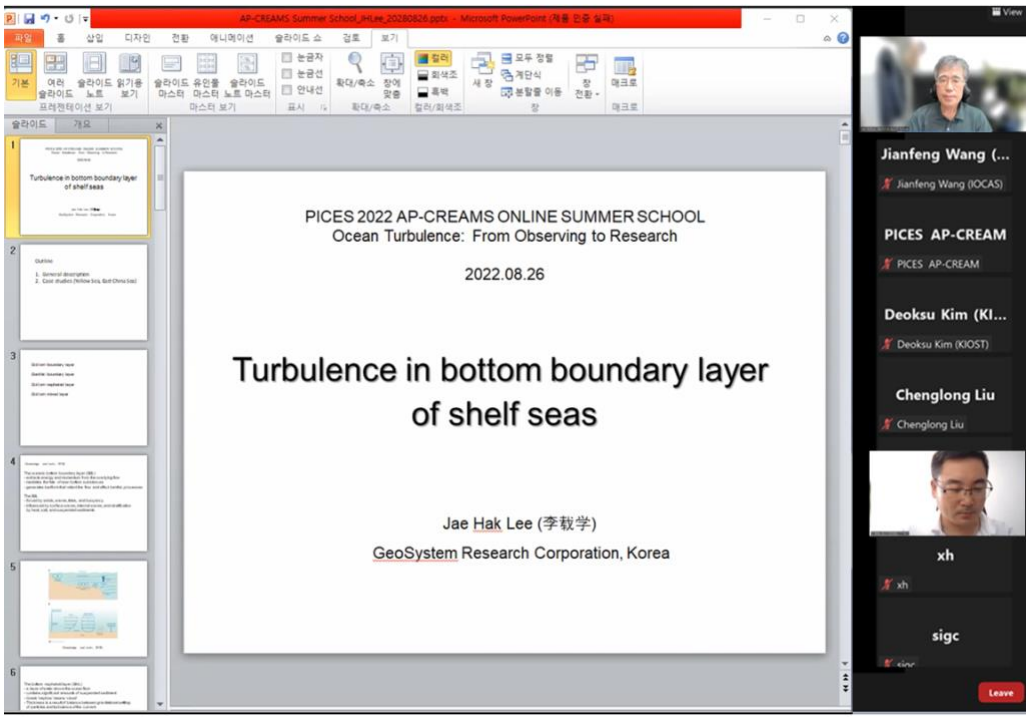
Dr. Jianfeng Wang lectures on introduction of ocean turbulence measuring instruments and techniques



Technician Evan lectured on introduction to VMP Probes, sensors, deployment checks and maintenance

Because the COVID-19, online summer school cannot provide filed experiment and instrument operation opportunity, AP-CREAM provided online training of how to deploy and maintain the instruments. Dataset processing skill and the related MATLAB codes were also shared. Graduate students and early-career scientists all considered their understanding of ocean turbulence and ability of analyzing the data of ocean turbulence are highly promoted.

The Evaluation received from participants was very positive including comments such as “It was a fantastic and helpful summer school”; “We can get pretty comprehensive knowledge from the summer school”; “The summer school provided useful knowledge for starters like us!” and IOCAS would like to host anther offline summer school in the future.



Prof. Jae-Hak Lee lectured on turbulence in bottom boundary layer of shelf seas

AP-CREAM would like to thank hosting partners Institute of Oceanology, Chinese Academy of Sciences, Marine Observation Branch (MOB) of Chinese Society for Oceanology and Limnology (CSOL) and Northwestern Pacific Ocean Circulation and Climate Experiment (NPOCE) program.

Author biography:

Dr. Jianfeng Wang (jfwang2013@qdio.ac.cn) is an assistant professor in the Key Laboratory of Ocean Circulation and Waves, Institute of Oceanology, Chinese Academy of Sciences since 2013. He received his B.Sc and Ph.D. from Ocean University of China in 2007 and 2013 respectively. He has studied in University of Massachusetts, Dartmouth as a visiting scholar from 2010 to 2012. The primary focus of his research is turbulent mixing and the variation mechanisms. He is a sea going scientist that has done a lot of field work and has rich experience in instrument operating and data processing.

Prof. Fei Yu (yuf@qdio.ac.cn) is Chief Scientist in Institute of Oceanology, Chinese Academy of Sciences (IOCAS). He has been a Professor in the Key Laboratory of Ocean Circulation and Waves, IOCAS since 2008. He received his B.Sc. from the Ocean University of China (1991) and a Ph.D. from the Institute of Atmospheric Physics, Chinese Academy of Sciences (2001). The primary focus of his research is marine in-situ observation and regional oceanography. Recently, he works on 3D structure of Yellow Sea warm current, mechanism of Yellow Sea cold water mass, daily variability of north YSCWM front, water exchange between Kuroshio and East China Sea, circulation in Pacific and climate change, mesoscale processes and turbulent mixing. Over 30 projects include the National Nature Science Funds, Strategic Priority Research Program of Chinese Academy of Sciences, National Key Technologies R&D Program, Global Change and Air-Sea Interaction and so on. He had new light about 3D structure of YSWC, mechanism of YSCMW and subsurface eddy in the western Pacific. Within PICES he is a member of the East Asian Marginal Seas (AP-CREAMS)

List of Lecturers

	Name	Institute	Title	Email
1	Fei Yu	Institute of Oceanology, Chinese Academy of Sciences, CN	Professor	yuf@qdio.ac.cn
2	Hao Wei	Tianjin University, CN	Professor	hao.wei@tju.edu.cn
3	Chuanyu Liu	Institute of Oceanology, Chinese Academy of Sciences, CN	Professor	chuanyu.liu@qdio.ac.cn
4	Jae-Hak Lee	Korean Institute of Ocean Science and Technology, Republic of Korea	Professor	jhlee@kiost.ac.kr
5	Jianfeng Wang	Institute of Oceanology, Chinese Academy of Sciences, CN	Assistant Professor	jfwang2013@qdio.ac.cn
6	Zifei Chen	Institute of Oceanology, Chinese Academy of Sciences, CN	Assistant Professor	chenzifei@qdio.ac.cn
7	Evan Cervelli,	Rockland Scientific International, Canada	Technician	evan@rocklandscientific.com

List of participants

	Name	Institute	Title	Email
1	Steven M. Figuero	Chungnam National University, Department of Civil Engineering, Republic of Korea	Post-doctoral	stevenmiguelfigueroa@gmail.com
2	Day Hong Kim	Ocean Observation Lab, Seoul, Republic of Korea	Graduate Student (Master's Degree)	dayhong94@gmail.com
3	Ivaldo de Jesus Fumo	Eduardo Mondlane University, Mozambique	Undergraduate	Ivaldofumo02@gmail.com
4	Ojudoo Darius AJAMA	Ocean Sciences Department, Inha University, Incheon, Republic of Korea	Graduate Student (Phd)	ajamaojudoo@gmail.com
5	Yubeen Jeong	Pusan National University, Busan, Republic of Korea	Graduate Student (Phd)	ybjeong@pusan.ac.kr
6	Deoksu Kim	Korea Institute of Ocean Science & Technology (KIOST), Republic of Korea	Graduate Student (Phd)	deoksukim@kiost.ac.kr
7	Jongwi Chang	Inha University, Republic of Korea	Graduate Student (Phd)	changjw214@gmail.com
8	Yeongseok Jeong	Chungnam National University, Republic of Korea	Undergraduate Student	jys961120@gmail.com
9	Tachanat Bhatrasataponkul	School of Marine Technology, Burapha University, Thailand	Academic Faculty	tachanat@coaps.fsu.edu
10	Xiaolin Bai	Xiamen University, CN	Associate Professor	xbai@xmu.edu.cn
11	Hao Xun	Ocean University of China, CN	Graduate Student (Phd)	xunhao@stu.ouc.edu.cn
12	Xin Xiao	Ocean University of China, CN	Graduate Student (Phd)	xiaoxin@stu.ouc.edu.cn
13	Peiwen Zhang	Institute of Oceanology, Chinese Academy of Sciences, CN	Post-doctoral	zpw@qdio.ac.cn
14	Jia You	Institute of Oceanology, Chinese Academy of Sciences,CN	Graduate Student (Phd)	youjia@qdio.ac.cn
15	Zhanjiu Hao	Institute of Oceanology, Chinese Academy of Sciences, CN	Graduate Student (Phd)	haozhanjiu@qdio.ac.cn

16	Xianbin Bi	Pilot National Laboratory for Marine Science and Technology	Engineer	xbbi@qnlm.ac
17	Chenglong Liu	Pilot National Laboratory for Marine Science and Technology	Engineer	clliu@qnlm.ac
18	Xin Zhao	Pilot National Laboratory for Marine Science and Technology	Engineer	xzhao@qnlm.ac
19	Xinning Ni	Ocean University of China	Graduate Student	nxn0220@163.com
20	Qianqian Ren	Ocean University of China	Graduate Student	renqianqian@stu.ouc.edu.cn
21	Saranya js Kumar	Kerala Agricultural University, Kerala,India	Graduate Student (Master)	saranyaozhoor@gmail.com
22	Joo-Hyang, Kim	Seoul National University, Republic of Korea	Graduate Student (Master)	joohyang7993@gmail.com
23	Iára Andressa Torres Cabrera	Universidad Nacional Agraria La Molina	Undergraduate	20181309@lamolina.edu.pe
24	Takeyoshi Nagai	Tokyo University of Marine Science and Technology	Associate Professor	takeyoshi@gmail.com
25	Roland Ovbiebo	Scripps Institution of Oceanography University of California San Diego	Graduate Student	rovbiebo@ucsd.edu

Appendix 7

Revised Committee Action Plans

BIO Committee Action Plan (2016 -)

Mission

The Biological Oceanography Committee's mission is to promote and coordinate biological oceanography and interdisciplinary research in the northern North Pacific Ocean. This includes biology and ecology of non-harvested organisms and biogeochemical cycles.

Specific topics of interest to the BIO committee include:

- Dynamics of lower trophic level organisms including krill and micronekton
- Dynamics of marine birds and mammals
- Dynamics of other non-harvested organisms
- Distribution and migration
- Life history
- Physiology
- Food webs and ecosystems
- Variability and long –term trends
- Ecosystem modeling
- Phylogeny and genetics
- Anthropogenic effects
- Biogeochemical cycles

In considering these topics, the BIO committee endeavors to develop new concepts relating to the regulation of marine ecosystems and their component organisms. A common focus is the relationships between anthropogenic factors, climate and ecosystems.

Given the connections between anthropogenic factors, climate and ecosystems, the BIO committee's area of interest intersect those of other PICES committees, PICES FUTURE Advisory Panels and Sections. This Action Plan endeavors to reflect these connections, as well as the PICES Strategic Plan, as revised in 2011.

Strategy of the BIO Committee

To implement its mission, the BIO Committee will address each of the five central themes of the PICES Strategy: (A) Advancing scientific knowledge; (B) Applying scientific knowledge; (C) Fostering partnerships; (D) Developing capacity; and (E) Ensuring a progressive organization. Specific goals, actions and tasks within each of these themes are as follows.

Theme A *Advance scientific knowledge*

Goal 1. Understand the functioning, resilience, and vulnerability of marine ecosystems.

Action 1.1 Improve our understanding of biological oceanography in the North Pacific.

Task 1.1.1 Convene annual BIO paper sessions to foster information exchange on a diversity of BIO topics.

Task 1.1.2 Convene a series of sessions and workshops that examine the dynamics of lower trophic organisms of the North Pacific.
Task 1.1.3 Convene a series of sessions and workshops that examine the dynamics of marine birds and mammals of the North Pacific.
Task 1.1.4 Convene a series of sessions and workshops that examine the dynamics of non- harvested organisms of the North Pacific.
Task 1.1.5 Facilitate and encourage the activity of the BIO Advisory Panels and Working Groups.

Action 1.2 Improve our understanding of ecosystem resilience and vulnerability.

Task 1.2.1 Convene a series of sessions and workshops on development of ecosystem indicators to characterize ecosystem responses to multiple stressors.
Task 1.2.2 Convene a series of sessions and workshops on identifying ecosystems that are vulnerable to natural and anthropogenic forcing.

Goal 2. Understand and quantify how marine ecosystems respond to human activities and natural forcing.

Action 2.1 Evaluate and increase the knowledge and forecasts of climate effects on marine ecosystems of the North Pacific.

Task 2.1.1 Define, coordinate and integrate the research activities needed to understand, assess and project climate change impacts on marine ecosystems.
Task 2.1.2 Review the existing information on carbon cycling in the North Pacific, including, the biological pump, impacts of ocean acidification on marine biota, and possible feedbacks to atmospheric greenhouse gases.
Task 2.1.3 Review the existing regional modeling efforts and assess the requirements for regional ecosystem modeling studies.
Task 2.1.4 Evaluate and select potential ecosystem models for comparison to identify indicators of large-scale ecosystem change.

Action 2.2 Link to FUTURE activities in order to understand and quantify the impacts of human activities and climate on marine ecosystems.

Task 2.2.1 Actively solicit advice from countries, scientists, and stakeholders for what type of information is needed for status reports.
Task 2.2.2 Expand and improve status report synthesis to better explain how the ecosystem functions and provide the relevant evidence for impacts of human activity and climate.

Theme B *Applying scientific knowledge*

Goal 3. Provide scientific advice pertinent to North Pacific ecosystems.

Action 3.1 Provide the PICES Science Board and Governing Council with information necessary for PICES actions and endorsement regarding management of North Pacific resources.

Task 3.1.1 Provide input to the Science Board on FUTURE Implementation Strategy.

Action 3.2 Promote the use of the PICES North Pacific Ecosystem Status Report (I and II) to understand the functioning of marine ecosystems.

Task 3.2.1 Contribute to produce the next reports.

Task 3.2.2 Evaluate the report and the process used to create it.

Goal 4. Ensure that PICES products are relevant, timely, and broadly accessible.

Action 4.1 Publish products related to the FUTURE Science Plan and ongoing BIO activities in the PICES.

Task 4.1.1 Routinely publish products of BIO activities, such as papers from BIO topic sessions, in special issues of peer-reviewed journals and working group reports.

Action 4.2 Link published products to the PICES website.

Task 4.2.1 Provide web links with information on recent publication.

Theme C. *Foster partnerships*

Goal 5. Collaborate with organizations and scientific programs relevant to PICES.

Action 5.1 Develop formal linkages with ICES, SCOR, SOLAS, IMBER, IWC, ESSAS and other organizations on biological oceanography.

Task 5.1.1 Periodically sponsor PICES scientists to join organizing committee and to give presentations in international symposia of mutual interest.
Task 5.1.2 Invite scientists from other international organizations to participate in PICES BIO sponsored workshops and topic sessions of mutual interest.
Task 5.1.3 Formalize PICES participation in symposia held with other organizations.

Goal 6. Strengthen communication and engagement with users of PICES scientific products.

Action 6.1 Understand, quantify and broadly communicate the impacts of human activities on marine ecosystems, and how these impacts result in consequences for humans.

Task 6.1.1 Work with the PICES Secretariat and other PICES committees to assure broad BIO outreach to the public.

Theme D. *Develop capacity*

Goal 7. Advance methods and tools to improve and enhance scientific activities.

Action 7.1 Develop new methods for use of accumulated data.

Task 7.1.1 Convene a series of topic sessions and workshops on the development of methods and metadata associated with BIO Working Groups.

Action 7.2 Provide a recommendation on ecosystem models by inter-comparison.

Task 7.2.1 Convene MEMIP (Marine Ecosystem Model Inter-comparison Project) related workshops and topic sessions.

Action 7.3 Develop or recommend methods of measuring secondary production.

Task 7.3.1 Convene a series of topic sessions and workshops to develop or recommend methods for measuring growth or production of krill and other zooplankton.BIO Committee Action Plan (2012–2015)

Goal 8. Foster collaboration among scientists within PICES.

Action 8.1 Improve opportunities for early carrier scientists.

Task 8.1.1 Add links to the BIO website announcing graduate student opportunities in PICES member countries.

Task 8.1.2 Maintain BIO Paper session at PICES Annual Meeting to foster participation of early carrier scientists in PICES.

Task 8.1.3 Continue to sponsor and promote PICES/ICES Early Career Scientist Symposia.

Action 8.2 Improve participation of all member countries in BIO activities.

Task 8.2.1 Select topics for working groups and topic sessions of broad interest among all PICES member countries and maintain broad representation among co-conveners.

Goal 9. Create education and training opportunities.

Action 9.1 Promote training courses and summer schools in relation to biological oceanography in the Pacific rim.

Theme E. *Ensure a progressive organization*

Goal 10. Provide an effective infrastructure to support PICES activities.

Action 10.1 Create and oversee expert groups to support FUTURE and other scientific activities.

Task 10.1.1 Make recommendations to the Science Board on the establishment of new expert groups to support FUTURE and other scientific activities.

Task 10.1.2 Delegate representatives as members of the FUTURE Advisory Panels to effectively communicate with the FUTURE Advisory Panels.

Task 10.1.3 Oversee and coordinate the activities of the daughter expert groups through communication with the FUTURE Advisory Panels.

PICES FIS Committee Action Plan (2016)

Mission

The FIS Committee's area mission is to promote and coordinate fisheries science and interdisciplinary research in the northern North Pacific. This includes biology and ecology of living resources, particularly those that are subject to harvest or have the potential to be harvested.

Specific topics of interest to the FIS committee include:

- Taxonomy;
- Genetics;
- Behaviour;
- Diet and trophic relationships;
- Habitat;
- Distribution;
- Abundance;
- Ecology;
- Population dynamics;
- Regimes and global warming;
- Ecosystem dynamics;
- Aquaculture and ocean ranching; and
- Methods for stock assessment.

In considering these topics, the FIS committee endeavors to develop new concepts relating to the regulation of fish populations. A common focus is the relationships between human factors, climate, ecosystems, and fishery resources.

Given the connections between humans, climate, and fishery resources, the FIS committee's areas of interest intersect those of the other PICES committees (POC, MEQ, BIO, TCODE, and MONITOR) and PICES FUTURE Advisory Panels (AICE, COVE, and SOFE). This Action Plan endeavors to reflect these connections, as well as the PICES Strategic Plan, as revised in 2011.

Strategy of the FIS Committee

The 2011 PICES Strategic Plan has five themes: A) Advance scientific knowledge, B) Apply scientific knowledge, C) Foster partnerships, D) Develop capacity, and E) Ensure a progressive organization. Specific goals are identified within each of these themes. The actions of the FIS Committee endeavor to meet these goals.

Theme A. Advance scientific knowledge

Goal 1. Understand the functioning, resilience, and vulnerability of marine ecosystems

Action 1.1 Improve our understanding of North Pacific ecology.

Action 1.2 Improve our understanding of ecosystem function and resilience.

Goal 2. Understand and quantify how marine ecosystems respond to human activities and natural forcing.

Action 2.1 Evaluate and increase the knowledge and forecasts of climate effects on marine ecosystems of the North Pacific.

Action 2.2 Evaluate potential impacts of humans on marine ecosystems of the North Pacific.

Action 2.3 Develop and evaluate potential approaches toward mitigating effects of fishing on marine ecosystems.

Action 2.4 Assess the degree to which marine resources are robust to human uses and vice versa.

Theme B. Applying scientific knowledge

Goal 3. Provide scientific advice pertinent to North Pacific ecosystems

Action 3.1 In cooperation with the MEQ Committee, develop the scientific basis for an ecosystem approach to fisheries management, including assessments and the provision of scientific advice. Specifically, the following activities are needed:

Action 3.2 Improve the understanding and application of alternative stock assessment techniques and harvest strategies and their utility for fishery management approaches.

Goal 4. Ensure that PICES products are relevant, timely, and broadly accessible

Action 4.1 Publish products related to implementation of FUTURE Science Plan and ongoing FIS activities.

Action 4.2 Link published products to the PICES website.

Theme C. Foster partnerships

Goal 5. Collaborate with organizations and scientific programs relevant to PICES

Action 5.1 Develop formal linkages with ICES, NPAFC, IPHC and other organizations on fishery areas of common interest.

Goal 6. Strengthen communication and engagement with users of PICES scientific products

Action 6.1 Develop outreach to local coastal communities

Theme D. Develop capacity

Goal 7. Advance methods and tools to improve and enhance scientific activities

Action 7.1 Develop new tools to expand historical records of variability in North Pacific climate and biota.

Action 7.2 Improve the understanding of alternative stock assessment techniques and harvest strategies and their utility for fishery management approaches.

Action 7.3 Improve the methods and approaches available to study the biology and ecology of fishes and invertebrates in the North Pacific.

Goal 8. Foster collaboration among scientists within PICES

Action 8.1 Improve opportunities for young scientists.

Action 8.2 Improve participation of all member countries in FIS activities.

Action 8.3 Facilitate data synthesis and comparison among PICES-member country scientists

Goal 9. Create education and training opportunities

Theme E. Ensure a progressive organization

Goal 10. Provide an effective infrastructure to support PICES activities

Marine Environmental Quality (MEQ) Committee
ACTION PLAN 2022 –

MEQ Mission Statement

To promote and coordinate interdisciplinary scientific research on marine environmental quality, improve understanding of the impacts of anthropogenic and natural stressors on living marine resources (including plastics and other contaminants, harmful algae and biotoxins, marine aquaculture and non-indigenous species), and increase societal awareness about human activities and ecological impacts in North Pacific coastal and marine environments.

Goal 1: Understand the functioning, resilience, and vulnerability of marine ecosystems.

Action 1.1 Identify emerging environmental threats and vulnerable marine ecosystems and species.

Task 1.1.1 Convene topic sessions and workshops to characterize the source, status, trends and geographical distributions of emerging environmental stressors and their impacts on marine ecosystems and the coastal communities they support.

Goal 2: Understand and quantify how marine ecosystems respond to human activities and natural forcing.

Action 2.1 Improve understanding of the complex interactions between anthropogenic and natural stressors and their impacts.

Task 2.1.1 Convene science sessions and workshops to describe how multiple stressors affect coastal and marine ecosystems in the North Pacific.

Goal 3: Provide scientific advice pertinent to North Pacific ecosystems.

Action 3.1 Provide advice and share data on anthropogenic and natural stressors of coastal and marine ecosystems of the North Pacific Ocean.

Task 3.1.1 Contribute information to PICES Data on the status and trends of natural and anthropogenic stressors in the North Pacific.

Task 3.1.2 Contribute data to new and existing databases developed and used by MEQ expert groups.

Task 3.1.3 Convene an annual MEQ Contributed Paper (MEQ-P) session to foster information exchange on a diversity of marine environmental quality topics.

Goal 4: Ensure that PICES products are relevant, timely, and broadly accessible.

Action 4.1 Publish products related to the FUTURE Science Plan and ongoing MEQ activities in PICES.

Task 4.1.1 Routinely publish products of MEQ activities, such as papers from MEQ topic sessions, in special issues of peer-reviewed journals and working group reports.

Task 4.1.2 Work with the PICES Secretariat to ensure that published products and data are readily available to the PICES community.

Goal 5: Collaborate with organizations and scientific programs relevant to PICES.

Action 5.1 Establish and maintain linkages with organizations that share common interests with MEQ.

Task 5.1.1 Invite representatives from such organizations to attend and make presentations at MEQ business meetings, sponsored workshops and sessions.

Task 5.1.2 Periodically sponsor PICES scientists to join organizing committees and to give presentations at international symposia of mutual interest and relevance to MEQ.

Goal 6: Strengthen communication and engagement with users of PICES scientific products.

Action 6.1 Identify and engage users of MEQ-related products.

Task 6.1.1 Work to engage indigenous groups, traditional knowledge holders, and stakeholders in MEQ activities including, but not limited to, business meetings, expert groups, topic sessions and workshops.

Goal 7: Advance methods and tools to improve and enhance scientific activities.

Action 7.1 Develop new tools to monitor and to expand historical records of variability in North Pacific marine environmental quality.

Task 7.1.1 Convene a topic session or workshop to explore new methods for monitoring natural and anthropogenic stressors in the marine environment.

Task 7.1.2 Work with relevant international organizations to establish inter-calibration activities for techniques and methods to measure/monitor MEQ variables in coastal and marine ecosystems.

Task 7.1.3 Convene a workshop to explore alternative ways of deriving value from historical records of marine environment quality in the North Pacific.

Goal 8: Foster collaboration among scientists within PICES.

Action 8.1 Increase participation in MEQ activities.

Task 8.1.1 Actively engage ECOPs in MEQ activities including but not limited to business meetings, expert groups, topic sessions and workshops.

Task 8.1.2 Encourage representation and active participation by member states in MEQ activities.

Task 8.1.3 Seek opportunities to work more closely with other PICES Expert Groups.

Goal 9: Promote education and training.

Action 9.1 Create education and training opportunities relating to MEQ.

Task 9.1.1 Organize training courses, summer schools, student engagement and other outreach activities in relation to marine environmental quality topics.

Technical Committee on Data Exchange Action Plan (2022---)

Mission

The mission of the PICES Technical Committee on Data Exchange (TCODE) includes the following:

1. Identify the data management requirements of PICES;
2. Develop strategic plans to meet these requirements;
3. Recommend to Science Board, establishment of expert groups to deal with specific functions of TCODE;
4. Review the progress of tasks assigned within TCODE, and provide Annual Reports to Science Board on the work of TCODE;
5. Advise the PICES Secretariat on its data exchange activities; and
6. Review and update PICES data management policy

Strategy of TCODE

To implement its mission, the TCODE will address each of the six specific goals to advance and apply scientific knowledge of PICES strategy. Specific actions and tasks within each of these goals are as follows:

Goal 1: Foster collaboration among scientists within PICES and with other multinational organizations

Action 1 Establish dialogue with the various bodies of the international, national, state and local organizations, commissions and programmes involved in Marine Data and Information Management issues

Task 1.1 Maintain dialogue with the ICES Data and Information Group (DIG) and Data and Information Center

Task 1.2 Maintain dialogue with relevant programmes, sub-commissions, sub-projects in the IOC of UNESCO, such as IODE, ODINWESTPAC, NEAR-GOOS, IOOS, and CIOOS.

Task 1.3 Establish dialogue with organizations such as UNESCO/IOC and ICES to support the UN Decade of Ocean Science, in particular, its societal outcome of "Transparent and accessible ocean"

Task 1.4 Maintain dialogue with the NOWPAP DINRAC

Task 1.5 Review and evaluate proposals submitted to SCOR and ICES to establish new working groups

Task 1.6 Review and update PICES data management policy

Task 1.7 Work with PICES expert groups and PICES Secretariat to update and maintain PICES data inventory

Task 1.8 Provide guidance to each PICES expert groups regarding PICES data management policy and data inventory

Goal 2: Understand the status and trends, vulnerability and resilience, of marine ecosystems

Action 2 Propose topic sessions and workshops at upcoming annual meetings, and intersessional meetings and symposia

Task 2 Support topic sessions and workshops at upcoming annual meetings, and intersessional meetings and symposia

Goal 3: Understand and qualify how marine ecosystems respond to natural forcing and human activities

Action 3 Propose topic sessions and workshops at upcoming annual meetings, and intersessional meetings and symposia

Task 3 Support topic sessions and workshops at upcoming annual meeting, and intersessional meetings and symposia

Goal 4: Advance methods and tools

Action 4 Provide support for the use of shared information technologies

Task 4.1 Maintain PICES Metadata Catalogue Service

Task 4.2 Plan topic sessions and workshops at upcoming annual meetings for marine data quality control/assurance and information exchange

Task 4.3 Advise the PICES Secretariat and expert groups on data exchange activities

Goal 5: Provide relevant scientific information pertinent to North Pacific ecosystems that is timely and broadly accessible

Action 5 Support preparation of the North Pacific Ecosystem Status Report (NPESR)

Task 5 Assist in maintenance of ETSO database

Goal 6: Engage with early career scientists to sustain a vibrant and cutting edge PICES scientific community

Action 6 Promote training and education activities of local, regional and international organizations

Task 6 Support training and education activities of regional and international organizations, programmes, projects such as IOC, IODE, and ODINWESTPAC.

Legend:
POMA – PICES Ocean Monitoring Service Award
SCOR – Scientific Committee on Ocean Research
ICES = Intergovernmental Council for the Exploration of the Sea
IODE = Intergovernmental Oceanographic Data and Information Exchange
IOC = Intergovernmental Oceanographic Commission
UNESCO = United Nations Education Scientific and Cultural Organization
NOWPAP = Northwest Pacific Action Plan
DINRAC = Data and Information Network Regional Activity Center
NEAR-GOOS = North-East Asian Regional Global Ocean Observing System
NPESR = North Pacific Ecosystem Status Report
ODINWESTPAC = Ocean Data and Information Network of the Western Pacific
IOOS = Integrated Ocean Observing System
CIOOS = Canadian Integrated Ocean Observing system.
ETSO = Ecological Time Series Observations