



Intersessional Science Board Meeting 2022 — Note from the Science Board Chair

Vera Trainer



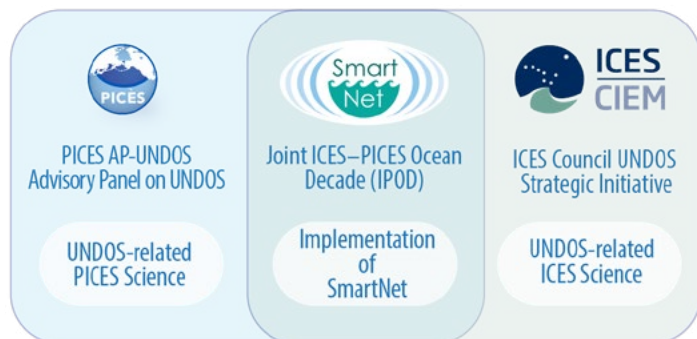
Many countries are now emerging from the global pandemic, and this is an exciting time for PICES to demonstrate leadership in reimagining the future of scientific meetings in a way that aligns with our concerns about equity, inclusion, and climate change. As leaders in ocean science and the study of climate change impacts, it is important for us to carefully consider our **carbon footprint**. Towards that end, the **Study Group on Generating Recommendations to Encourage Environmentally- Responsible Networking (SG-GREEN)** was proposed at the 20th Intersessional Science Board (SB) meeting from 11/12-13/14 April 2022, and was recently approved by PICES Governing Council (GC). While there may never be a complete replacement for the social events and serendipitous brainstorming provided by in-person meetings, the urgency of climate change impacts from global travel has highlighted the importance of a balanced approach to sharing scientific knowledge through a combination of remote conferencing and in-person meetings. Now is the time for PICES to explore the appropriate balance of in-person and remote meetings, and to lead by example in the international science arena. This will create a lasting legacy for PICES well into the future by addressing environmental justice, equity and diversity in its engagement with the worldwide scientific community. If you're interested in participating in **SG-GREEN**, please email me at vera.l.trainer@noaa.gov, and remember that GC delegates make the final membership determinations.

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PICES-ICES Joint UNDOS SmartNet Organizational Structure



Another new Advisory Panel will focus on PICES contributions to the United Nations Decade for Sustainable Development (AP-UNDOS). The AP-UNDOS will be the primary body to facilitate PICES engagement with the UN Decade of Ocean Science through the lifetime of the Decade (2021-2030). The initial activity of AP-UNDOS will be the implementation of the Sustainability of Marine Ecosystems through Global Knowledge Networks (SmartNet) program, a joint ICES/PICES UNDOS-endorsed program. SmartNet seeks to strengthen and expand the collaboration of ICES/PICES and partner organizations. As the Decade progresses, the AP-UNDOS will provide the broader function of planning and implementing PICES engagement in all UNDOS activities, beyond the scope and purview of SmartNet. In this capacity, AP-UNDOS will coordinate with PICES Science Board, the FUTURE Scientific Steering Committee, and other Expert Groups engaged in UNDOS-related activities.

At the ISB-2022 meeting, the Chairs of **PICES Committees** (5 science: BIO, FIS, HD, MEQ, POC; and two technical: MONITOR, TCODE)* reported on progress and planned activities of their respective **Expert Groups** since PICES-2021. Many Expert Groups, including Working Groups, Sections, Advisory Panels and Study Groups, now engage in virtual intersessional meetings to connect with one another throughout the year to make steady progress toward their goals. Updates were also provided by PICES **SEAturtle** and **Ciguatera** (sponsored by the Government of Japan, Ministry of Fisheries and Forestry (MAFF)) Special Projects, and the **Basin Events to Coastal Impacts (BECI)** UNDOS project. Many thanks to all the members of PICES Expert Groups who have continued their collaborative work virtually over the last year.

Prior to the ISB-2022, on April 4/5-6/7, 2022, the **FUTURE Program** Scientific Steering Committee (FUTURE SSC; Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems), also held its virtual intersessional meeting. During both the SB and FUTURE meetings, the strategy for evolving the FUTURE Scientific Program during the UNDOS was discussed. Conversations

will continue over the next few months, to determine the best strategy for direction and balancing of PICES resources toward PICES UNDOS initiatives and celebration of the FUTURE Science Program accomplishments. A FUTURE-SSC meeting accomplishment summary can be found on [page 4](#).

Several reports have received recommendation by SB for publication, including the following five products of PICES Committee collaborations.

PICES Section on Carbon and Climate (S-CC): Jiang, L.-Q et al., (2021) collaborated with the Coastal Ocean Data Analysis Product in North America (CODAP-NA) – to create an internally consistent data product for discrete inorganic carbon, oxygen, and nutrients on the North American ocean margins, published in Earth Systems Science Data 13, 2777–2799, doi.org/10.5194/essd-13-2777-2021.



Collaborative work by the Joint ICES/PICES Working Group on Ocean Negative Carbon Emissions (WG46 / ONCE) resulted in the following four publications:

Jiao N., et al., (2020) Microbes mediated comprehensive carbon sequestration for negative emission in the ocean. National Science Review 7: 1858-1860. [doi: 10.1093/nsr/nwaa171](https://doi.org/10.1093/nsr/nwaa171).



Jiao N., et al., (2021) Excessive greenhouse gas emissions from wastewater treatment plants by using the chemical oxygen demand standard Science China: Earth Science 65: 87-95 [doi: doi.org/10.1007/s11430-021-9837-5](https://doi.org/10.1007/s11430-021-9837-5).



Jiao, N. (2021) Developing Ocean Negative Carbon Emission Technology to Support National Carbon Neutralization, Bulletin of Chinese Academy of Sciences (Chinese) 36. [doi: https://doi.org/10.16418/j.issn.1000-3045.20210123001](https://doi.org/10.16418/j.issn.1000-3045.20210123001).



Wang, F., et al., (2021) Technologies and perspectives for achieving carbon neutrality, The Innovation. [doi: doi.org/10.1016/j.xinn.2021.100180](https://doi.org/10.1016/j.xinn.2021.100180).



I sincerely acknowledge the tremendous efforts, dedication and contribution of the SB in steering PICES science activities. The dedication and focus shown by SB members during our intersessional meeting is greatly appreciated. Our collective gratitude is extended to all members of the PICES Secretariat for their stellar help in organization and scheduling of meetings as well as assistance in visioning the future for PICES.

PICES-2022 will be held at the Hotel Paradise in Busan, Korea from September 23 to October 2, 2022. The Opening Ceremony will be followed by the Science Board session, "*Sustainability of Marine Ecosystems through global knowledge networks during the UN Decade of Ocean Science*", and several days of parallel Sessions.

Please familiarize yourself with the PICES-2022 Annual Meeting Science Program on the PICES website and plan your travel soon. For more information on PICES-2022, [see page 10](#) in this issue of PICES Press.

Many of you will plan to hold your business meetings virtually prior to PICES-2022, so that we can focus on science during the annual meeting. The entire SB looks forward to working with all of you – the PICES community – on many exciting new activities, and seeing you in person during **PICES-2022** this September.

Vera Trainer
SB Chair

*PICES Standing Committees

- BIO - Biological Oceanography Committee
- FIS - Fishery Science Committee
- HD - Human Dimensions Committee
- MEQ - Marine Environmental Quality Committee
- POC - Physical Oceanography and Climate Committee
- MONITOR - Technical Committee on Monitoring
- TCODE - Technical Committee on Data Exchange

Right: *Haenyeo (Woman Divers)*, Ink and wash, is the image chosen for this year's PICES-2022 Annual Meeting poster. We are grateful for permission to use this image, granted by contemporary artist Seok-woo Lee.



FUTURE SSC's 8th Intersessional Meeting ~ Highlights

Sukyung Kang and Steven Bograd

The FUTURE Scientific Steering Committee (hereinafter referred to as "FUTURE") held its 8th intersessional meeting since 2014. FUTURE (**F**orecasting and **U**nderstanding **T**rends, **U**ncertainty and **R**esponses of North Pacific Marine **E**cosystems) is PICES' second integrative science program, launched at PICES-2009. This year's virtual meeting, from April 4-6th, 2022, was led by FUTURE Co-Chairs Steven Bograd and Sukyung Kang, and attended by 12 SSC members, two guests, and five PICES Secretariat representatives who hosted the online meeting.

Review of 2021-22 activities

There has been a change in FUTURE membership since the last virtual PICES annual meeting. Dr. Jackie King of Canada has stepped down from FUTURE and was thanked for her excellent service to the program over several years. FUTURE revised its liaison table to account for membership changes, and to maintain communication links between the FUTURE Science Program and PICES Expert Group members.

FUTURE reviewed its activities and key accomplishments since its last virtual meeting at PICES-2021, which includes completion of the FUTURE Product Matrix through the addition of the work of the most recent working groups. FUTURE's Product Matrix links products developed by PICES Expert Groups to specific objectives and questions of the FUTURE Science Program, allowing for an easily-accessed catalogue of FUTURE-relevant products as well as a synthesis of products and a gap analysis of unmet objectives. As next steps on the Product Matrix, FUTURE will request that all current Expert Groups map their products to the FUTURE matrix when preparing their final report. The final Product Matrix will be included in the FUTURE Phase II Final Report and posted on the FUTURE Website. Another task related to the Product Matrix is to write a peer-reviewed manuscript. FUTURE acknowledged the need for a face-to-face meeting to outline a journal manuscript that will use the Product Matrix to:

- highlight key achievements of the FUTURE program;
- identify knowledge gaps and the reasons they remain;
- share the implications for large-scale science programs.

FUTURE plans to hold a manuscript-writing meeting during PICES-2022 in Busan, Korea.

FUTURE reviewed the new versions of its schematic prepared by Lori Waters, PICES Communications Officer. New Expert Groups were added, completed Expert Groups faded back, the look and feel of the schematic was refreshed to increase legibility, and cross-cutting groups

such as ECOP and Science Communications were added. The full set of FUTURE schematics developed during the program will be available on the PICES website as a visual legacy of the FUTURE program.

FUTURE's Expert Group activities

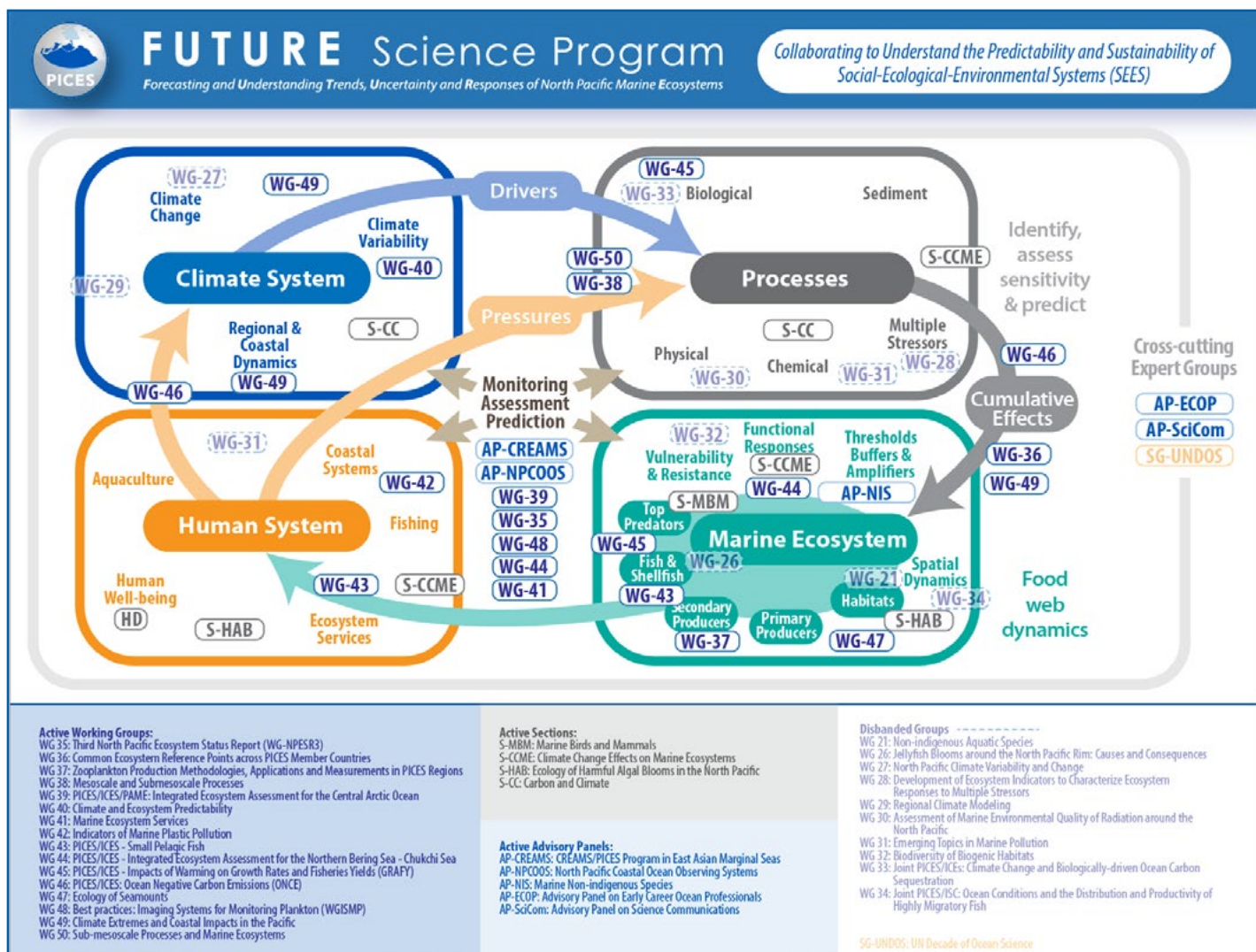
FUTURE reviewed recent activities of the Expert Groups that are parented or co-parented by FUTURE:

- **WG 36:** Working Group on Common Ecosystem Reference Points across PICES Member Countries
- **WG 40:** Working Group on Climate and Ecosystem Predictability
- **WG 41:** Working Group on Marine Ecosystem Services
- **WG 49:** Working Group on Climate Extremes and Coastal Impacts in the Pacific
- **SG-UNDOS:** Study Group on United Nations Decade of Ocean Science
- **AP-ECOP:** Advisory Panel on Early Career Ocean Professionals

AP-ECOP has been very active and they transitioned from a Study Group to an Advisory Panel at PICES-2021. They completed an [ECOP workshop at PICES-2021](#) and are preparing a manuscript for the journal *Frontiers in Marine Science*. FUTURE expressed their strong support for these activities.

SG-UNDOS is the primary body to facilitate PICES engagement in the UN Decade of Ocean Science. They have submitted a proposal for a longer-term Advisory Panel, which FUTURE SSC strongly supported.

FUTURE revisited the idea of hosting its next FUTURE Open Science Meeting (OSM), to highlight and synthesize accomplishments of the FUTURE Phase II (2014–2020) Science Program, with an emphasis on the application of the [SEES approach](#) in the context of the UN Decade of Ocean Science for Sustainable Development. This meeting would also be used as an opportunity to strategize for the next phase of PICES flagship science program. However, due to delays related to the COVID-19 pandemic, and because many other meetings are now being scheduled for the 2022–2023 time period, FUTURE decided to instead hold a workshop on the theme of 'The Future of PICES Science' in conjunction with PICES-2024, to provide all PICES scientists with the opportunity to link their research to PICES FUTURE Science program.



FUTURE program planning

The FUTURE-SSC continued strategizing FUTURE Program planning in light of: the 2021 launch of the United Nations Decade of Ocean Science (UNDOS); establishment of UNDOS endorsed ICES/PICES Joint Program "SmartNet"; and a need to efficiently use PICES limited resources to maintain focus. The SSC recognizes the increasing demand for integration of FUTURE with UNDOS-relevant activities in PICES. FUTURE members are planning additional strategy sessions to consider how best to:

- refocus FUTURE Phase III to fulfill remaining elements of the Science Plan;
- maintain PICES integrated Science Program as a means of providing value to PICES through:
 - synthesis of PICES Science products;
 - coordination of PICES Science activities.

Upcoming FUTURE activities

The FUTURE SSC prepared an Action Plan for the coming year, which includes:

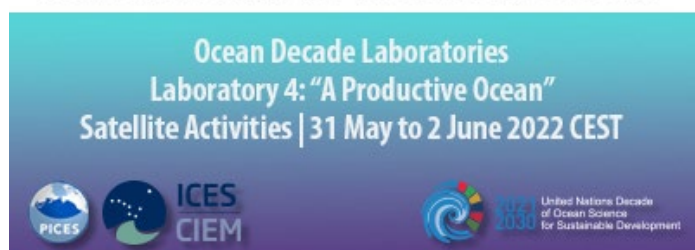
- PICES-2022 meeting and workshop planning;
- adding the revised liaison table and the FUTURE schematic to PICES website;
- finalizing and dissemination of the FUTURE Phase II Product Matrix and Final Report;
- planning the 2024 FUTURE Open Science Meeting;
- continued strategizing on future of FUTURE;
- preparing FUTURE SSC annual business meeting in Busan.

SmartNet Event: Establishing Global Knowledge Networks to Achieve “A Productive Ocean”

Sanae Chiba, PICES Deputy Executive Secretary, SmartNet Co-lead



SmartNet: Establishing Global Knowledge Networks to Achieve “A Productive Ocean”



Since its launch in 2021, UN Decade of Ocean Science for Sustainable Development (UNDOS) has had a series of virtual “Ocean Decade Laboratories” events as an interactive platform to support global action for the seven societal goals of the Ocean Decade: An Inspiring and Engaging Ocean, A Predicted Ocean, A Clean Ocean, A Healthy and Resilient Ocean, Safe Ocean, An Accessible Ocean, and A Productive Ocean.

ICES/PICES joint SmartNet Program: UNDOS Laboratory Satellite Event

On June 1st, 2022, SmartNet hosted the event “Establishing Global Knowledge Networks in SmartNet” as a satellite activity of the UNDOS “Productive Ocean” Laboratory. The event was organized in collaboration with the Ocean Decade Collaborative Center for the NE Pacific.

SmartNet is the networking program which seeks to establish a global knowledge network for ocean science by strengthening and expanding collaboration between ICES, PICES and partner organizations. The objectives of this event were to introduce SmartNet to the UNDOS communities, and to provide networking opportunities with potential partner organizations, stakeholders, end users, and UNDOS-endorsed activities with common goals. SmartNet emphasizes subjects such as climate change, fisheries and ecosystem-based management, social-ecological-environmental-systems (SEES), coastal communities and human dimensions, and cross-cutting issues such as promotion of Early Career

Ocean Professionals (ECOP), engagement of under-represented communities, and science communication. Thus, the event also aimed to advance progress around these key themes.

The event started with *ignite* talks by 9 panelists from SmartNet and partner organizations, followed by open discussion. [The video of the event is available here.](#)

SmartNet Ignite Talks:

1. **Introduction to the UN Decade of Ocean Science for Sustainable Development.** Rebecca Martone, [Tula Foundation](#), [Ocean Decade Collaborative Center for the NE Pacific](#)
2. **SmartNet overview,** Steven Bograd, [SmartNet PICES Co-Lead](#)
3. **The Climate-Fisheries Nexus in UNDOS: FishSCORE Program.** Kathy Mills, [Gulf of Maine Research Institute](#)
4. **Perspectives on local and traditional knowledges sharing.** Luis Tupas & Michael Robotham, [Asia-Pacific Network for Global Change Research](#)
5. **The US Agency International Development OurFish OurFuture Activity.** Peter Freeman, [University of Rhode Island](#)
6. **Perspectives on Marine Protected Areas and fisheries from Blue Belt Program.** Serena Wright, [Cefas](#)
7. **Capacity sharing with Least Developed Countries (LDCs) and Small Islands Developing States. (SIDS),** Khushboo Jhugroo, [Hakai Institute](#)
8. **Knowledge networks as a tool for diverse engagement and effective decision making amidst change.** Erin Satterthwaite, [California Sea Grant & Scripps Institution of Oceanography.](#)

Rebecca Martone reviewed 10 challenges, the mission of UNDOS: Catalyze transformative ocean science for solutions for sustainable development, connecting people and our ocean. She stressed that – in a nutshell – these challenges are all about cooperation, making connections and bringing people and initiatives together.

Steven Bograd (SmartNet PICES co-lead) provided an overview of the [SmartNet Program](#) (see figure at right: SmartNet Structural Landscape and Strategy).

SmartNet Structural Landscape and Strategy



Kathy Mill introduced the UNDOS-endorsed program FishSCORE 2030, which aims to establish a global network among scientists and fisheries practitioners for sustainable and climate-resilient fisheries and ecosystem management. FishSCORE plans to develop information and tools for resilience assessment for effective fisheries policy.

Louie Tupas and Michael Robotham, of the Asia-Pacific Network for Global Change Research (APN) described details of their programs on integrating global knowledge and local and indigenous knowledge in the Pacific island communities in a context of climate change adaptation. They reviewed the lessons learned and perspectives gained through their programs (see their publication “Local and Indigenous Knowledge for community resilience” [here](#)). They also introduced [The Marine Cultural Health Index \(MCHI\)](#) which was developed to monitor marine ecosystem health based on local and traditional knowledge in New Zealand.

Peter Freeman provided an overview of the USAID Agency-funded OurFish OurFuture Project (2021-2026), which aims to address the social and ecological drivers of Illegal, unreported and unregulated (IUU) fishing that are negatively impacting local livelihoods and biodiversity, with specific focus on 6 Pacific Island countries. He underlined the need to take a holistic view of the systems causing social-ecological issues such as IUU, and to increase the [social capital](#) among a collaborative network to facilitate effective problem solving.

Serena Wright shared a case study of Marine Protected Area (MPA) and yellowfin tuna fisheries in the South Atlantic Ocean which is a part of Blue Belt Program funded by the Government of the United Kingdom. She demonstrated how scientific evidence can be effectively fed by policy-making for marine conservation through engagement of stakeholders throughout the process — from co-design to co-production of knowledge.

Khushboo Jhugroo provided her perspective on capacity sharing with the Least Developed Countries (LDCs) and Small Islands Developing States (SIDS). As an ECOP from Mauritius (a SIDS), she reminded us of the vulnerability and risks LDCs and SIDS hold against environmental and socioeconomic stresses. She urged UNDOS actions to establish frameworks and systems to enable data and technological capacity-sharing to sustain local livelihoods which are largely dependent on ocean health and productivity.

Erin Satterthwaite overviewed the roles of ECOP and the importance of intergenerational efforts for global knowledge networks, to address the long-term transformation as envisioned by the UNDOS societal goals. Showing the geographical, sectorial and disciplinary diversity of global ECOP networks, she underlined ECOP’s role in engagement of diverse communities for the co-design and co-production of knowledge, that is indispensable for effective decision making.

Kathryn Sheps of the *Tula Foundation, Ocean Decade Collaborative Center for the NE Pacific* moderated the open discussion. Panelists and participants discussed key questions and implications raised by the ignite talks:

- One of the challenges of SmartNet is the strategy for networking: how can we facilitate collaboration of ocean science communities and multiple stakeholders, local and traditional knowledge, and policies? How can we build a meaningful network of the existing networks?
- How do we connect issues across different spatial and temporal scales? How can scientists ‘downscale’ global to basin-scale scientific knowledge to meet specific local needs? For example, how can model projections of extreme climate impacts on the ocean help local communities to sustain small scale fisheries and reduce the climate and oceanic hazard risk?
- Capacity development was another common topic: What kind of information/technology transfer is required by diverse local communities to support their aims of sustainable ocean management? What kind of governance and structure can help effective knowledge transfer? How can we improve equity in opportunities in a very asymmetric seascape across countries?

Jörn Schmidt, SmartNet ICES Co-Lead, summarised and wrapped up the event. As follow up, he suggested some near-term actions of SmartNet: to provide training through partnerships and a sustained infrastructure for cooperation; to exchange lessons learned and best practices for community-supported observation and data collection, and connecting different knowledge systems for community and stakeholder engagement.

In conclusion, the SmartNet Ocean Decade Laboratory event provided us with insight and perspectives on the challenges SmartNet must face, and an opportunity to reach out to potential collaborators.

Next steps

SmartNet must develop a tangible, fit-for-purpose action plan and road map toward 2030 by identifying high priority topics based on societal importance and feasibility (with the help of ICES/PICES frameworks and resources which can readily be used or developed to create solutions for specific issues).

UNDOS Laboratory Wrap-up: some personal thoughts

The wrap-up of “Productive Ocean,” as the last of seven UNDOS Laboratories, was also the final event of the UNDOS Laboratory event. With the second-round UN Ocean Decade Conference in less than a month, this marks the finale of the first year of UNDOS activities. The Wrap-up event program and video are available [here](#) and [here](#) (and include appearances of both SmartNet Co-Leads: Jörn – a popular presenter at UNDOS Labs (at 00:51) – and Steven, who gave a great summary of the SmartNet satellite event (at 1:31:00).

Two brilliant ECOPs: Angelique Pouponneau, Policy Advisor to the Chair of the Alliance of Small Island States (Seychelles) and Guillermo Ortuño Crespo, Postdoctoral Researcher, Stockholm Resilience Centre (SRC) in Sweden, closed the event side-by-side with IOC Executive Secretary, Vladimir Ryabinin. It was impressive that Angelique commented that Clean, Healthy, Safe, Accessible, Predicted Ocean are all needed to achieve a Productive Ocean ~ thus; a “Productive Ocean” is the Sustainable Ocean we want.

Looking back at my first year of UNDOS “Productivity” as the co-lead of SmartNet, I must admit I have not felt very productive. Back in 2015, there was an uplifting moment for ocean science communities when the United Nations called for actions for the Sustainable Development Goals with SDG 14: Life Below Water. That was followed by the first ever high-level International Ocean Conference in 2017 and the launch of the UN Decade of Ocean Science with the catchy slogan “The Science We Need for the Ocean We Want; The Ocean We Need for the Future We Want.” I was inspired by loads of pep talks encouraging scientists to stand for the right things in our own ways, and I felt the massive momentum and opportunities. Now, after one year, I am exhausted and feeling lost, with endless assignments, duties, a flood of information to digest, around-the-clock online meetings/events, and each new deadline ~ all related to UNDOS activities. Maybe I don't yet have the coping skills to deal with all of these priorities and tasks at once, but I believe many colleagues experience similar fatigue. At the Wrap-up closing, Vladimir said that UNDOS is a “Marathon,” and we've only just started the long, enduring race. So let's take a deep breath, have a tea break, and get ourselves motivated again to tackle the long journey together.

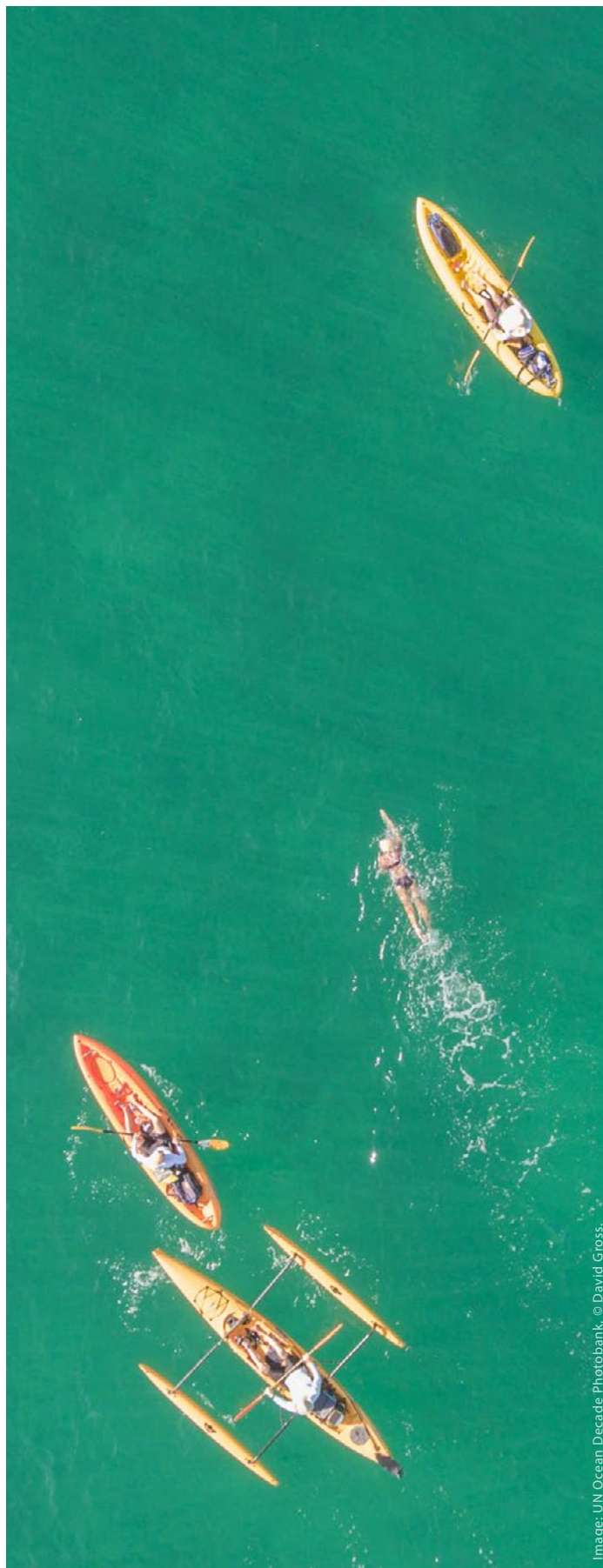


Image: UN Ocean Decade Photobank, © David Gross.

PICES and ICES at Our Ocean 2022, Palau

Sonia Batten



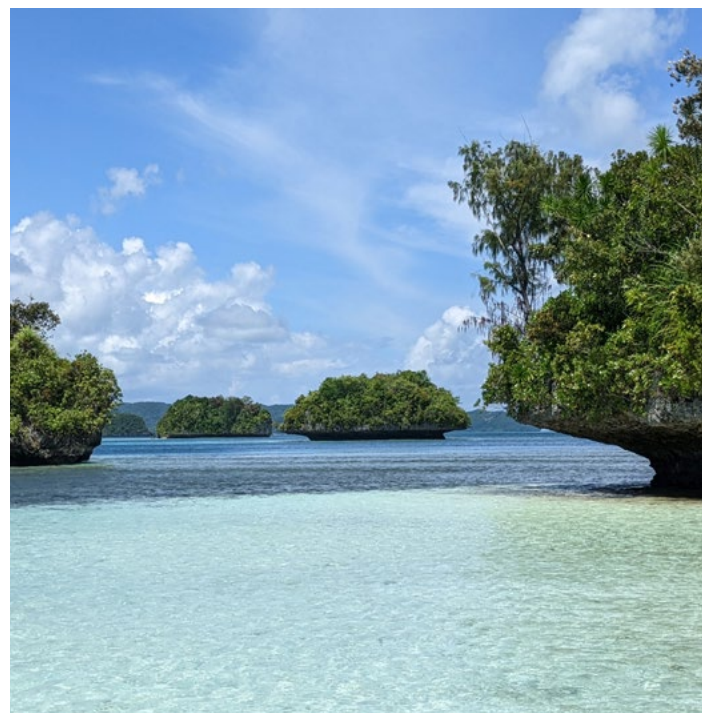
PICES and ICES were invited to attend the [Our Ocean 2022 Conference](#) in Palau this April, one of a series of high-level ocean-focused events being held in 2022. The event was co-hosted by the USA and Republic of Palau governments. Senator John Kerry and President Surangel Whipps Jr. put the challenges faced by Small Island Developing States (SIDS) front and centre. The effects of climate change, sustainable fisheries and a blue economy, conservation,

marine protected areas and marine security were all addressed, notably often including the perspective of indigenous or local community leadership and inclusion. The timing of the event, previously twice-delayed by the COVID-19 pandemic and held just as travel was beginning to open up in many places, presented a challenge for attendees as well as the local hosts. With no tourists for almost two years the remote nation of islands was faced with a sudden influx to cater to, and attendees faced numerous COVID tests and many flights to get there. It was worth it.

The Conference focused on six Areas of Action and comprised selected speakers and organized panels around each Area. Diversity and equity in gender, geographic and career-stage was exemplary and the quality of the speakers was universally excellent. Each themed session ended with an opportunity for nations and organizations to pledge commitments. While many of the commitments reflected plans put in place long before the Conference, with the event itself acting as the announcement venue for them, nonetheless the impression was very much that there is gathering momentum to provide resources, and a genuine desire to make progress on these issues while there is time.

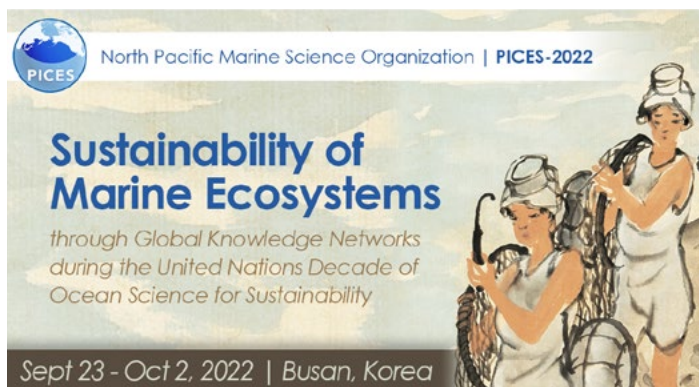
As the joint SmartNet UNDOS program develops, this was a good opportunity to gain a deeper understanding of the challenges and progress made by organizations working in the wider Pacific, especially SIDS, and to identify potential partners that could work with us to make sure that SmartNet can meet its goals in this area of focus. We were pleased, for example, to be able to include contacts made at Our Ocean as speakers in the recent SmartNet satellite event [detailed on pages 6-8 of this issue](#).

On a personal note, the conference was the first reminder for me since 2019 of how great it is to meet with colleagues old and new, in person, and to be inspired by conversations and presentations. With stunning scenery around us, warm Palau hospitality, and messages from many world leaders acknowledging the need for, and commitment to, action, it was a memorable experience and a reminder of why the work that PICES members do is more important than ever.



Looking forward to a return to in-person annual meetings at PICES-2022

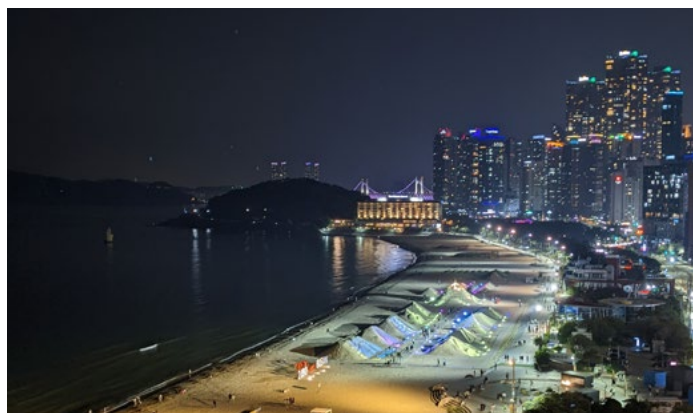
Sonia Batten



Three Secretariat members travelled to Busan, Korea during the third week of May, 2022, to discuss logistics for PICES-2022 and to view the venue. Although travel requires more planning these days, it all went very smoothly and it was wonderful to see some of our Korean colleagues face to face for the first time in nearly three years!

The PICES-2022 venue, the Paradise Hotel, is right on the beach with plenty of restaurants and hotels in the neighbourhood. The last week of May, while we were there, was warm and sunny; the city was bustling and people were out and about enjoying the sights (wearing masks) and we are told to expect the same weather and atmosphere in late September. We understand that not everyone is comfortable travelling yet, and for some there may be last minute challenges that will prevent their attendance, but the PICES Secretariat and our Korean hosts are looking forward to welcoming as many of you as possible to PICES-2022, to catching up on the science that is being done in PICES countries, and to resuming discussions and collaborations over coffee or a meal together. We have missed this very much during the pandemic!

Plans for an annual meeting with ICES in 2023 have been temporarily suspended while we consider if a joint event is still feasible at this time. Whether we end up holding a solo, co-located or joint meeting the likely venue is Seattle, in the last week of October, 2023. More information will be provided as soon as it is confirmed, so please be patient.



An Invitation to the Science Communication Workshop at PICES-2022: How to Create Memorable PICES Science Stories

Members of AP-SciCom



At the upcoming annual meeting, the AP-SciCom will present a science communication workshop to assist PICES Expert Group members in better telling of their science stories, to help audiences to better understand their work. The AP-SciCom has invited a number of expert speakers for this workshop, and this short guide will help you to prepare for the workshop. We hope to see you there!

Who can attend: members (and especially Chairs) of PICES Expert Groups, PICES Science Programs (e.g. FUTURE, SmartNet) and Special Projects. Expert group members can work together in teams.

What to prepare: Choose a current research project, term of reference, achievement of your expert group, or question you are working on for PICES. Write a concise statement on:

1. the main issue your work addresses;
2. why your work is relevant / important.

During this workshop, we will have three main objectives:

1. Write a clear, concise, and compelling message;
2. Learn to use images to drive your message;
3. Deliver and amplify your message to help audiences better understand and remember your message.

Your messages will be used to create storyboards to refine as a roadmap for the videos you'll create. Bring your phone/tablet and computer with iMovie or other movie-making software. We'll create short ~3 minute videos showcasing your compelling PICES science stories.

To prepare for the workshop, you need to do the following:

1. **Watch:** *Narrative Structure is a Puzzle*: <https://youtu.be/VWmobO6enY0>
2. **Watch 0:00-12:30:** *AAAS Video*: <https://youtu.be/ungl-jozHLA>
3. **Read:** *The Narrative Gym*, by Randy Olsen <http://abtframework.com/>

Instructors: (In person and virtual*): Brian Palermo, Vera Trainer, John Pohl, Elliott Hazen, Lori Waters, Julie Claussen*.

- DAY 1 – Development of Science Content**
- Morning*
- ABT Narrative**
1. **ABT Method Introduction**, Julie Claussen.
 2. **Develop your Narrative** - short video presentations
 - a. You Must Tell Your Story
 - b. The Three forces of Narrative
 - c. Two Audiences
 - d. The One Thing
 - e. Dobzhansky Template
 3. **Example:** A personal journey with ABT, Lian Guo.
 4. **Creating effective visuals**, John Pohl.
 5. **Storyboarding** – Taking your message from the page to presentation, Julie Claussen.
 - a. Storyboarding: combining story and images
 - b. Storyboard work breakout session: Brian Palermo will offer input and advice.
- Visuals**
- Afternoon*
- Delivery**
6. **Connect with audiences** - group exercises with Brian Palermo.
 - a. Audience connection
 - b. Delivery
 - c. Amplifiers
 - d. Communities of Practice

Evening - Work on Storyboards, text and photos for your short video.

DAY 2 – Putting it all together

Morning

1. **Review presentation**
 - Review ABT and storyboard visuals
2. **Complete your storyboard**
 - Brian will offer input and advice.
3. **Take your story from paper to video** Brian Palermo
 - How to, tips, what to consider, etc.
4. **Work in Development Teams on products**
 - Brian will offer teams input and advice.
 - Follow storyboard to file 1st draft
5. **Complete 1st draft video product**
 - 1 team member to load work into imovie or other video making program
6. **Reviewing draft products – Feedback sessions**
 - Meet in groups to play 1st drafts - in person instructors to provide feedback on messaging, clarity, visuals, delivery
7. **Team work on 2nd drafts based on feedback**
 - Brian will offer teams input and advice.
8. **Presentation of products**
 - Meet in groups to play drafts and receive feedback on messaging, clarity, visuals, delivery
9. **Summary and next steps**
 - Final videos for YouTube upload and a descriptive 280 character tweet can be emailed to Lori.Waters@pices. so the PICES Secretariat can share your work!

PICES Ciguatera Project in International News

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The goal of the 3-year (2020-2023) PICES Ciguatera Project, funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, is to build the capacity of local small-scale fishers and community members to monitor their coastal ecosystems and coastal fisheries for Ciguatera Fish Poisoning (CFP) in tropical reef fisheries. CFP stems from the human consumption of fish containing toxins produced by benthic microalgae of the dinoflagellate genera *Gambierdiscus* and *Fukuyoa*, the sources of ciguatoxin. Globally, CFP has the most significant human health and economic impacts of any algal-based poisoning syndromes.

Indonesia, a developing Pacific Rim country with one of the most extensive coral reef systems in the world on which many of its coastal communities depend, was chosen for the project as a developing nation with 35% of its coral reefs in poor condition, primarily due to anthropogenic stressors. Ciguatera uses the simple "Assess. Detect. Avoid!" messaging strategy to minimize CFP exposure in community-scale fisheries, and relies on investments in socio-ecological scientists – a specialty of the MAFF mandate. Full details on PICES Ciguatera project are available on the project webpage: <https://meetings.pices.int/projects/Ciguatera>

NASIONAL

wartaJakarta.com

by Kasiyanto Yasran 03/06/2022

Governor of NTB Supports Synergy of Ciguatera Indonesia and PICES



Wartajakarta.com - Governor of NTB, Dr. H. Zulkieflimansyah welcomed the research plan carried out by the Indonesian Ciguatera Scientist Team from the Indonesian Institute of Technology (ITI), the National Research and Innovation Agency (BRIN), the University of Indonesia (UI) and the University of Mataram (UNRAM). This was conveyed when the Governor received an audience from the Ciguatera Indonesia Scientist Team, supported by PICES, in his office, Monday, May 23, 2022.

"Agreed, the important thing is to keep working together. What we can help, we will definitely help," said Bang Zul.

In his remarks, the Governor, as reported by Suara NTB said, this research is an implementation of ITI – PICES (North Pacific Ocean Science Organization) which is supported by several research institutions and universities (BRIN, UI and UNRAM) in Building a Local Warning Network for Detection and Dimensions Ciguatera Fish Poisoned Humans in the Indonesian Community will be held in Gili Meno, Air, and Trawangan (Matra)-Lombok Islands.

This research was also supported by the Research and Innovation Agency (BRIN) through the research center and organization for the Environmental and Life Sciences Program in the study of Potential Hazards for Hazardous Algae Phenomena. (MAB) and Ciguatera Fish Poisoning (CFP) in Relation to Human Activities in the Aquatic Tourism Park (TWP) Gili Matra Islands.

For information, the Ciguatera Indonesia Scientist Team chose Gili Matra as the research location because Gili is one of the icons of tourism in NTB. The Research Coordinator who is also a Research

Professor from the Research Center for Environmental and Clean Technology, the National Research and Innovation Agency (BRIN), Prof. Suhendar I Sachoemar said that this research activity is a collaborative research between research institutions and universities in Indonesia, including ITI, BRIN, UI, UNRAM supported by PICES (The North Pacific Marine Science Organization).

PICES is an international research institute consisting of 6 countries in the North Pacific, namely Canada, Japan, the People's Republic of China, the Republic of Korea, the Russian Federation and the United States.

According to Suhendar, in addition to research activities, there will also be workshops and international technology dissemination supported by PICES experts in collaboration with the NTB Provincial Government and the NTB Provincial Work Units (SKPD).

Universities, Kupang National Water Conservation Area (BKKPN), Kupang National Water Conservation Agency (BKKPN). Regional Research and Innovation (BRIDA) NTB Province, Department of Marine Affairs and Fisheries, Ministry of Environment and Forestry, students, coastal communities, environmentalists and other stakeholders.

Suhendar expressed his gratitude for the good response from the Governor of NTB to the research plan that his team will carry out. *"We will research Ciguatera about the Gilis. Ciguatera is a microbenthic algae that poses a threat in environmental waters. Thank you, Mr. Governor, for being ready to help,"* said Suhendar.

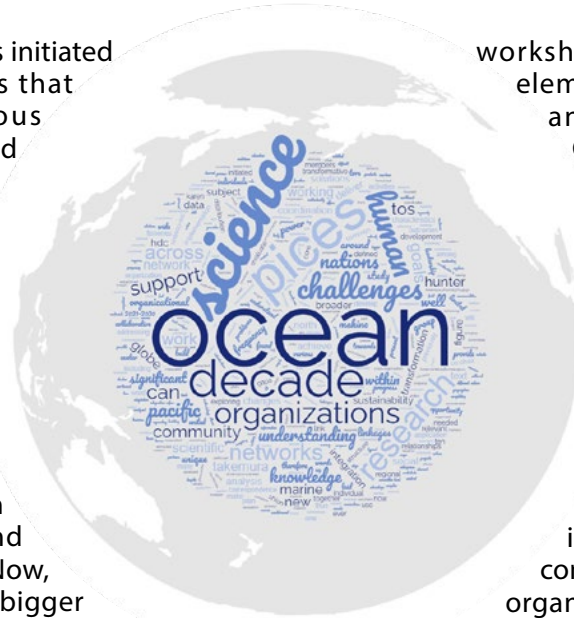
Exploring Human Networks to Power Sustainability

Karen Hunter (Fisheries & Oceans Canada) and Shion Takemura (Japan Fisheries Research & Education Agency)

For more than 30 years, PICES has initiated international research projects that provide a link between various institutions, countries, and cultural spheres across the North Pacific Ocean. These research linkages have led to greater understanding of North Pacific wide events, processes, changes, and challenges. Still, PICES understands that its reach has been limited despite the beneficial aspects and outcomes of working together in an integrated fashion, both for scientific understanding and for those completing the work. Now, PICES has been invited to think bigger and broader than ever as we work towards achieving challenges posed by the United Nations Decade of Ocean Science (Ocean Decade; 2021-2030).

As we enter a new era of ocean sciences, it is essential to examine previous ways of 'operating' to look for new solutions that support human resilience and ingenuity. PICES' unique leadership position gives our scientific community an advantage to make progress towards the goals outlined for the Ocean Decade. Principally, our combined knowledge and experience offers a unique opportunity to design and deliver 'transformative ocean science' (TOS). TOS is defined as a revolution in ocean science that transforms business as usual (UNESCO-IOC 2021). Thus, at its core, TOS relies on the structure and operations of human enterprises and organizations to make progress. While not a typical subject of study in ocean science, human networks play an enormous role in how we as a community of practitioners, experts and knowledge holders deliver TOS. At the very least, transformation requires leadership, communication, coordination, and integration. Taking the lead from the Ocean Decade, we have the opportunity as an ocean science community to align under the ten challenges laid out before us. Yet, it remains difficult to build relationships within and across the ten challenges, and across geographies and languages in support of large scale transformation.

Coordination is defined as the process of bringing many individuals or parties together to achieve a common and desired plan or goal. The ocean science community typically coordinates itself by establishing organizations to support this function, where holding meetings,



workshops, and conferences are a key element to share new advancements and explore common problems.

Our individual networks within such coordination efforts often rely on existing relationships, introductions, opportunities to present to a wide audience, and the almighty evening social. Outside of this organizational support, individuals are, for the most part, left to develop their networks as skillfully as possible, and use publishing as the central avenue to integrate into their field and broader science community. Integration refers to how organizations work between or among their components, such as inter- or intra-departmental coalitions (e.g. CCCC and FUTURE programs in PICES). Cross-organization coordination and integration present even further challenges. This is where scientific advancement can be limited by organizational structure because at its core, science is the pursuit of a methodically-organized body of knowledge on a particular subject, thus suiting silos quite well. As is well known, solutions to modern problems are not found in one subject, and ocean science solutions seem about as complex as one can get. However, for example, we need integration of ocean science to advance understanding of how changes in oceanic drivers are impacting nature and humans within it, as well as how changes in human actions can deliver more desirable environmental outcomes. To our knowledge, it has not been previously attempted to understand the network of ocean science research to support a transformation of relevant organizations across the globe. Building from a 2020 PICES study and expanding to other organizations, it is our intent to link, and therefore leverage, ocean science knowledge and action across boundaries that have not previously been assessed.

To begin these inquiries from a social lens, the PICES Human Dimensions Committee (HD) completed a committee-level research project in 2020 to assess the internal human network of PICES (Takemura, Hunter, Makino, in prep). This work was initiated to help us understand how the organization and its researchers may already be addressing a variety of Ocean Decade goals. The HD research team assembled and analysed research products created by PICES since 1992. The application of text and correspondence analysis techniques supported the use of these materials as a rich data source for exploring the PICES network and its linkages to the Ocean



Dr. Shion Takemura (takemura_shion01@fra.go.jp) is a Senior Researcher in the Socio-Ecological Systems Division, Fisheries Stock Assessment Center, Fisheries Resources Institute, Japan Fisheries Research and Education Agency. His fields and topics of research are coastal fisheries management, landscape ecology and citizen science with emphasis on natural resource management. Within PICES, he is a member of the Human Dimensions Committee. He is involved in the PICES/MAFF Ciguatera and FishGIS projects to develop a community-based monitoring system (FishGIS app) with local fishers.



Karen Hunter is the Climate Response Program Lead in Pacific Region, Fisheries and Oceans Canada (DFO). With her DFO colleagues, Karen has co-developed a risk-based framework to operationalize the integration of climate change in decision-making and is generating ecological metrics to support risk-based objectives for Marine Protected Areas. Previously, Karen led a research team at Rutgers University, New Jersey, USA, focusing on the impacts of changing habitat conditions on fish movement and growth and also directed a UNESCO Biosphere Reserve in British Columbia – thus, the ‘changing environment’ and ‘challenging human problems’ have been central to her work for more than 20 years. Karen serves as Vice-Chair of the PICES Human Dimensions Committee.

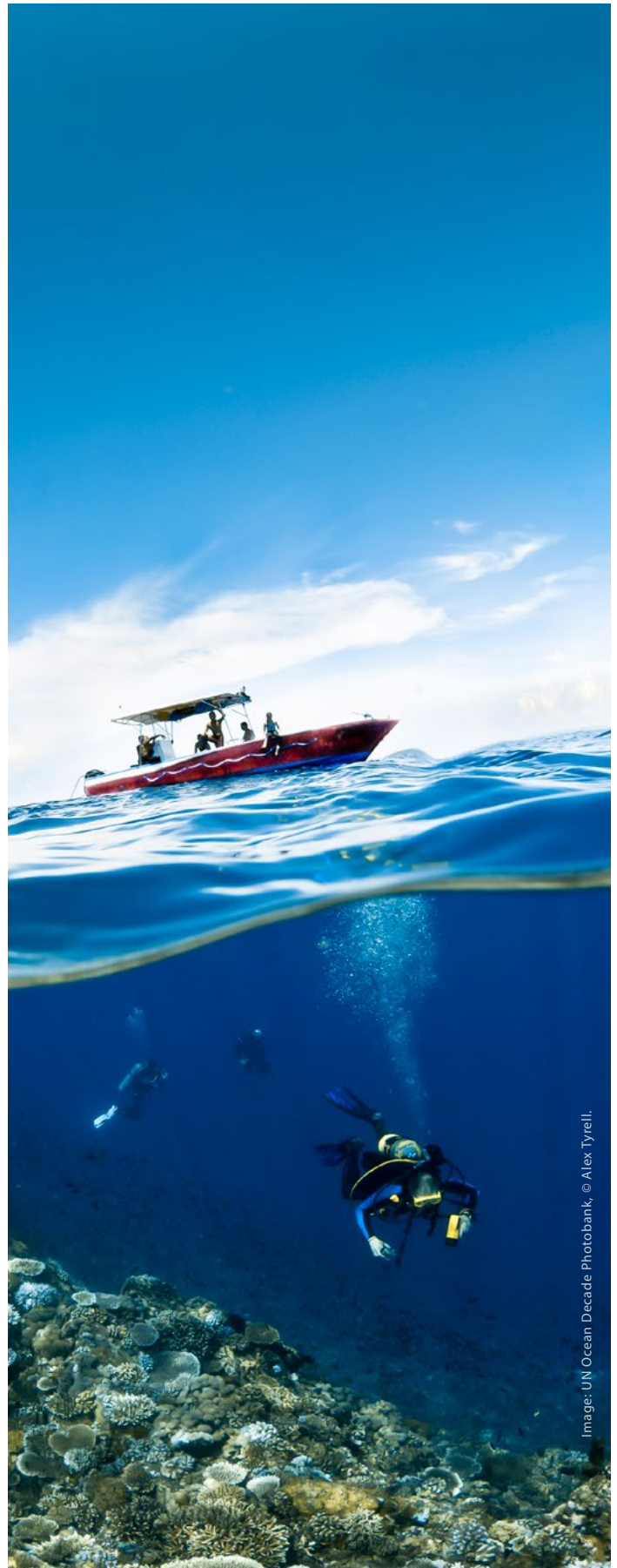


Image: UN Ocean Decade Photobank, © Alex Tyrell.

AP-ECOP's Early Career Ocean Professionals Update: ECOP cross-pollination in PICES and Internationally

Raphaël Roman, Erin Satterthwaite, Hannah Lachance



From the very first [efforts](#) to build an ECOP network across the North Pacific in 2020, to the release of a comprehensive and well-informed [engagement plan](#) in 2021, the Study Group on Early Career Ocean Professionals ([SG-ECOP](#)) actively reached out to the wider PICES community and its international partners, doing so through online surveys, workshops at Annual meetings (see summaries [here](#) and [here](#)) and cross-institutional dialogues ([here](#)).

The natural disbandment of [SG-ECOP](#) was only the end of the beginning. Kick-started in 2021, the new ECOP advisory panel ([AP-ECOP](#)) is now striving to embed and integrate the diverse perspectives and innovative thinking of ECOPs into the long-term institutional capacity and scientific work of PICES. AP-ECOP is also presented with a unique opportunity to help shape and guide PICES's journey throughout the ongoing UN Decade of Ocean Science for Sustainable Development (2021-2030). Professional development and international research collaboration opportunities abound within the PICES structure, underlined by joint Expert Groups across the PICES member countries and with other organizations (e.g. ICES, APN, etc.), panels on cross-cutting themes such as Science Communication ([AP-SciCom](#)), a formally endorsed Decade Program ([SmartNet](#)) that aims to establish and nurture a global knowledge network for ocean science, an [intern program](#), as well as a multitude of working

groups addressing contemporary and cross-disciplinary ocean issues in the North Pacific. Having opportunities and knowing how to engage and participate in these various initiatives can be challenging for some ECOPs, which is why AP-ECOP will continue the [work done by SG-ECOP](#) in identifying low, medium and high engagement options for ECOPs, which would fit with their time and experience levels. Overall, we are eager to support and assist newcomers by acting as liaisons between all organizational levels, similar to "cross-pollination."

Within AP-ECOP, an inclusive and supportive peer-to-peer leadership model will be tested, whereby four co-chairs, who will be representative of geographical diversity (2 from the West Pacific and 2 from the East Pacific) and institutional experience (2 newcomers and 2 ECOPs well-versed in PICES's structure and operations), will be rotating and replaced every 2 years. Other working groups (such as [WG 49 on "Climate Extremes and Coastal Impacts in the Pacific"](#)) are also striving to offer more leadership roles to ECOP members, who, regardless of their experience level, will gain new skills and receive invaluable support from mid-level and senior professionals, who in turn will benefit from two-way knowledge sharing across all career stages. In light of the voluntary nature of such commitments, which might deter some ECOPs from stepping into these roles, PICES is now granting a

“Letter of Acknowledgement for Services to PICES”, recognizing – and helping employers to recognize – the importance and professional value of leadership positions taken within the organization.

ECOPs have also started to become more integrated within PICES’s governance structure. As an example, annual Intersessional Science Board (ISB) meetings have been consistently granting observer status to 1-2 ECOPs (upon request) over the last 3 years. We hope this will remain the case for many more years to come, with new ECOP members invited to join and participate in higher-level organizational decision-making processes. Although AP-ECOP has not yet officially started its activities, the momentum continues, and the level of excitement is palpable. Whether you are an expert group (co)-lead eager to involve more ECOP members, or an early career newcomer wondering how to collaborate and engage within PICES, please do not hesitate to reach out to us so that we can all design and work towards “the (North Pacific) ocean we want.”

Members of AP-ECOP have already made waves at the national, regional and global levels, and there are abundant new opportunities (training workshops, summer schools, virtual dialogues, etc.). In the short-term, some of our representatives will be attending the [UN Ocean Conference](#) in Lisbon, Portugal (June 27 - July 1, 2022) and the [ICES/PICES Early Career Scientist Conference](#) in Newfoundland, Canada (18-21 July, 2022), while playing key advisory and coordinating roles in future joint international conferences and scientific meetings, such as [ECCWO5](#) in Bergen, Norway (17-21 April, 2023) and the [2023 ICES/PICES Science Conference](#) tentatively set for Seattle, USA (23-27 October, 2023) ([See page 10 for more details](#)).

While the first official meeting between all AP-ECOP members has yet to occur, the list of agenda items for 2022 is already extensive, with many exciting developments and works in progress:

- **A new mentorship platform** specifically tailored to the needs of the PICES community will be developed and tested in the second half of 2022, with a [plan to unveil it at the next PICES Annual Meeting](#) slated to happen in Busan, South Korea. This pilot project will help foster and nurture intergenerational and cross-country exchanges between mentees (ECOPs) and mentors (mid-and late-career professionals). Encouragingly, a majority of experienced PICES members expressed interest in being considered as mentors [when surveyed in the summer of 2021](#). AP-ECOP welcomes any ECOPs eager to take part in the pilot phase of the mentorship program to contact our representatives. Anyone is welcome!

- The current ECOP definition used within PICES (i.e. “*Early career scientists who are less than 36 years old, or who defended their PhD thesis within the last 5 years*”) will be expanded upon to be more inclusive of ECOPs coming from different sectors and career backgrounds (e.g. someone who graduated at an older age or who graduated with a university degree more than 5 years ago, but still self-identifies as early in their career). This updated definition will also be aligned with the standard one used by the [ECOP Program](#) at the global level. AP-ECOP recognizes that certain award criteria (e.g. [Zhu-Peterson Award](#) and [FUTURE Early Career Scientist Award](#)) may need to be left relatively unchanged. Two separate definitions (general vs. award) will be recommended for approval at PICES 2022.



ECOP DEFINITION



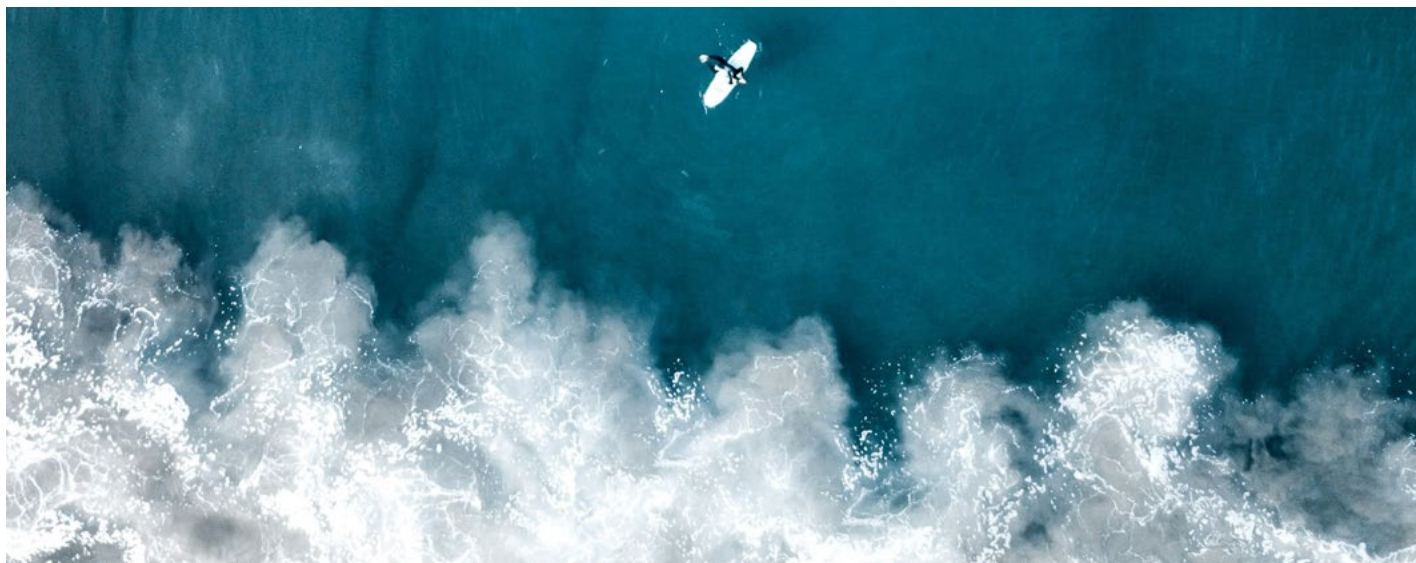
ECOP is broadly considered an ocean professional who is in the initial phases of his/her/their career and self-identifies as an early career scientist or practitioner. We recommend that PICES use an expanded definition of ECOPs to include professionals who graduated with a degree more than 5 years ago but still consider themselves as early in their career.

The definition we propose is:

Self-identified: Someone who self-identifies as an early career professional and in the beginning of his/her/their career

Within 10 years of obtaining a degree or 5 years in a current position: 10 years or less since obtaining a degree or less than 5 years in a current job or profession

We suggest that this broader definition be applied to the general PICES ECOP definition but recognize that PICES ECOP award(s) (e.g. PICES Zhu-Peterson award criteria) could be based on different rules, depending on needs or funding. In addition, this definition would also be aligned with the standard used by the Ocean Decade ECOP Program.



- AP-ECOP will also explore new professional opportunities for ECOPs within PICES, notably by expanding on the current intern program. This could involve the hiring of another (paid) intern whose role would be to coordinate international marine science programs across the North Pacific, and to support PICES in achieving its milestones in the context of the UN Decade of Ocean Science for Sustainable Development (2021-2030). This unique role would provide the intern with first-hand experience in intergovernmental processes, while being at the forefront of the next chapter of scientific discovery. Novel leadership roles for ECOPs are currently being discussed with FUTURE, SmartNet, WG-49, AP-UNDOS and many other groups. The unwavering support provided by PICES leadership (Science Board, Secretariat, Committee chairs, etc) has been an invaluable source of motivation and energy, springboarding AP-ECOP to new heights.
- Conscious of the language barriers faced by some ECOPs, AP-ECOP will continue the work started by SG-ECOP, and make it a habit to share key executive summaries as well as promotional and engagement materials in the five languages of PICES member countries (Chinese, English, Japanese, Korean and Russian). Some ECOPs see the language barrier as an impediment to international scientific collaborations and to professional development outside of their national borders. AP-ECOP will aim to overcome such obstacles and increase involvement from under-represented communities in PICES member countries, with special emphasis on China, Japan, the Republic of Korea and Russia.
- Assessing ECOP representation within Expert Groups and other organizational bodies is not always an easy task. In addition, demographic data collected during PICES events (Annual Meetings and symposia) **do not capture the true attendance rate of ECOPs** (specifically non-student ECOPs). AP-ECOP plans to recommend enhancements and adjustments to PICES data collection procedures, which will help better monitor and keep track of ECOP representation both within the PICES structure and at its events. The insights derived from this statistical information can identify gaps and thus opportunities for greater participation and leadership from ECOPs. Ideally, PICES events should have a relatively equal distribution between attendees from all different career stages (early, mid and late), while quantitative benchmarks could become long-term targets for Expert Groups (e.g. membership comprised of at least 25% of ECOPs).
- Fostering international collaborations and networking opportunities with regional and global partners (e.g. Asia Pacific Network for Global Change Research (APN), ECOP Program, International Council Exploration of the Sea (ICES), etc.) is another important undertaking of the AP-ECOP. Nurturing and leveraging previously forged connections with other early career networks will help advance participatory and inclusive engagement in the North Pacific and internationally. Besides being a formidable opportunity to finally meet in-person for members of the AP-ECOP, the [ECOP workshop \(W4\)](#) planned for PICES-2022 in Busan, South Korea, will also constitute an important step towards strengthening existing relationships and establishing novel ones. The workshop will be convening early career and senior leaders from both PICES and partner organizations, exploring and showcasing the myriad of ways that ECOPs can contribute to research and science, capacity building, communication, community empowerment, and policy, including within the context of international processes such as the UN Ocean Decade. An open brainstorming session will follow to explore the idea of a North Pacific ECOP “bridge” or liaison hub between Asia and North America (with PICES as a convening platform), and the role AP-ECOP can play during the UN Ocean Decade.



Mr. Raphael Roman is an interdisciplinary ocean researcher and a regional consultant for the Intergovernmental Oceanographic Commission of UNESCO, where he coordinates the Asian node of the ECOP Programme, an endorsed Ocean Decade Action. Hailing from landlocked Switzerland, Raphael has developed his passion for marine conservation, coastal community wellbeing and ocean governance through various research and consultancy appointments across the North Pacific (in both Canada and Japan). From 2019 to 2021, Raphael was based in Iwate Prefecture in Northeastern Japan, investigating multi-species fisheries management approaches, seafood supply chains and the social-ecological impacts of the 2011 Great East Japan Earthquake and tsunami. It was during his time in Japan that he joined the Study Group on Early Career Ocean Professionals (SG-ECOP). Currently the co-chair of the newly formed Advisory Panel on ECOPs (AP-ECOP), Raphael strives to establish and sustain a vibrant, engaged, and inclusive regional ECOP community in the North Pacific, across sectors, disciplines, and cultural contexts."



Dr. Erin Satterthwaite is a translational marine ecologist with California Sea Grant at Scripps Institution of Oceanography, UCSD. She works at the interface of applied marine research, diverse stakeholder engagement, and data communication to advance ocean knowledge for sustainability. She works on ocean sustainability topics related to marine biodiversity, ocean observations, diverse engagement & knowledge co-production, fisheries & the sustainable blue economy, social-ecological systems, participatory science, and biological oceanography. She is currently supporting initiatives: to coordinate the longest integrated marine ecosystem time series, CalCOFI; to include underrepresented voices – such as early career professionals – into knowledge co-production in support of sustainability; and to integrate ecological and social observations into ecosystem-based management.



Ms. Hannah Lachance is the International Fisheries Science Specialist supporting the National Oceanic and Atmospheric Administration (NOAA) in the United States. In this role, she helps coordinate NOAA Fisheries international science engagements through bilateral and multilateral partnerships, such as with PICES. Previous to this position she worked for state, federal, and academic organizations conducting freshwater fish surveys and research geared toward conservation, restoration and management of key native species as well as wildlife and livestock research on species that ranged from cattle to impala. She obtained her MS in Natural Resources with a concentration in Aquatic Ecology and Watershed Science from the University of Vermont during which time her research focused on climate change impacts, life history characterization, and genomic identification of a native group of prey fish, ciscoes, in the Great Lakes.

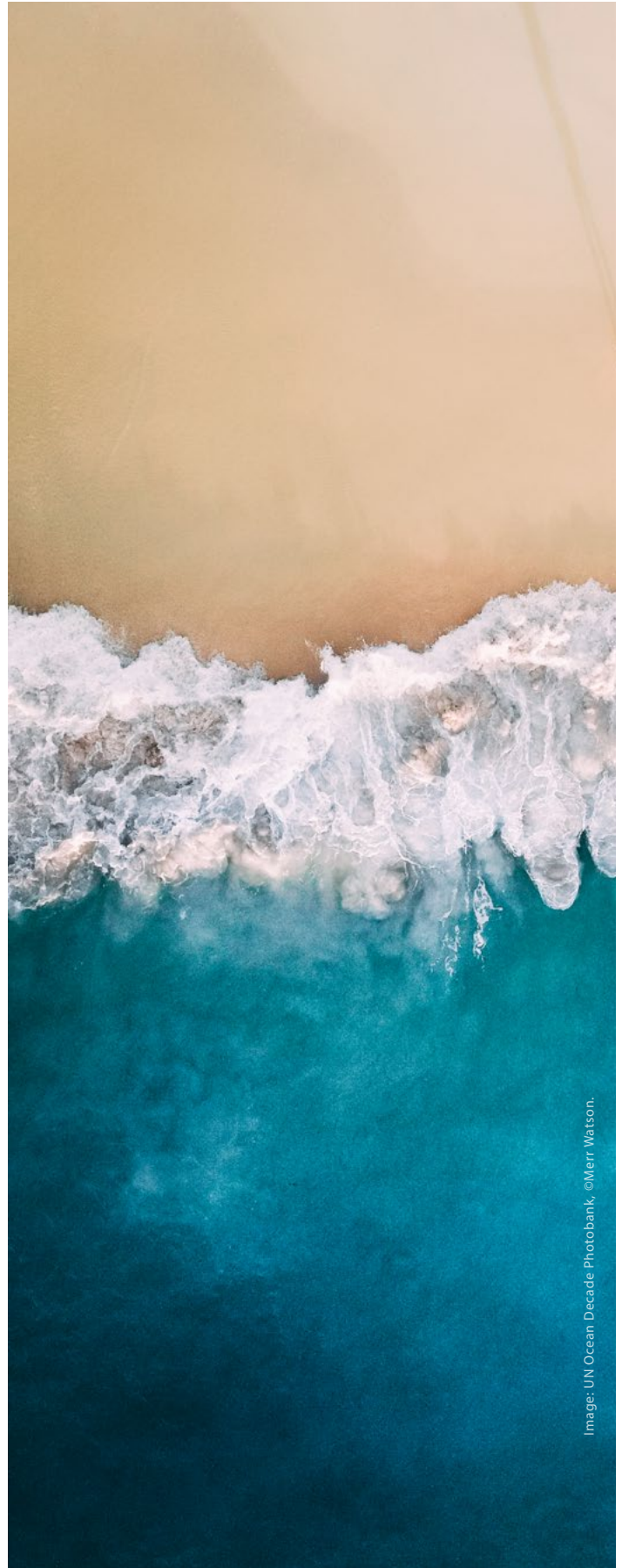


Image: UN Ocean Decade Photobank, ©Merr Watson.

Eagerly anticipating the 4th ICES/PICES ECS Conference this July!

Celine Byrne, ICES

Ocean sciences for the future we want



St. John's, Newfoundland, Canada, is set to welcome an influx of early career scientists this July as it plays host to the [Fourth ICES PICES Early Career Scientist Conference](#).

The successful conference had its inaugural event back in 1999, as the “*Young Scientists Conference on Marine Ecosystem Perspectives*”, held in Denmark. In 2007, ICES and PICES joined forces and the event has since taken place every five years, alternatively hosted by each of the organizations (USA, 2007, Spain, 2012, and South Korea, 2017). Alongside ICES and PICES, Fisheries and Oceans Canada will host the conference. In 2022, the event has the further honour of being an official event of the United Nations Decade of Ocean Science for Sustainable development (2021–2030).

One of the main aims for this conference is the development of contacts and associations among early career scientists. The organizers hope that all participants take the opportunity to meet new colleagues, make contacts, and discuss collaborations that will persist long after their return home and that this will help to advance our collective understanding of the marine environment. For early career scientists, by early career scientists

Nine early career scientists, three representing each of the convening organizations, were selected to build the scientific programme. The theme chosen by the scientific steering committee, [Ocean sciences for the future we want](#), is directly linked to the UN Decade of Ocean Science for Sustainable Development 2021-2030 and the

important role early career scientists play in the current and future health of our oceans and coasts for the benefit of humanity. They developed nine theme sessions under the wider themes of: Ecosystem and ocean processes; Inclusive, interdisciplinary, and transparent ocean sciences; and Emerging technologies and techniques for ocean science.

In addition to the science that will be presented by the early career scientists, participants will enjoy a full schedule of keynote speakers. Paul Snelgrove (Memorial University of Newfoundland), Shelley Denny (Unama'ki Institute of Natural Resources), Liisa Peramaki (Fisheries and Oceans Canada), and Enrique Curchitser (PICES and Rutgers University), will all deliver inspiring lectures during the week.

Participating Organizations with ICES and PICES

Participants will have the opportunity to further acquaint themselves with the Ocean Decade as the Canadian [Early Career Ocean Professionals \(ECOPs\) Node](#) will be present to provide an overview of the global ECOPs programme. In addition, the [Marine Environmental Observation, Prediction and Response Network \(MEOPAR\)](#) will host a workshop to boost networking skills with tips from a diverse panel of highly qualified professionals, as well as a chance to put these into practice with social networking BINGO.



Cape Spear

Located at the easternmost point of North America, Cape Spear Lighthouse National Historic Site is home to the oldest surviving lighthouse in Newfoundland and

Labrador and is an iconic symbol of the province's marine history. Participants will have the opportunity to take a break from scientific presentations to soak up the history of the location. Who knows? There may even be some whale sightings!

ICES, PICES and Fisheries and Oceans Canada are excited to meet, host, and listen to the future generation of marine scientists in St. John's this July!



ICES
CIEM



Fisheries and Oceans
Canada

Pêches et Océans
Canada

PICES Contributions to OSM2022

Elizabeth Logerwell



ASLO's Ocean Sciences Meeting (OSM) has been held annually since 1984 and is normally a very well-attended in-person science conference. This year, the organizers made the difficult last-minute decision to hold this as a virtual-only meeting – like many other conferences worldwide – to maintain participant safety during the COVID-19 pandemic. Still, according to ASLO, “more than 5,300 ocean specialists from over 75 different countries submitted abstracts for OSM22,” held from 24 February to 4 March this year. ASLO describes OSM as the “global leader in ocean sciences conferences”, with primary co-sponsors the American Geophysical Union (AGU), the Association for the Sciences of Limnology and Oceanography (ASLO), and The Oceanography Society (TOS). PICES was a co-sponsor for the first time in 2022.

Dr. Logerwell shares the work she presented at OSM, under the conference theme “Come Together and Connect” focused on strengthening the ocean sciences community through discussing both basic and applied research while making scientific and social connections. Titles of the accepted abstracts of PICES Scientists appear on the following page.

The OSM website featuring all scientific presentations will remain live until 9 September, 2022, so if you missed it earlier, there is still time for you to take in the shared presentations, session recordings, author data, and poster chats.

PICES extends its thanks to our scientist members who presented this year at OSM. Congratulations, and thank you for your important work!

Winners and Losers in a Warming Arctic: Potential Habitat Gain and Loss for Epibenthic Invertebrates of the Chukchi and Bering Seas

Elizabeth Logerwell (NOAA NMFS/AFSC RACE Division)

Muyin Wang (NOAA/PMEL)

Lis Jorgensen (IMR, Norway)

Kimberly Rand (NOAA/AFSC Affiliate)

The goal of our study that was presented at OSM 2022 was to examine how the epibenthic invertebrate community in the Pacific Arctic Region might be affected by continued increases in ocean temperatures. We used epibenthic invertebrate catch and bottom temperature data collected on groundfish assessment and ecosystem surveys from 2009-2018 in the Bering and Chukchi seas to determine the “preferred” temperature of all taxa. We grouped taxa into five clusters according to their similarity in median temperature and temperature range. We then used an ensemble of eight climate models to project bottom temperature to mid-century (2050) and end of the century (2100) (Figure 1). Based on these projections, we show how the amount and distribution of cluster-specific thermal habitat might change with ocean warming. We found that by mid-century there was a 50% decrease in thermal habitat for all clusters except for the most eurythermic cluster, and that thermal habitat contracted to the north. By the end of the century there was very little thermal habitat for all clusters, except the most eurythermic cluster, and habitat was further contracted to the north (Figure 2). The cold-water and stenothermic cluster, hypothesized to be the most vulnerable to ocean warming, had virtually no projected thermal habitat by the end of the century. These “losers” were primarily gastropods and the bivalve mussel *Musculus* sp. These taxa are prey to the endangered Pacific walrus (*Odobenus rosmarus*), which is harvested as a food resource in native Alaskan communities. Bivalves are prey for commercial flatfish such as yellowfin sole (*Limanda aspera*) and Alaska plaice (*Pleuronectes quadrituberculatus*). By 2100 the most eurythermic cluster, hypothesized to be the least vulnerable to

warming, had projected suitable thermal habitat throughout most of the Bering and Chukchi seas, except nearshore coastal regions. The most abundant species of these “winners” was the basketstar *Gorgonocephalus* cf. *arcticus*. The loss of thermal habitat for all but the “winners” could impact the species diversity of the Bering and Chukchi seas because the “winner” cluster accounted for only 26 taxa or 8% of all taxa observed. Although temperature is a key determinant of habitat, a full habitat and ecosystem model is needed to provide more detailed predictions. In addition, more laboratory studies of thermal acclimation potential of Arctic benthic invertebrates are needed. Our results provide the first indications that the epibenthic invertebrate community in the Bering and Chukchi seas, which supports marine mammals, seabirds and human communities, may be seriously impacted by future ocean warming.

Additional PICES presentations accepted at OSM2022

- Savoca et al., Proposing Bioindicators to Monitor Plastic Pollution in the North Pacific. Oral presentation.
- Trick et al., Successes and Cautionary Tales in Ocean-Community Research: Building the Framework. Oral Presentation.



Libby Logerwell graduated from Stanford University in 1988 with a degree in Biological Sciences. She earned her PhD from University of California Irvine in 1997, where she studied the at-sea foraging distribution of North Pacific seabirds. She came to NOAA Fisheries Alaska Fisheries Science Center (AFSC) in 2001. For

15 years, she was lead of the Fishery Interaction Team, studying the effects of commercial fishing on Steller sea lion prey fields. She is now Program Supervisor in the joint AFSC and Pacific Marine Environmental Laboratory Ecosystems and Fisheries-Oceanography Coordinated Investigations Program (EcoFOCI). She has lead surveys in the Beaufort and Chukchi seas. A common theme throughout her research career has been fisheries (or seabird) oceanography and habitat use. She is active in the promotion of Ecosystem-Based Management nationally and internationally through her involvement with the North Pacific Marine Science Organization (PICES) and the International Council for the Exploration of the Sea (ICES). She is a member of the PICES FIS committee and chair of the PICES/ICES Working Group on Integrated Ecosystem Assessment of the Northern Bering and Chukchi seas (WG44).

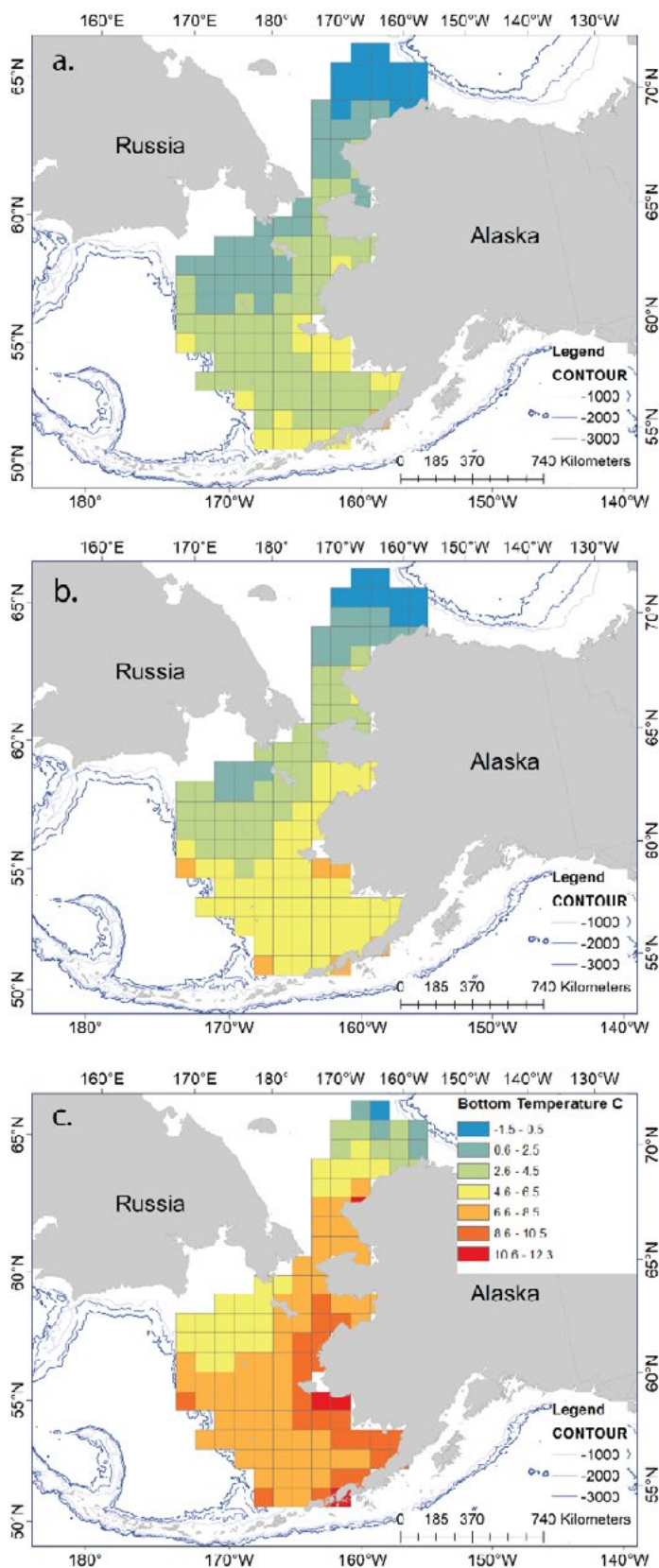


Figure 1. Maps of bottom temperature forecasts (average of 8 models): a) present (2008-2017), b) mid-century (2045-2054), c) end of century (2091-2100). Temperature scale shown on Figure 1c is the same for all maps.

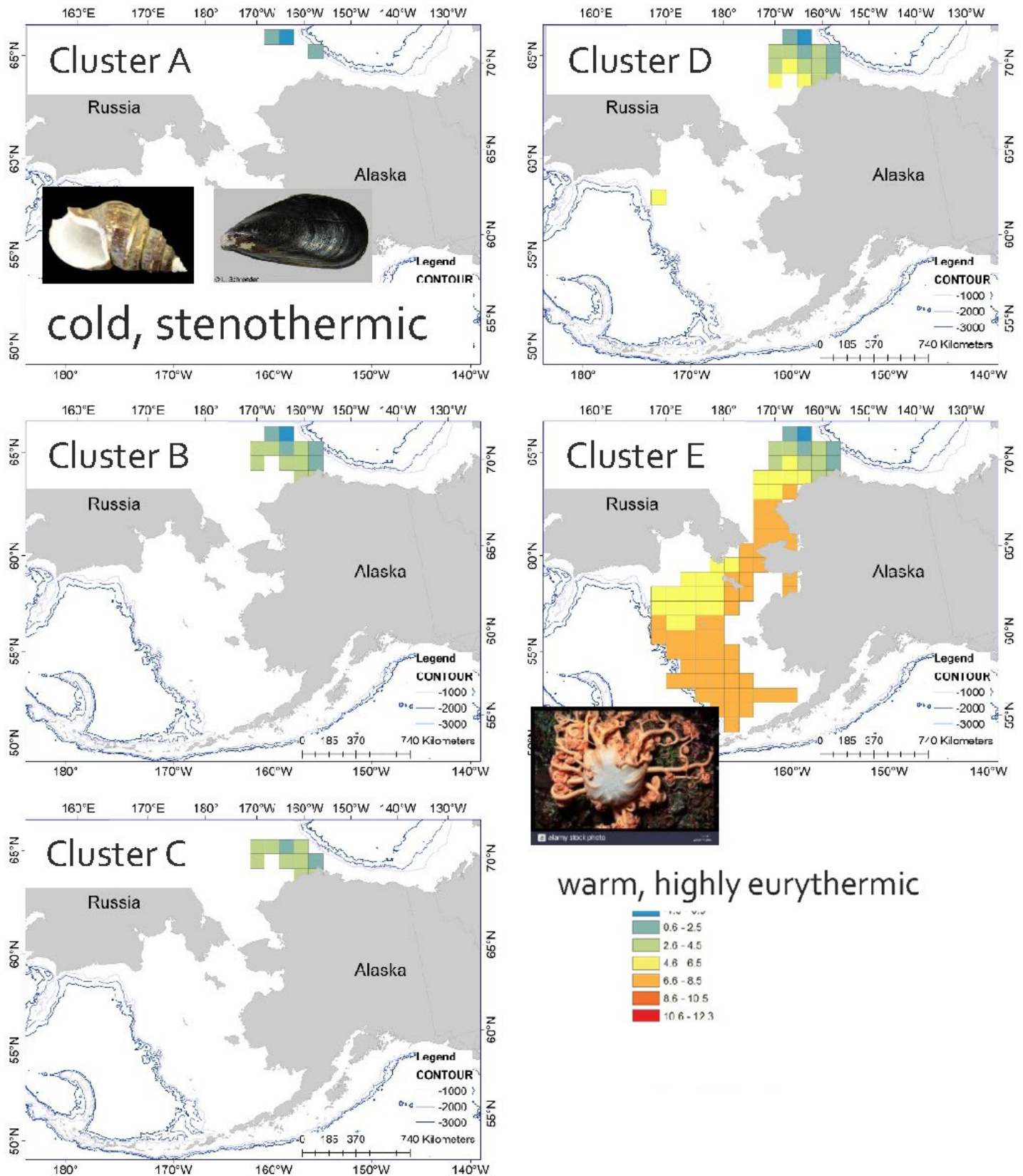


Figure 2. Maps of temperature-defined habitat for each cluster based on end-of-century model forecasts. Temperature scale is the same for all maps.

43rd annual Pacific Ecology and Evolution Conference (PEEC)*Caitie Frenkel and Micah Quindazzi*

The goal of the 43rd annual Pacific Ecology and Evolution Conference (PEEC) held at the Victoria Conference Centre (VCC) in Victoria, Canada on March 19/20, 2022 was to provide early career scientists (undergraduate and graduate students, post docs, etc.) conducting ecological research in the Pacific Northwest a supportive space. This enabled them to share their work, network with their peers, foster connections and boost their confidence as researchers. PEEC 2022 was held as a hybrid event, hosting over 120 participants in-person and virtually. Additionally, the organizing committee endeavored to create an inclusive space for traditionally-marginalized groups of people, including those in gender and racial minorities. The location and hybrid-style of the conference increased its accessibility to attendees, making this the largest PEEC within the last decade.

The global COVID-19 pandemic was an isolating experience for many, and therefore it was of utmost importance to us to provide this peer-networking opportunity. While PEEC is typically held at the Bamfield Marine Science Centre (BMSC), hosting in Victoria helped ensure the safety of the small, coastal community of Bamfield. The location change also allowed the expansion of the conference by one day, providing more time for presentations, posters, and workshops than in previous years. While the VCC offered a more upscale and formal experience for PEEC, we balanced this with whimsical session names, colorful name tags with pronoun stickers, and a casual dress code to retain the fun and approachable atmosphere for which PEEC is known.

PEEC 2022 had a total of 38 12-minute talks, 29 3-minute talks, and 12 posters. Due to the number of attendees and the diversity of their work, presentations and posters spanned over a dozen different subfields within the larger fields of biology, environmental studies, anthropology, geography, fisheries, and earth and ocean sciences. The presentations were divided into nine in-person sections organized based on presenter subfield disciplines. The ten presentation sections and poster session are described below.

Deep Ecology and Other Ways of Knowing

Traditional ecological knowledge is an important, yet often unrecognized, component of ecological research. The involvement of Indigenous voices within the fields of ecology, conservation, and resource management is an important component of the reconciliation process. This group of talks included work that highlighted the importance of the field and relevant ongoing work.

Carp-e Diem

This group name was a pun on the old Latin aphorism. These talks were centered around marine fish ecology and fisheries science. This type of work is of great ecological, social, and cultural importance here, due to British Columbia's >25,000km of coastline.

Life uh... Finds a Way

This quote comes from "Jurassic Park" and highlights the often unpredictable nature of organisms in the face of our limited knowledge of them. These talks were related to the ecology of specific species or their communities.

Mammalian Mayhem

These talks focused on behavioral ecology of different mammal species, including grizzly bears, Biggs killer whales, and silver haired bats.

Can I Speak to the Manager?

While the title of this section was a joke, the fields of conservation and ecosystem management are not. These talks elucidated how to better incorporate methods such as citizen science, mapping, and bioenergetics into conservation and ecosystem management.

Ecology at Scale

This section was dedicated to talks regarding ecology and management of landscapes, including coniferous forests, grasslands, kelp forests, and biogeoclimatic zones.

Coastal Cuties

Centered on behavioral ecology, these talks focused on coastal ecosystem organisms, such as plainfin midshipman, barnacles, and seagulls.

Everything is on Fire and Underwater at the Same Time

Climate change can feel daunting, and sea level rise and forest fires are of particular concern in BC. These talks focused on climate change research and conservation.



PEEC 2022 organizing committee. L-R: Dominique Maurcieri (Communications & Registration Chair), Jade Steel (Event Coordinator Chair), Laurel Sleigh (Sponsorship Chair), Caitie Frenkel (Committee Chair), Lauren Burton (Program & Logistics Chair), Michael Livingston (Finance Chair), Micah Quindazzi (Program & Workshop Chair), and Matt Csordas (Sponsorship Chair). Missing: Kaitlyn Zerr (Judging & Awards Chair).

Hard Parts and Where to Find Them

Based on the movie title *"Fantastic Beasts and Where to Find Them,"* this section focused on the use of hard parts, (e.g. bones and scales), to conduct research on organisms.

With six professional workshops organized into two sections of three concurrent workshops, this conference held the record for the most workshops available at a PEEC:

- Dr. Sara Mynott's workshop outlined how to effectively communicate scientific research to engage target audiences.
- Lianna Gendall and Nicola Houtman provided a comprehensive view of how to construct study area maps using QGIS.
- Dr. Mauricio Carrasquilla-Henao from Ocean Networks Canada (ONC) demonstrated how to use ONC databases to access continuously recorded data from various research stations across British Columbia.
- Micah Quindazzi and Matt Csordas took attendees on an iNaturalist field trip to Beacon Hill Park and Clover Point in Victoria.
- Karyssa Arnett and Sydney Dixon from the Strawberry Isle Marine Research Society instructed participants on how to identify marine mammals commonly found in British Columbia and how to report incidents involving them.
- Dominique Maurcieri and Michael Livingston's R workshop enabled participants to get statistics help.

Dr. Amanda Bates kicked off the conference as the keynote speaker following the traditional land acknowledgement and welcome. Dr. Bates is a professor at UVic, an Impact Chair in Ocean Ecosystem Change and Conservation, and a Pew Marine Fellow. Her research is transdisciplinary, spanning several fields, including marine physiology and community ecology, with a global perspective. She discussed some of her current and past work in her talk *"Marine Biodiversity in the Anthropocene: Grand Challenges*

and Glimmers of Hope for Healthier Futures." Bates discussed issues around predicting changes in biodiversity in response to on-going and future global change, especially when scientists lack historical baseline data. While this is one of the most perplexing issues facing conservation scientists today, she highlighted transdisciplinary solutions and opportunities facilitated by global communication tools and collaborative networks. Her talk was inspiring to the early career scientists in the audience, providing a hopeful energy at the beginning of the conference.

Dr. Heather Alexander kicked off the afternoon sessions of the second day with her plenary talk *"Celebrating 50 Years of Excellence in Research and Education"* on the history of Bamfield Marine Science Centre, as this year marks the 50th anniversary of BMSC as a world-renowned marine science teaching and research facility. Alexander has lived in Bamfield and worked at BMSC for over 30 years in varying capacities, and is currently the University Programs Coordinator and Communications Manager. BMSC and PEEC have a long history together, with BMSC hosting PEEC for 22 out of 43 total conferences. Dr. Alexander's talk on the history of BMSC included many archived photos from its time as a cable station, the renovations to transition it into a research facility, and its first undergraduate program. This was a nostalgic presentation for the audience, many of whom have participated in BMSC's undergraduate education programming or conducted research at the marine station. Dr. Alexander also shared how the BMSC navigated challenges due to COVID-19, and plans for future directions, encouraging attendees to pursue research opportunities at the marine station.

An awards ceremony ended the conference on a high note, with undergraduate and graduate students receiving awards including: best talks, posters, and the most iNaturalist observations. A variety of artwork, tourism experiences, and clothing items local to Vancouver Island were donated as in-kind awards and speaker gifts by the



A Black Turnstone (*Arenaria melanocephala*) photographed by Danielle Lacasse during the iNaturalist workshop (<https://www.inaturalist.org/observations/109086977>).

following groups: Hello Yellow Canary, Seamount Ceramics (Mairi Miller), Lemon Shark Studio (Lindsay Albers), BMSC, Eagle Wing Whale & Wildlife Tours, the Redd Fish Restoration Society, the Shaw Centre for the Salish Sea, the UVic Bookstore, the Victoria Butterfly Gardens and Wild Play. Additionally, the UVic Department of Geography also loaned us their projectors for the event, without which we could not have played any of our presenters' slides. We would like to thank the above organizations for their generous donations, as they were greatly appreciated by the speakers, and award winners.

PEEC's organization rotates annually between the BMSC's coastal member universities (the University of British Columbia, the University of Victoria, and Simon Fraser University). Organizing this year's conference presented some unique challenges that have not been experienced in recent history, but we rose to the occasion to bring our community the largest PEEC within the last decade. Hosting in Victoria, BC this year increased the accessibility to many attendees, allowing for more knowledge-sharing and networking opportunities. These opportunities are of utmost importance to early career scientists, as they build lifetime collaborative working relationships to solve pressing ecological issues in the Pacific region and beyond. For more information about the conference, please visit our website: <https://peec2022.wordpress.com/>

PEEC has been held annually since 1980, however there has only been a hazy recollection of its broader history. We sought, as part of our duties, to document the history of the conference for future conference organizers. In the late 1970s, there was an exchange held between the University of Washington and UBC at Friday Harbor Labs to provide early career scientists in ecology with the means of getting to know one another. In the wake of these gatherings, this conference was born, and the first ever Pacific Ecology Conference (renamed to PEEC) was held in 2005. The first few conferences were held in Seattle, Friday Harbor labs, and Vancouver. UVic first organized the conference in 1985– the first year the conference occurred at BMSC (then the Bamfield Marine Station). Many prominent researchers have participated in PEEC over the years,

currently occupying research roles in the United States and Canada, including both of our conference speakers. Even the most prominent scientists feel that spark of starry-eyed wonder they had as a graduate student when you ask them about their memories of PEEC. Over the course of 43 years, this feeling of camaraderie between early career scientists is still going strong. Attendees were enthusiastic to participate in the conference and bond over mutual research interests. We hope this conference continues well into the future and will continue to be important for early career scientists.

We would like to extend deep gratitude and thanks to our generous sponsors, without which we would not be able to host the largest and most successful PEEC to date. We would like to recognize and thank our gold level sponsors: PICES, ONC, the UBC Faculty of Forestry, University of Alberta Department of Biological Sciences, and the University of Calgary Faculty of Sciences. Thank you to our silver level sponsors: the Canadian Institute of Ecology and Evolution (CIEE), SFU Faculty of Science, and Knappett Projects. Thank you to our bronze level sponsors: Canadian Society for Ecology and Evolution (CSEE), SFU Department of Biological Sciences, UBC Biodiversity Research Centre, UBC Department of Botany, UBC Department of Forest and Conservation Sciences, UBC Institute for Resources, Environment, and Sustainability, and Ecofish. Finally, thank you to our supporter level sponsors: Mosaic Forest Management, SFU School of Resource and Environmental Management, UBC Faculty of Graduate Studies, UVic Department of Biology, UVic School of Environmental Studies, and the Vancouver Island University Biology department.

A successful conference requires a team, and we would like to acknowledge the nine members of the organizing committee this year: Dominique Maucieri, Michael Livingston, Matt Csordas, Laurel Sleigh, Jade Steel, Lauren Burton, and Kaitlyn Zerr (and authors Caitie Frenkel & Micah Quindazzi). The conference would have not been possible without the coordinated efforts of this team, and we sincerely thank them for their efforts.



Caitie Frenkel is a MSc Student in the Marine Ethnoecology Lab, supervised by Dr. Natalie Ban, at the University of Victoria. She acted as the Committee Chair for PEEC 2022. Caitie is studying why, and where, commercial fishing gear is lost in British Columbia using an interdisciplinary approach. In addition to ghost gear, her other research interests include fisheries and marine spatial mapping.



Micah Quindazzi is a PhD Candidate supervised by Dr. Francis Juanes in the department of Biology at the University of Victoria. He acted as the Program and Workshop Chair for PEEC 2022. Micah is using otolith microchemistry to track the marine migrations of Coho and Chinook Salmon. Outside of otolith microchemistry, he also conducts research on otolith morphology, asymmetry, and mineralogy.



The Bering Sea: Current Status and Recent Trends

Edited by Lisa Eisner

Climate

During the period of October 2021 through March 2022, the western and eastern portions of the Bering Sea experienced different atmospheric forcing relative to climatological norms. A map of surface air temperature anomalies for this period (Figure 1) shows that it was relatively warm over the western Bering Sea with the greatest departures from normal ($> 1^{\circ}\text{C}$) over the western Aleutian Islands. This was the 6th warm year in a row for this time of year relative to the climatological average over the years 1981–2010, with 2016–17 representing the extreme over the historical record back to 1948–49. In contrast, the eastern Bering Sea had near-normal to cool surface air temperatures, with the coldest anomalies just offshore of the coast of western Alaska near 60°N . This was quite a departure from the air temperatures that prevailed in recent years, with 2012–13 being the last year that was as cold over the southeast Bering Sea shelf.

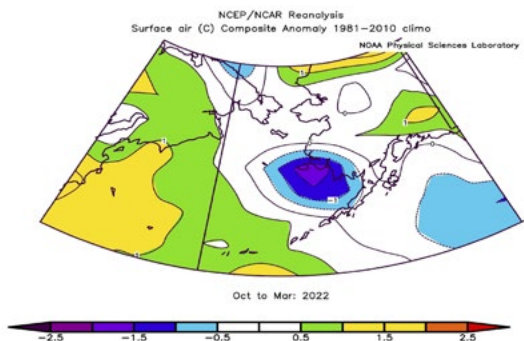


Figure 1. Mean surface air temperature anomalies ($^{\circ}\text{C}$) from the NCEP/NCAR Reanalysis for October 2021 - March 2022. Figure courtesy of Nick Bond, University of Washington (UW)/ Cooperative Institute for Climate, Ocean, and Ecosystem Studies (CICOES).

The combination of warmth in the western portion and cooler temperatures in the eastern portion of the Bering Sea is consistent with the overall pattern of sea level pressure (SLP) anomalies for October 2021 through March 2022. As shown in Figure 2, the SLP anomaly distribution featured a ridge of higher than normal pressure extending from the central North Pacific Ocean across the eastern part of the Aleutian Islands to the eastern tip of Siberia. The surface winds with this distribution included anomalies from the southeast of $1\text{--}1.5\text{ m s}^{-1}$ in the western Bering, and hence a tendency for more air masses of mild, maritime origin. Wind anomalies from the northwest at $1\text{--}2\text{ m s}^{-1}$ over the southeastern Bering Sea shelf accounted for its relatively cold weather, as noted above. Relatively high SLP south of the eastern Aleutians during the months of October through March is common during La Niña,

as was the case in 2021–22. But important details in the atmospheric patterns from a Bering Sea perspective vary between these events; the previous winter of 2020–21 also included La Niña but in that case the SLP anomaly pattern resulted in wind anomalies from the southwest over the southeastern Bering Sea shelf and relatively warm weather. From a sub-seasonal perspective, the eastern Bering Sea shelf experienced particularly cold air temperatures during the last part of November 2021 and the second week of February 2022; it was much warmer than normal during the last two weeks of December 2021.

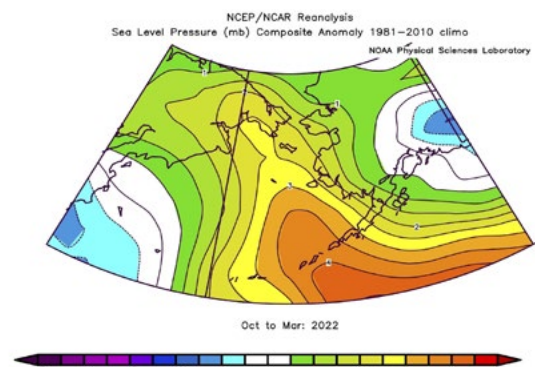


Figure 2. Mean sea level pressure (SLP) anomalies (mb) from the NCEP/NCAR Reanalysis for October 2021 - March 2022. Figure courtesy of Nick Bond, UW/CICOES.

The months of April and May 2022 included a transition in the regional atmospheric circulation pattern, as indicated in the 2-month SLP anomaly map (Figure 3). This pattern resulted in warm weather for the Northern Bering Sea, and a relatively rapid retreat of sea ice after a short period of cold winds from the north in early April 2022. The wind anomalies for the southeastern Bering Sea shelf for April through late May were from the east, implying that the advection of near-surface passive drifters (such as some zooplankton and ichthyoplankton) was directed more off-shelf than typical.

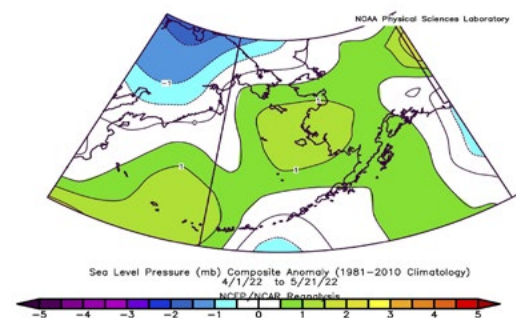


Figure 3. Mean sea level pressure (SLP) anomalies (mb) from the NCEP/NCAR Reanalysis for 1 April - 21 May, 2022. Figure courtesy of Nick Bond, UW/CICOES.

Sea ice

Sea ice formation near the Alaska Coast was accelerated by a record cold November, followed by normal variability in sea ice cover December – March, with a very rapid decline in April (Figure 4). Repeated strong winds from the E-NE led to repeated reformation of ice on the NE shelf as the existing ice was blown away from shore. This process led to very thin ice in the eastern Bering Sea compared to the median over the last 11 years (Figure 5).

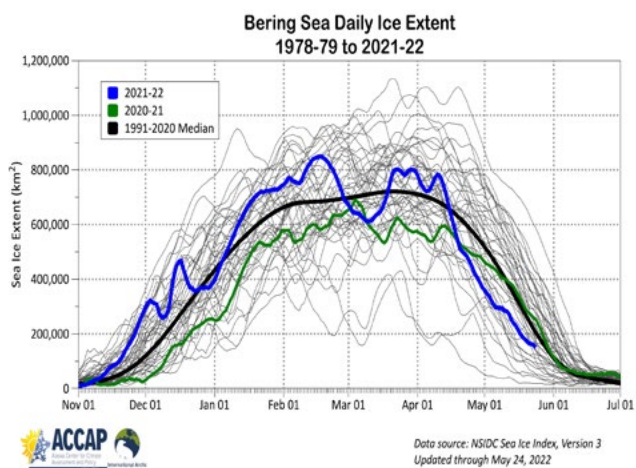


Figure 4. Bering Sea daily sea ice extent for winter 2021-22 (blue), and winter 2020-21 (green) compared to prior winters, 1978-79 to present. Area includes the eastern and western Bering Sea. Figure courtesy of Rick Thoman, Alaska Center for Climate Assessment and Policy (ACCAP).

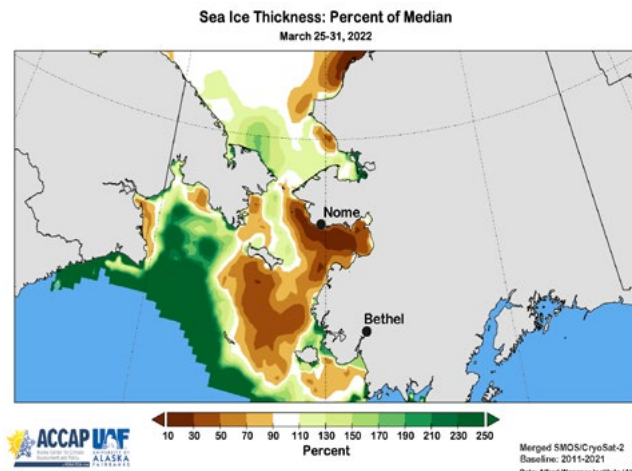


Figure 5. Sea ice thickness for late March 2022 as a percent of the median over 2011-2021. Figure courtesy of Rick Thomas, ACCAP.

Spring phytoplankton blooms

Satellite chlorophyll-a (chl-a) data, a proxy for phytoplankton biomass, allows analysis of large scale patterns in phytoplankton dynamics. Near real-time satellite chl-a for spring 2022 (8-day composites) from VIIRS (https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdVHNC_hla8day.html) show noticeable ice edge blooms in April followed by open water blooms in the southeastern Bering Sea in May (Figure 6). This pattern of ice associated blooms followed by open water blooms is likely related to the rapid decline in sea ice cover from 10 to 20 April (Figures 4, 6).

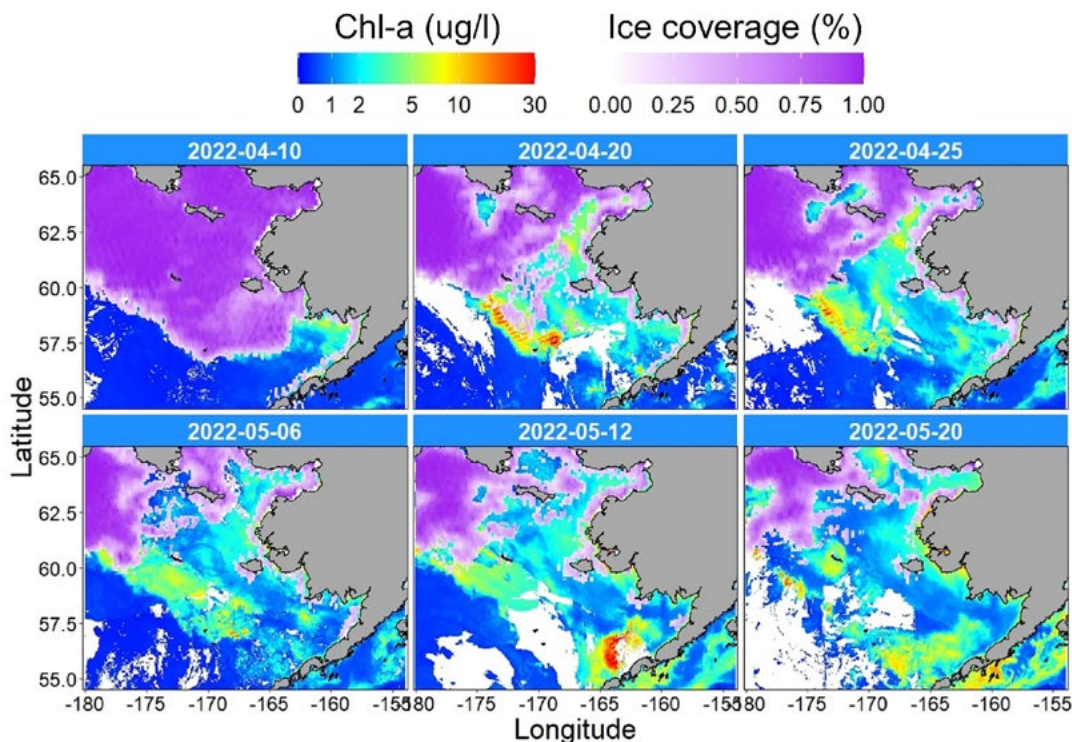


Figure 6. Satellite near real-time chl-a data ($\mu\text{g/l}$) from VIIRS -8 day composites (last day of composite listed for each plot), April through mid-May 2022 in the eastern Bering Sea. Figure courtesy of Jens Nielsen, UW/CICOES.

Expanding harmful algal bloom sampling in the Bering

Harmful algal blooms (HABs) occur when certain phytoplankton species proliferate and negatively impact humans or wildlife. In Alaska, HABs and the toxins they produce have historically been a greater concern south of the Aleutian Islands, where temperatures were higher and there was no sea ice. But as ocean temperatures in the Bering Sea increase, and the ice-free period lengthens, there is growing concern that HABs will be more common and impact the harvest of subsistence foods such as shellfish, fish and marine mammals.

To address this changing situation, data collection on HABs is expanding in the Bering Sea through work conducted by tribal organizations (Qawalangin Tribe of Unalaska, Aleut Community of St Paul, Native Village of Diomede, Norton Sound Health Corporation), academic institutions (University of Alaska Fairbanks, Woods Hole Oceanographic Institution), federal agencies (National Oceanic and Atmospheric Administration (NOAA), National Park Service), and non-profit organizations (Alaska Conservation Foundation, Alaska Ocean Observing System (AOOS)). These entities are supporting and conducting HAB monitoring in the Bering Sea (Figure 7) including examining which phytoplankton species are present in the Bering Sea, and taking samples of food items and ecosystem components for toxin testing.

The organizations conducting this work are members of the Alaska Harmful Algal Bloom (AHAB) Network – a statewide platform for communicating and coordinating HAB awareness, research, monitoring, and response. This collaborative work is crucial to better understanding HABs and mitigating their impacts in the Bering Sea and throughout Alaska. To learn more about the work being done on HABs, visit the Alaska Harmful Algal Bloom network website: <https://legacy.aos.org/alaska-hab-network/>

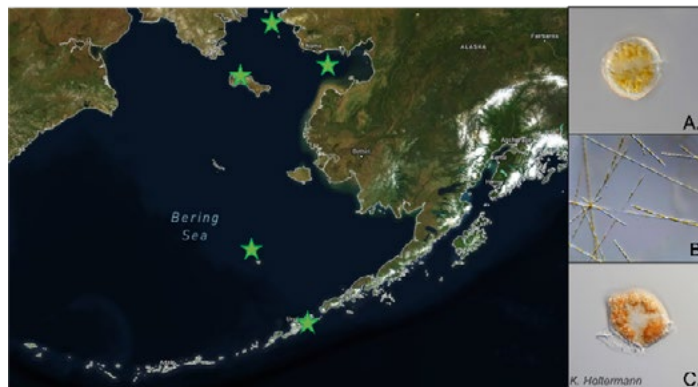


Figure 7. HAB sampling locations (green stars) in the Bering Sea, along with pictures of the three most concerning phytoplankton species: A. *Alexandrium* sp., B. *Pseudo-nitzschia* sp., C. *Dinophysis* sp. Figure courtesy of Thomas Farrugia, AOOS AHAB Network Coordinator.

North Pacific right whale feeding

In early February 2022, at least two critically endangered North Pacific right whales were sighted feeding just north of Unimak Pass by commercial fishermen (Figure 8). This is the first photographic evidence of right whales feeding overwinter in the Bering Sea. For more information and a video, please see: <https://www.fisheries.noaa.gov/feature-story/new-photos-may-be-first-visual-evidence-north-pacific-right-whales-feeding-bering-sea>



Figure 8. Map of location and photo of two skim feeding North Pacific right whales sighted on 7 February 2022. Photo credit: Joshua Trosvig. Figure courtesy of Jessica Crance, NOAA, Alaska Fisheries Science Center (AFSC).

NOAA spring ice seal survey

In April 2022, the Polar Ecosystems Program (PEP) at NOAA AFSC conducted a research cruise to the marginal zone of the pack ice to study the habitat requirements and ecological relationships with sea ice of ribbon and spotted seals (collectively termed ice seals) in the core of their Bering Sea breeding area (Figure 9). The seals' movements, haul-out behavior, diet, genetic population structure, and health will be investigated and monitored. The three survey goals were: 1) to capture ribbon and spotted seals to instrument them with satellite-linked tags to examine seasonal movements, foraging behavior, and timing of haul-out; 2) to collect measurements and tissue samples to assess seal health and condition; and 3) to use uncrewed aerial systems (UAS) to investigate impacts of changing ecosystems. A particular focus of the work in 2022 is on health and condition of young-of-the-year seals and their mothers, and potential impacts of diminishing sea ice.

The NOAA ship *Oscar Dyson* brought scientists up to the southern edge of the marginal ice zone, where they could launch small inflatable boats to locate and capture ice seals hauled out on ice floes. The cruise in 2022 was shorter than any of the previous PEP ice seal cruises (11 days in the marginal ice zone compared to the usual 21 days). They also encountered unusually poor weather with heavy fog, snow, and high winds and swell for most of the trip. In spite of these challenges, scientists were able to capture five seals and collect morphometric measurements and

biological samples (blood, skin samples, nasal and rectal swabs, whisker, hair, blubber thickness measurements). One adult male spotted and one adult female ribbon seal were instrumented with satellite tags (immediately operational) to provide location, diving data (dive depths, durations), environmental data during dives, and haul-out data. Scientists also used the UAS to collect images of seals. These images will be used to assess methods for estimating seal body condition, and to monitor body condition from UAS imagery over time (Figure 10). For more information see the Strait Science talk, Bering Sea Ice Seals: Researchers Return! https://www.youtube.com/watch?v=jMrRI_5D0rY

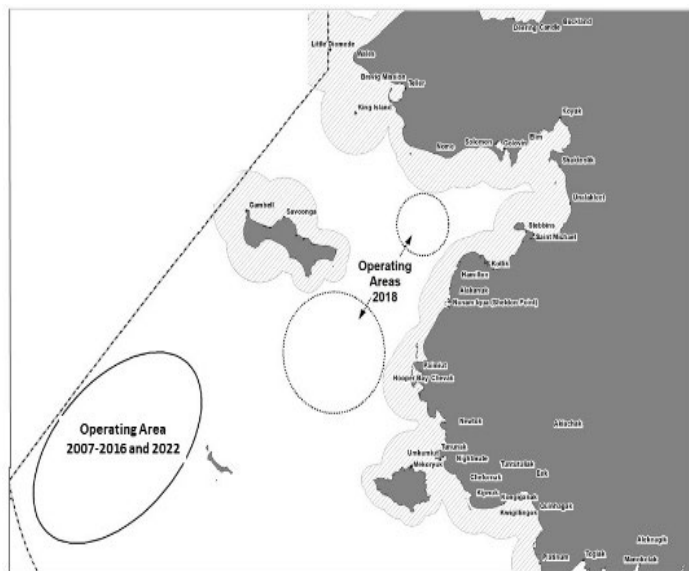


Figure 9. Ice sea marginal ice zone survey areas in the Bering Sea, 2007-2016 & 2022 (lower oval) and 2018 (circles). Figure courtesy of Heather Ziel, NOAA AFSC.



Figure 10. (Top) the UAS on a flight (photo credit Michael Cameron NOAA AFSC). (Bottom) an image taken by the UAS of a ribbon seal female and her pup (photo credit NOAA AFSC).

2022 surveys in the Bering Sea

- NOAA AFSC ice seal survey in the eastern Bering Sea on the *R/V Oscar Dyson*, 5 - 25 April.
- NOAA Pacific Marine Environmental Lab (PMEL) and AFSC [EcoFOCI oceanographic biophysical mooring and hydrographic surveys](#) in the eastern Bering Sea on the *R/V Oscar Dyson*, 10 - 19 May (spring) and 16 - 30 September (fall).
- NOAA AFSC eastern Bering Sea (EBS) summer groundfish and crab bottom trawl survey on the *F/V Vesteraaelen* and *F/V Alaska Knight*, 26 May - 30 July. The Northern Bering Sea survey will occur immediately after the EBS survey using the same vessels and gear, 1 - 23 August.
- NOAA AFSC eastern Bering Sea acoustic trawl survey on the *R/V Oscar Dyson*, 27 May - 6 August.
- NOAA AFSC and CICOES Beluga whale aerial abundance survey in the Norton Sound region of the eastern Bering Sea, 20 June - 2 July.
- NOAA AFSC southeastern Bering Sea surface trawl and ecosystem survey on the *R/V Oscar Dyson*, 12 August - 11 September.
- NOAA AFSC northern Bering Sea surface trawl and ecosystem survey on the *F/V Northwest Explorer*, 27 August - 20 September.
- NOAA Arctic Research Cruise (Oceanic and Atmospheric Research or "NOAA Research" and NOAA Fisheries) fall of 2022, northern Bering / Chukchi seas. Vessel / date, TBD.
- NOAA Research technology development field test of the Oculus glider. Nome, AK. Anticipated July-September.

Acknowledgements:

Many thanks to the scientists who helped create this report: Drs. Nicholas Bond and Jens Nielsen at UW/CICOES provided information on climate and phytoplankton spring blooms, respectively. Dr. Rick Thoman at ACCAP provided the sea ice data, and Dr. Thomas Farrugia at AOOs, AHAB provided information on HAB monitoring. NOAA AFSC scientist Jessica Crance provided the Right Whale feeding observation, and scientists Heather Ziel and Dr. Michael Cameron provided the ice seal survey update. Heather Tabisola at NOAA PMEL provided information on NOAA Research/PMEL surveys.



Dr. Lisa Eisner (lisa.eisner@noaa.gov) is a Biological/Fisheries Oceanographer at the Alaska Fisheries Science Center of NOAA Fisheries in Juneau, Alaska and Seattle, Washington. Her research focuses on oceanographic processes that influence phytoplankton and zooplankton dynamics and fisheries in the eastern Bering and Chukchi seas, and she has been the lead oceanographer for the BASIS program (Bering Arctic Subarctic Integrated Survey). She is vice-chair of PICES MONITOR committee and a lead/co-PI on current (and past) eastern Bering Sea and Chukchi Sea research programs.

The western North Pacific during the 2021/2022 cold season

Kazuhiro Nemoto

Sea surface temperature in the 2021/2022 cold season

The western North Pacific was characterized by positive anomalies of sea surface temperatures (SSTs) in the area from 35°N to 45°N throughout the 2021/2022 cold season (Figure 1). In particular, remarkably positive SST anomalies were observed to the east of 150°E along 45°N from December 2021 to January 2022. The negative SST anomalies prevailed south of Japan in December 2021 and in the area along 30°N after January 2022.

Sea ice in the 2021/2022 cold season in the Sea of Okhotsk

The winter maximum sea ice extent in the Sea of Okhotsk was 0.81 million km² in early March, which was around 72% of the 30-year average of 1.12 million km², marking the second-lowest value since 1971. The seasonal maximum exhibits a long-term decreasing trend of 0.056 million km² per decade, which corresponds to 3.5% of the Sea of Okhotsk's total area (Figure 2).

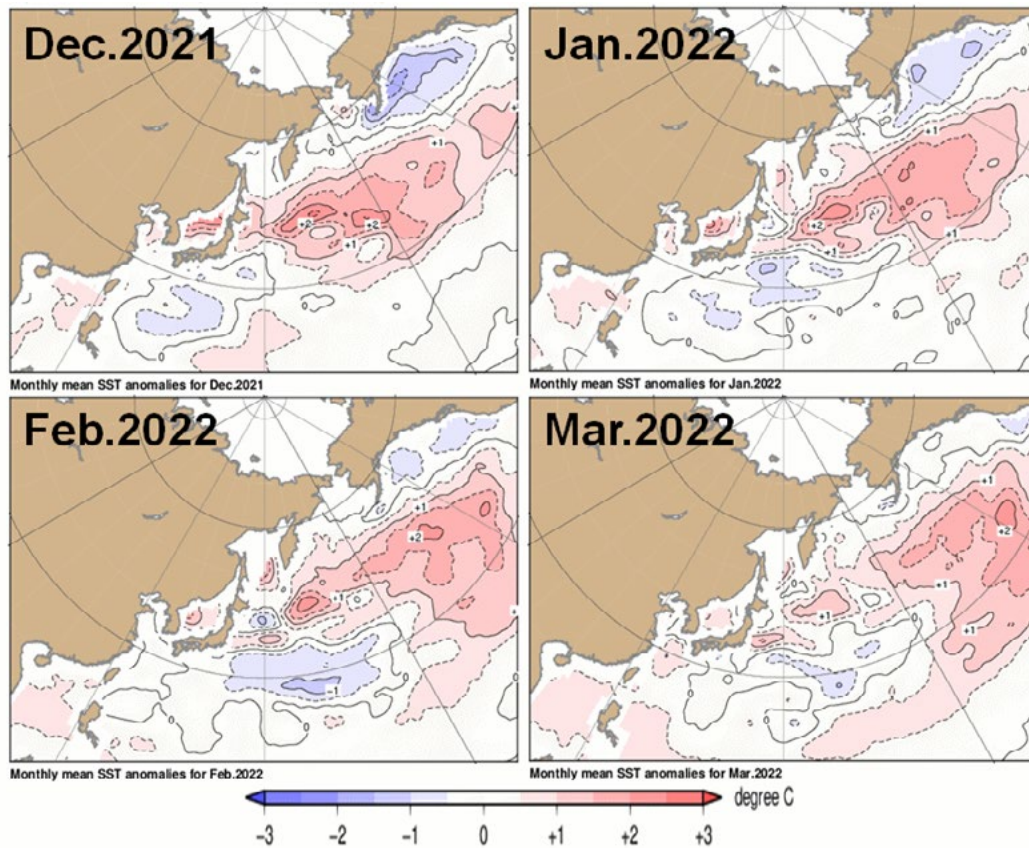


Figure 1. Monthly mean SST anomalies from December 2021 to March 2022. Monthly mean SSTs are based on JMA's COBE-SST (centennial in-situ observation-based estimates of variability for SST). Anomalies are deviations from 1991–2020 climatology.

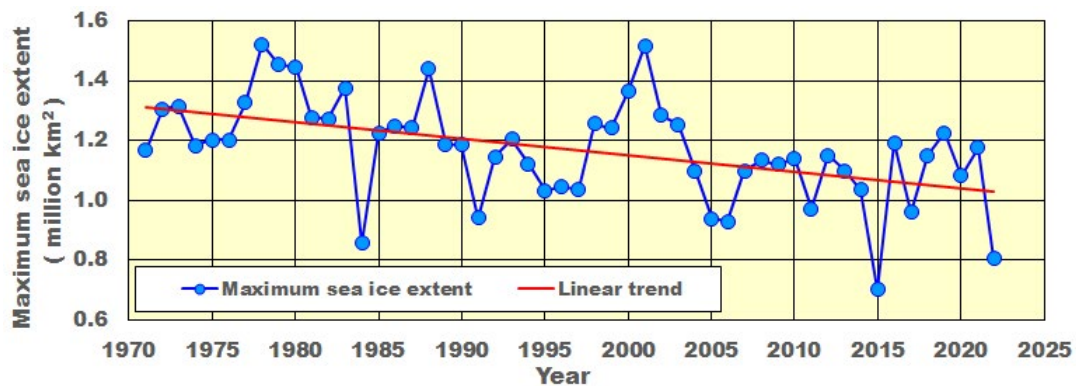


Figure 2. Time series of winter maximum sea ice extents in the Sea of Okhotsk, 1971 – 2022. The red line denotes the long-term linear trend.

Column inventory rates of anthropogenic CO₂ in the subtropical region of the western North Pacific

The Japan Meteorological Agency has conducted hydrographic observations in the western North Pacific. Figure 3 shows time-series of dissolved inorganic carbon (DIC) on isopycnal surfaces along 137°E, 165°E and 24°N. The DIC increases at depth are primarily attributable to uptake of anthropogenic CO₂ by the ocean.

Using the increase rates, the column inventory rates of ocean CO₂ between the sea surface and 27.2σ_θ (a depth of about 1000m) along 137°E, 165°E and 24°N were calculated to be approximately 5–11, 4–11 and 7–10 tC·km⁻²·y⁻¹, respectively (Figure 4). The rates around 20 - 30°N are higher than those at other latitudes. This is caused by the transport of CO₂ from the surface to the ocean interior by water masses known as the North Pacific subtropical mode water and the North Pacific intermediate water.

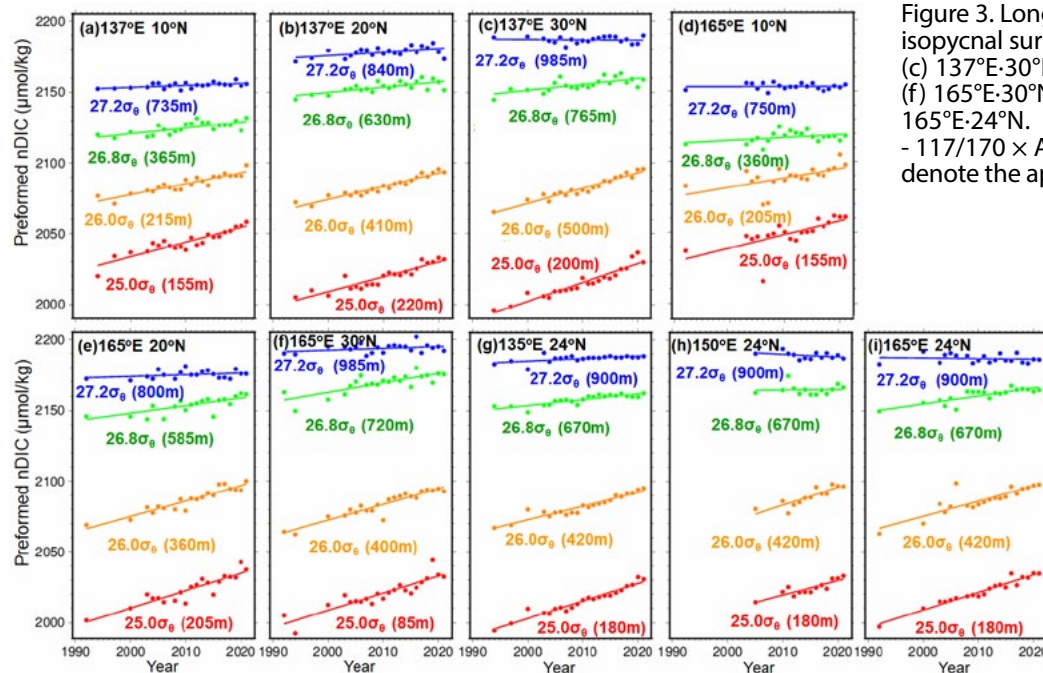


Figure 3. Long-term trend of preformed nDIC on isopycnal surfaces. (a)137°E·10°N, (b)137°E·20°N, (c) 137°E·30°N, (d) 165°E·10°N, (e) 165°E·20°N, (f) 165°E·30°N, (g) 135°E·24°N, (h) 150°E·24°N, (i) 165°E·24°N. Preformed nDIC is defined as (DIC - 117/170 × AOU) × 35/S. Values in parentheses denote the approximate depth in density.

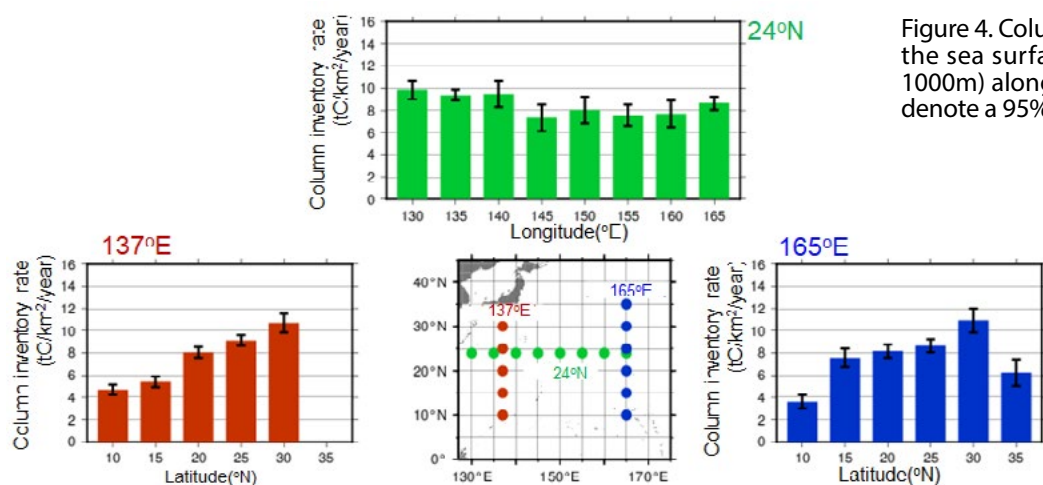


Figure 4. Column inventory rates of DIC between the sea surface and 27.2σ_θ (a depth of about 1000m) along 137°E, 165°E and 24°N. Error bars denote a 95% confidence level.



Mr. Kazuhiro Nemoto is the Head of the Atmospheric and Marine Environment Analysis Center, Atmospheric Environment and Ocean Division of the Atmosphere and Ocean Department of the Japan Meteorological Agency (JMA), in Tokyo, Japan.

Cool winter and early spring conditions in the Northeast Pacific

Akash Sastri, Tetjana Ross, and Moira Galbraith

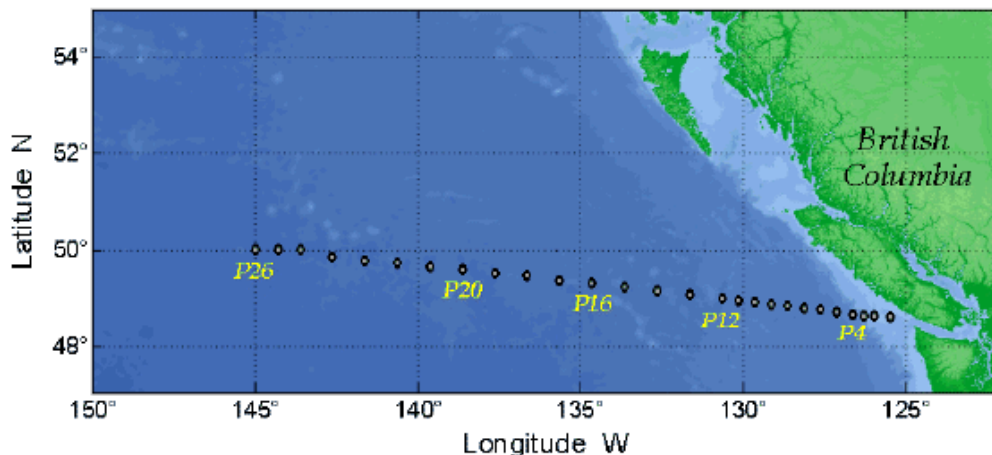


Figure 1. Location of sampling stations along Line P (<http://www.waterproperties.ca/linep/>).

The cooler conditions that started in mid-2020 and have continued into 2022 have marked a departure from a warmer than average northeast Pacific in 2014-2016 and 2019-2020. This is largely due to a persistent La Niña (e.g. the Oceanic Niño Index has remained near or below the -0.5 °C threshold for La Niña since mid-2020). Extremely warm conditions along outer Line P (Figure 1) were identified in the central Gulf of Alaska during the winter of 2013/2014 (Freeland, 2014) and then observed along the inner line and west coast of North America by the summer and fall of 2014 (Bond et al., 2015). The depth of positive temperature anomalies along the line increased with time during the 2014-2016 marine heatwave (Freeland and Ross, 2019) and persisted in deep coastal British Columbia inlets (Jackson et al., 2018). Copepod biomass anomalies of warm/cool indicator species and groups responded to these events in a coherent manner along the west coast of North America (Fisher et al., 2020) and along Line P (Galbraith and Young, 2021). The return to and persistence of “normal” or moderately cooler than average conditions in 2021 and early 2022 has been accompanied by neutral and positive biomass anomalies for ‘subarctic’ and ‘boreal’ shelf copepod species along Line P.

Thus far in 2022 along Line P, temperatures were within 0.5°C of the 1959-2012 climatological mean throughout the upper 500 m of the water column. The exceptions were near the offshore end of Line P (where positive temperature anomalies exceeded 1°C in the upper 200 m) and close to the coast of Vancouver Island (where negative temperature anomalies exceeded 0.5°C). These anomalies are far smaller than during the marine heatwaves of 2014-2016 ($>3^{\circ}\text{C}$) and/or 2019-2020 ($>2.5^{\circ}\text{C}$).

While temperatures have been near normal since mid-2020, there were significant salinity anomalies in the near-surface waters across the NE Pacific. This fresh anomaly

and the emerging freshening trend in the NE Pacific is well illustrated by the Argo-derived salinity anomaly time series at Station Papa (Figure 3 a). Along Line P (Figure 3 b), this surface freshening is accompanied by an increase in salinity below 100 m, likely an indication of increased stratification. Sea surface salinity maps based on Aquarius satellite data (Melnichenko et al., 2016) show that these fresh anomalies stretch across the entire NE Pacific. A more recent analysis of the historical weather station time series and recent NOAA surface buoys at Station Papa (Margevitch et al., 2020) found surface freshening increasing with precipitation in excess of increasing evaporation.

Cooler conditions are historically along inner Line P are associated with greater productivity, neutral and/or positive biomass anomalies of boreal and subarctic copepods, and increased survival of early marine phase juvenile salmon and hatching success of planktivorous seabirds (Mackas et al., 2007; Hipfner et al., 2019). Biomass anomalies for copepod species indicative of warm conditions along the inner portion of Line P have returned to the climatological mean with a return to cooler conditions in mid-2020 (Figure 4). Anomalies in early 2022 (similar to the start of 2021) contrast with the relatively large positive anomalies during and immediately following the 2014-2016, 2019-2020 marine heat waves, as well as the intervening 2017-2018 period. Large, lipid-rich subarctic copepods found along the continental slope and offshore were at their climatological mean in 2021 and greater than average to start the year. Both 2021 and early 2022 are characterized by relatively large positive biomass anomalies for medium and large lipid-rich boreal copepods more closely tied to the shelf. The sign of the early spring biomass anomalies is generally similar to the annual anomaly for all indicator groups. The correspondence is strongest for the southern taxa whose biomass is more strongly tied to broad-scale circulation, particularly poleward transport in the late winter.

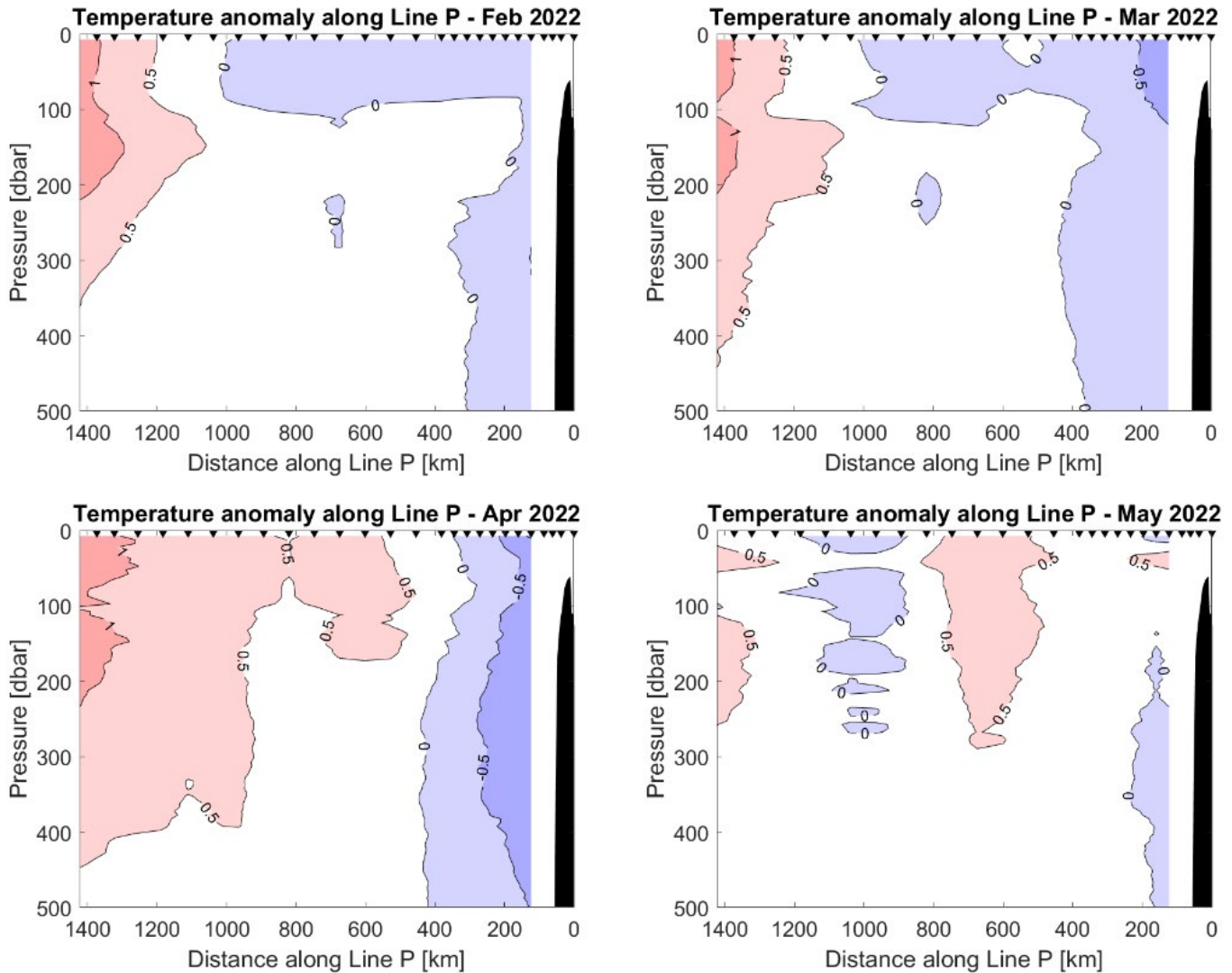


Figure 2. Plot of temperature anomalies (in °C) relative to the Line P Climatology (1956-2012), as observed by Argo floats in the NEP that were optimally interpolated onto the Line P station locations. Cool colours indicate cooler than average and warm colours indicate warmer than average for February, March, April and May 2022.

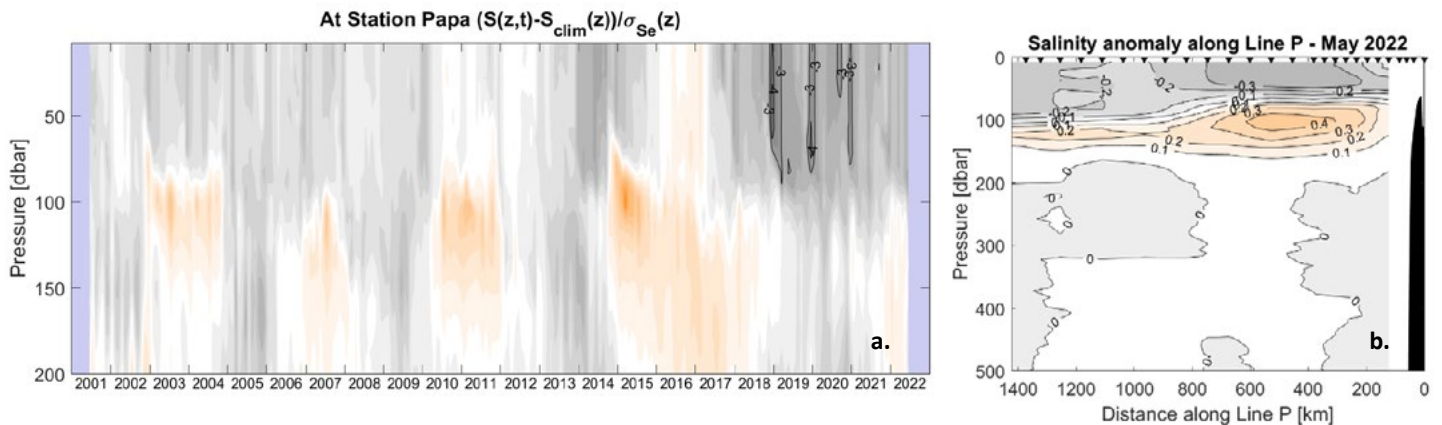


Figure 3. Plot of salinity anomalies relative to the 1956-2012 seasonally-corrected mean and standard deviation (from the Line P time series), as observed by Argo floats: a) near Station Papa (P26: 50°N, 145°W) during 2000-2022; and b) along the line in May 2022. The grey colours indicate fresher than average salinities and warm colours indicate saltier than average salinities. Dark colours indicate interannual anomalies that are large compared with the 1956-2012 standard deviations. The black lines highlight regions with anomalies that are 3 and 4 standard deviations below the mean.

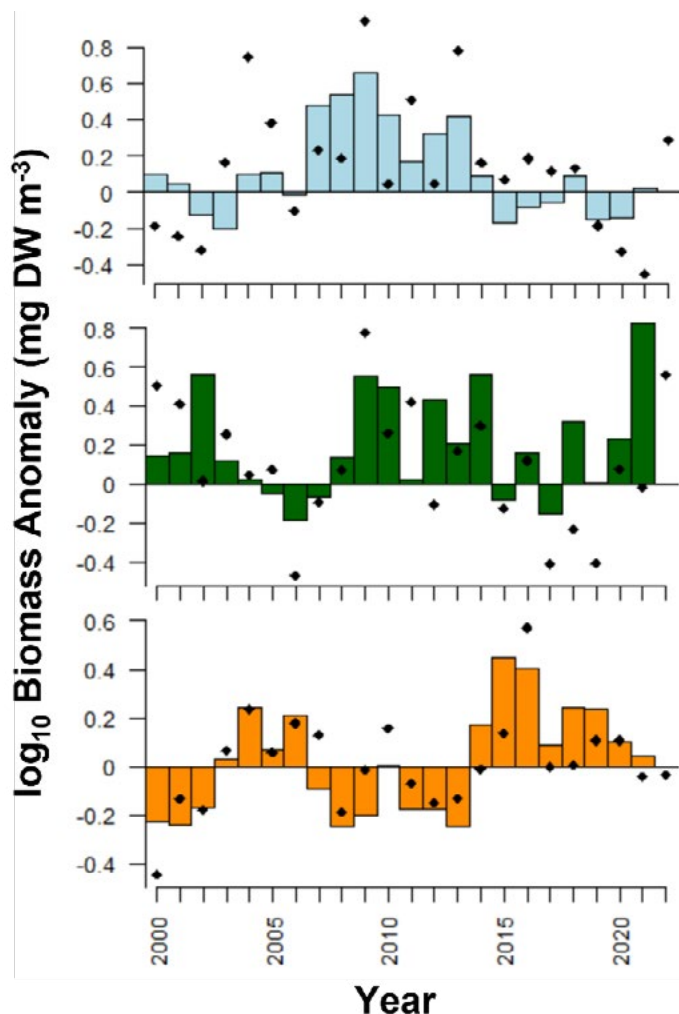


Figure 4. Copepod biomass anomalies (\log_{10} mg dry weight m^{-3}) along inner Line P (stations P4-P12, see Figure 1) for 2000-2020. Bars represent seasonally averaged annual biomass anomalies relative to the 1980-2010 climatology for large lipid-rich subarctic copepods (light blue), lipid-rich boreal shelf copepods (dark green), and small lipid-poor copepods with a stronger geographic affinity to the southern California current (orange). Black symbols represent the late winter – early spring (February and March) seasonal biomass anomalies for each year. Note: 2022 is represented only by the seasonal biomass anomaly.

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Dr. Akash Sastri is a Research Scientist with Fisheries and Oceans Canada at the Institute of Ocean Sciences in Sidney, BC, where he leads the Plankton Ecology program. He has a background in biological oceanography with a focus on the roles of marine plankton communities in changing environments. His Ph.D. thesis at the University of Victoria focused on the development and application of novel ways to measure zooplankton productivity routinely at sea. In PICES he is the Chair of the Biological Oceanography Committee (BIO), a member of Working Group on Towards best practices using Imaging Systems for Monitoring Plankton (WG48) and the Advisory Panel on North Pacific Coastal Ocean Observing Systems (AP-NPCOOS).



Dr. Tetjana Ross is a Research Scientist at the Institute of Ocean Sciences, Fisheries and Oceans Canada, in Sidney, BC. She is an ocean physicist who develops new ways to observe the ocean – from observing ocean mixing using sound to taking photographs of zooplankton in turbulence. Nowadays, she rarely goes to sea, sending robots out to do the work for her: both gliders and Argo floats (i.e., she currently leads the Pacific component of DFO's Argo and glider programs). In PICES she is member of the Technical Committee on Monitoring and the Working Group on Submesoscale Processes and Marine Ecosystems. (WG 50). In PICES she is member of the Technical Committee on Monitoring and the Working Group on Sub-mesoscale Processes and Marine Ecosystems (WG-50).



Moira Galbraith is a Zooplankton Taxonomist who works at the Institute of Ocean Sciences in Sidney, BC. She is a marine biologist who specializes in the identification of zooplankton from the west coast of Canada as well as the Arctic. She has been working, in conjunction with her co-workers, to develop various indices for tracing changes in British Columbia zooplankton community structure and biomass.

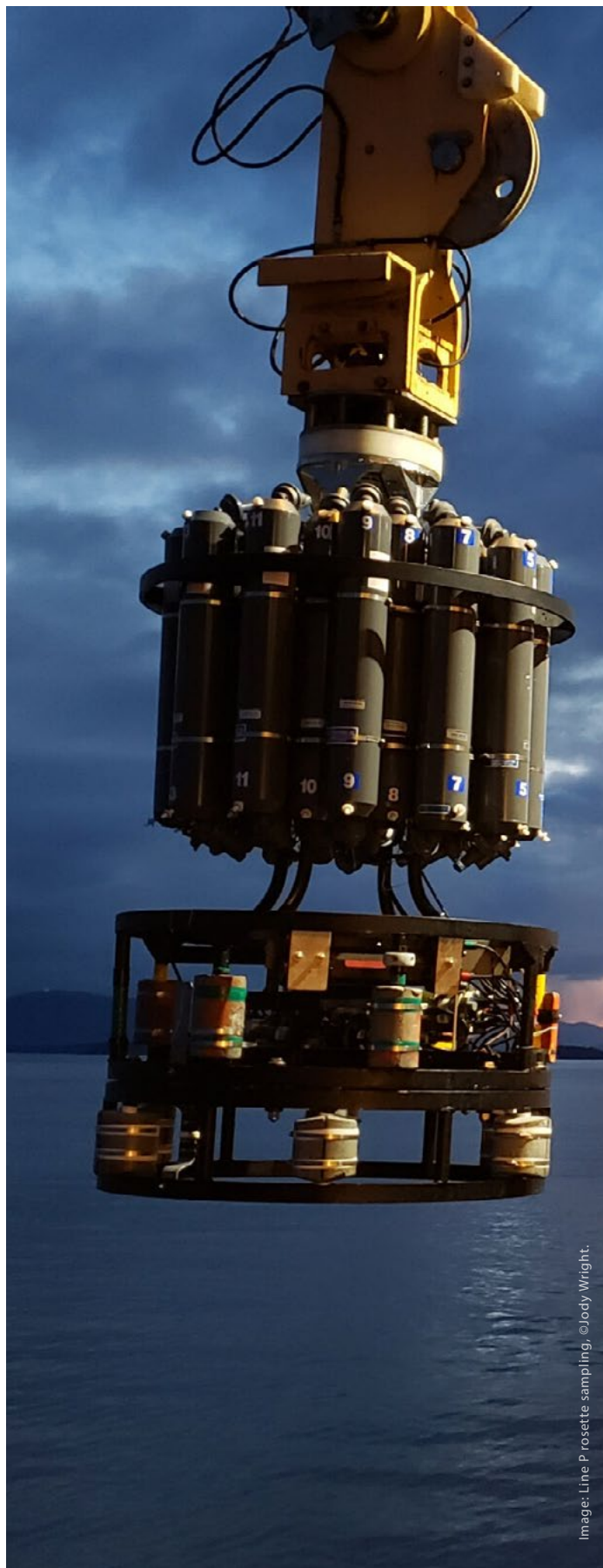


Image: Line P rosette sampling. ©Jody Wright.

Remembering Timothy Parsons — Pre-eminent Canadian marine scientist (1 November 1932 – 11 April, 2022)



Professor Timothy (Tim) R. Parsons (OC, FSRC) passed away in hospital on April 11, 2022 in the company of his family. Tim was one of Canada's most eminent marine scientists and recipient of many national and international awards and honours.

He was born in Colombo, Ceylon (now Sri Lanka) on November 1, 1932. When his father passed away suddenly, the family returned to England, where Tim spent his childhood and completed his early school education at Christ's Hospital, a public school. In 1949 at age 16, he travelled alone to take up a scholarship in agricultural studies at Macdonald College, part of McGill University. There he received his B.Sc., before moving to McGill's Department of Biochemistry in the Faculty of Medicine. He completed his Ph.D. in 1958.

Tim's first employment was as a research scientist at the Pacific Biological Station (PBS) in Nanaimo, where, with his good friend and colleague Dr. John Strickland, he helped set the newly emerging field of oceanography on solid ground with *A Manual of Sea Water Analysis* (*Bulletin 125 of the Fisheries Research Board of Canada*) in 1960, and subsequent (and expanded) editions in 1968 and 1984. These publications were the primary reference volumes in oceanographic laboratories around the world for more than 30 years. This effort in standardizing robust analytical techniques ensured that measurements of ocean parameters could be compared and contrasted across laboratories and oceans, something that was critical in the understanding of how the ocean works. While at PBS, Tim and co-workers pioneered studies on ocean ecosystems and how they impacted fish and fisheries. Their work included detailed observations of chemistry, plankton and juvenile salmon in the Strait of Georgia and Saanich Inlet, observations at Ocean Station PAPA (the longest time-series of open ocean measurements in the world) and a Trans-Pacific transect to Japan. It also included the pioneering work with marine mesocosms to bridge the competing challenges of the controlled experiment and the study of whole ecosystems.

Tim took a leave of absence from 1962 to 1964 and moved with his family to take up a position at the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO). This gave Tim a first-hand appreciation of the many challenges in building global science collaboration within a large bureaucracy.

On his return to the Department of Fisheries and Oceans, Tim and his colleagues put their understanding of lower

trophic level dynamics and how they influence fish into practical use with the fertilization of nutrient-poor Great Central Lake on Vancouver Island to increase the size and success of sockeye salmon smolts entering the ocean. The DFO lake fertilization program continues to this day.

In 1971, Tim was appointed to joint positions in the Departments of Zoology and Oceanography at the University of British Columbia. While at UBC, he was a key member of a large US National Science Foundation-funded project to research the impacts of low levels of pollution on entire marine ecosystems using very large floating enclosures (mesocosms) in Saanich Inlet, B.C., operating from the site of the newly created Institute of Ocean Sciences. This was an international science project organized as part of the International Decade of Ocean Exploration.



Tim with former student Ian Perry, at PICES-2019 in Victoria, on the occasion of Ian's receipt of PICES Wooster Award.

During his time at UBC, Tim mentored, supported, and inspired many students and colleagues in Canada and around the world. Many of these students have had long and successful careers in Fisheries and Oceans Canada and elsewhere. Tim was very proactive in building and sustaining collaborations between academic and government science. There was not always a lot of institutional support for this, but that did not deter Tim. In retrospect, it is clear that all parties benefited, as did the science.

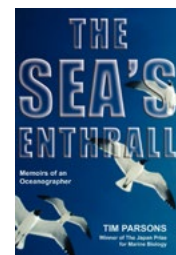
Tim also co-authored some classic textbooks in biological oceanography with versions for both undergraduate and graduate students. In 1997, Tim and Dr. Masayuki (Mac) Takahashi wrote *Biological Oceanographic Processes*. This textbook has withstood the test of time, and is popular among graduate students, physical oceanographers, engineers, hydrologists, fisheries experts, and a number of other professionals who require quantitative expressions of biological oceanographic phenomena. This volume was later revised and expanded to include benthic ecosystems with the addition of author Barry Hargrave.

Tim and his wife and colleague Carol Lalli (also an oceanographer), together wrote *Biological Oceanography: An Introduction*. This popular undergraduate textbook was produced for Open University, a large British public university with many overseas students. This ensured a wide distribution, and the volume was subsequently translated into Japanese and Chinese.

In 1979, Tim was elected a Fellow of the Royal Society of Canada for his contributions. In 1989, he was awarded the J. P. Tully Medal in Oceanography from the Canadian Meteorological and Oceanographic Society which is given to a "person whose scientific contributions have had a significant impact on Canadian oceanography."

Tim retired from UBC in 1992 and relocated to Brentwood Bay on Vancouver Island. He became an Honorary Emeritus Scientist at the Institute of Ocean Sciences where he continued to play an active role supporting, encouraging and occasionally challenging (as befits an Emeritus Scientist) DFO science staff at all levels. Tim and his wife Carol travelled extensively, teaching in Taiwan, the People's Republic of China, Malaysia, Chile, and Japan. He continued his career-long emphasis on a holistic view of marine ecosystems and the importance of getting out to sea and making high-quality observations from research ships, commercial vessels of opportunity and other means.

In 1993, he was awarded the [G.E. Hutchinson Award by the Association for the Sciences of Limnology and Oceanography \(ASLO\)](#) "in recognition of his achievements in combining chemistry with biology to make the ocean's ecology more predictable." In 1999, he was awarded the Murray A. Newman Award for "significant achievement in aquatic research" by the Vancouver Aquarium Marine Science Centre. In 2001, Tim was the first Canadian to be named as a [Laureate of the Japan Prize](#) (Japan's equivalent to the Nobel Prize) for "contributions to the development of fisheries oceanography and for conservation of fisheries resources and the marine environment." Tim was awarded honorary degrees by Hokkaido University (Japan), the University of British Columbia and the University of Victoria. In 2005, Tim was made an *Officer of the Order of Canada*. Also In 2005, Fisheries and Oceans Canada established the *Timothy R. Parsons Medal* to recognize "distinguished accomplishments in multidisciplinary facets of ocean sciences while working for Canadian Institutions or for the benefit of Canadian science," with Tim as its first recipient. Despite a busy life in science, Tim also was able to develop his diverse interests in poetry, tennis, carving, bridge and, in his younger years, hiking, skiing and the tango. He also found the time to record his life in *The Sea's Entrhall; Memoirs of an Oceanographer*, published in 2004.





Tim was also active and influential in the development of the North Pacific Marine Science Organization (PICES) and the early years of the organization. Tim was a founding member of the PICES Biological Oceanography Committee (BIO) through to 1996, and he gave the Keynote Lecture at PICES Fifth Annual Meeting (PICES-1996) in Nanaimo, Canada. To mark PICES tenth anniversary in 2001, the Science Board Symposium topic was *"Ten years of PICES science: decadal-scale scientific progress and prognosis for a regime shift in scientific approach."* Tim was an invited speaker and gave an overview on *"Future needs for biological oceanographic studies in the Pacific Ocean,"* with a critical and thought-provoking commentary on the maturity of biological oceanography as a branch of the marine sciences, and what is needed to help it to mature further. As mentioned previously, the importance of Strickland and Parsons' *A Practical Handbook of Seawater Analysis* to the development of oceanographic science is difficult to overstate. To mark the 50th anniversary of this publication and to examine the role that this manual and its descendants have played in the development of biological and chemical oceanography, the BIO Topic Session entitled *"The Practical Handbook at 50: A celebration of the life and career of Tim Parsons"* was held at PICES-2010 in Portland, USA.

Measuring a lifetime of contributions for a scientist is a complex task. The usual approach is to count the number of scientific articles and books published. [By this measure](#), (with over 150 primary publications in oceanography, fisheries, and pollution research, 3 honorary doctorate degrees, and many significant awards), Tim was a prolific scientist. However, this is only part of his story. It is also important to consider the impact that a scientist has had on the evolution of his field through mentoring and encouragement of students, co-workers and collaborators. When these measures are considered, Tim's influence has been immense. Many people will be mourning his passing while at the same time, many people, encouraged by Tim personally or through his published works, will also be continuing to explore, measure, integrate and analyze the ocean and its ecosystems in just the way Tim would have encouraged.



PICES Members: we hope to see you in person at PICES-2022, Sept 23–Oct 2, in Busan, Korea
Sustainability of Marine Ecosystems through global knowledge networks during the UN Decade of Ocean Science

PICES Events Calendar



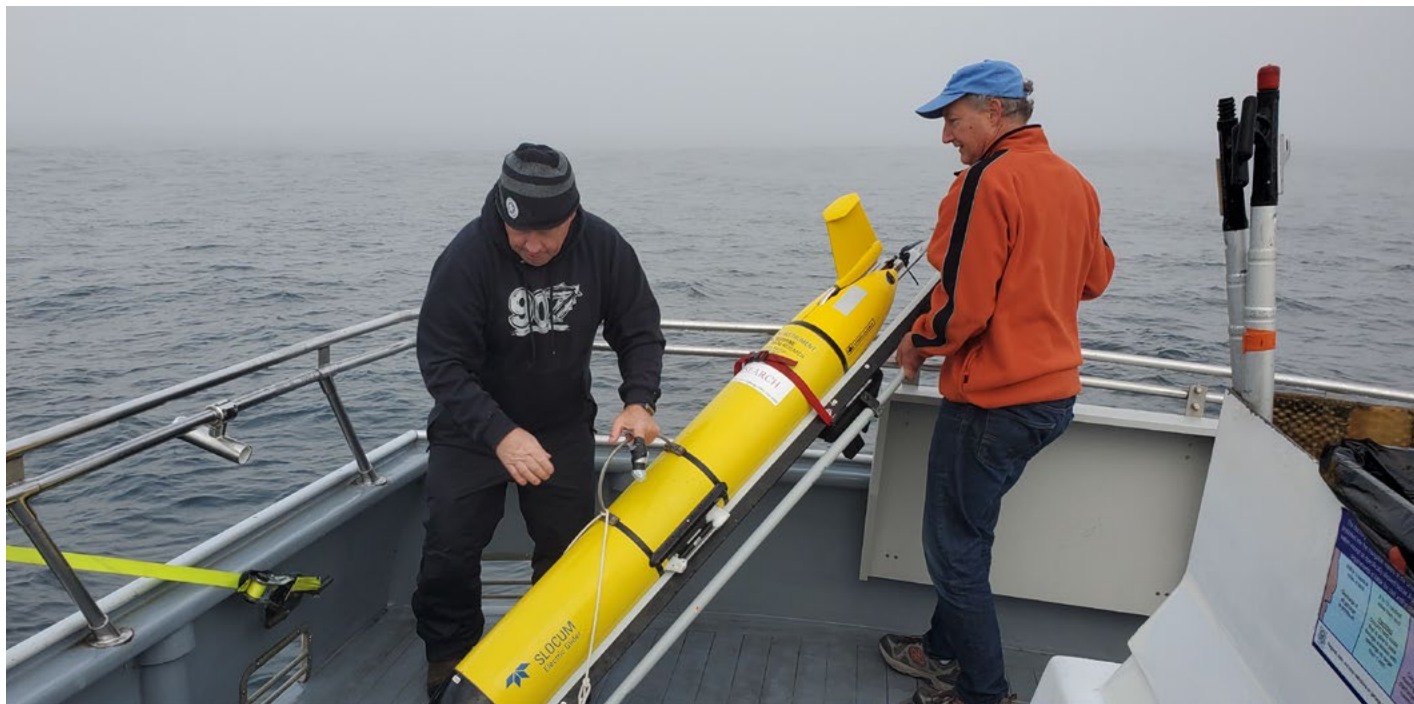
- [ICES/PICES Early Career Scientists Conference \(ECS2022\)](#)
St. John's, Newfoundland, Canada, 9–12 May 2022
- [PICES-2022 Busan, Korea, Sept 23–Oct 2, 2022](#)
- [Surface Ocean-Lower Atmosphere Study \(SOLAS\) OSM 2022](#)
Cape Town, South Africa, Sept 25–29, 2022
- [International Year of the Salmon Symposium \(IYS2022\)](#)
Vancouver, Canada, (Westin Bayshore) October 4-6, 2022
- [ICES/PICES/FAO International Symposium on Small Pelagic Fish \(SPFSymposium2\)](#) Lisbon, Portugal Nov. 7-11, 2022
- [MSEAS Marine Socio-Ecological Systems \(MSEAS2022\)](#)
Yokohama, Japan. 2023 Date TBD
- [Effects of Climate Change on the World's Ocean \(ECCWO5\)](#)
Bergen, Norway, April 17-21, 2023
- [PICES/ICES Joint Science Conference 2023](#)
Seattle, October 2023, TBC
- [ICES/PICES Zooplankton Production Symposium \(ZPS 2024\)](#)
Hobart, Australia, March 2024.
- [PICES event associated with Expo2025](#)
Osaka, Japan, 2025 event date TBD.



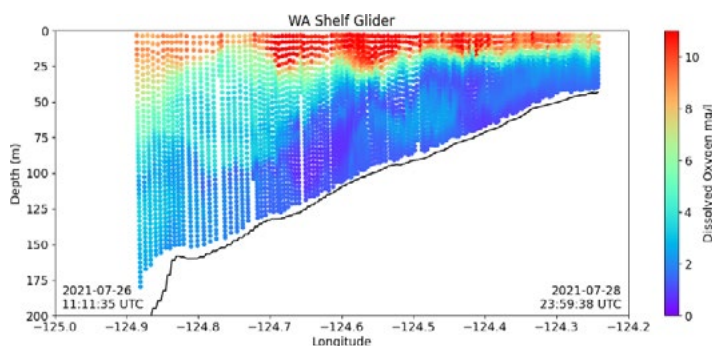
PICES Capacity Development Events

- [PICES AP-NPCOOS Ocean Big Data Virtual Summer School 2022](#)
VIRTUAL, August, 8-19, 2022. [Details.](#)
- [PICES AP-CREAMS Summer School on Ocean Turbulence](#)
VIRTUAL, August, 22-26, 2022. [Details.](#)
- [SOLAS Virtual Summer School 2023](#)
Cape Verde, Senegal. 2023 Dates TBC.

Your PICES Science Images



An image from Oregon State University glider work off Westport, Washington. The glider is making maps of water properties off the central Washington coast, (in particular, the near-bottom dissolved oxygen distributions such as those in the figure below). The glider provides data such as that included in Figure 2 of PICES Press Volume 30, Number 1 article *"Northeast Pacific Update: Summer 2021 low oxygen event on the west coast of North America."* In the image above is PICES member Jack Barth at right shown working with a deckhand on the Charter Vessel *Monte Carlo*. The instrument shown being deployed is a Teledyne Webb Research Slocum glider equipped with sensors for temperature, salinity, pressure, dissolved oxygen, chlorophyll fluorescence, light backscatter, and Colored Dissolved Organic Matter fluorescence. These instruments collect data for 3 weeks at a time. Funding for this project was provided by the U.S. NOAA Integrated Ocean Observing System, through the Northwest Association of Networked Ocean Observing Systems (NANOOS). Photo courtesy of Chad Gibson, OSU, 1 Oct 2021.



Dissolved oxygen measured from an underwater vehicle glider operated by Oregon State University on a cross-shore transect off Grays Harbor, Washington, USA (plots available at <http://nvs.nanoos.org> and data available at the U.S. Integrated Ocean Observing System Glider Data Acquisition Center, <http://gliders.ioos.us>). Hypoxic water occupies the lower three-quarters of the water column near the mid-shelf mooring location (~80 m isobath) and stretches from the outer continental shelf, shoreward to at least the 50-m isobath.

Your PICES Science Images – Call for images

PICES friends: do you have an interesting image of PICES science work to share in PICES Press? Please email high-resolution .jpg or .tif files, along with a short caption and your required image credit to: Lori.Waters@pices.int

Thank you!

PICES By the Numbers



North Pacific Marine Science Organization

6 member countries

30 Years of collaborative marine science

36 Active Expert Groups

>10,000 participants since 1992

>4,500 current participants

>500 current Expert Group members

>200 Publications

- 84** PICES science papers
- 58** Issues of PICES Press
- 62** Scientific Reports
- 7** PICES Special Publications
- 6** Books & Technical Reports





Open call for PICES Press submissions

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**PICES appreciates you sharing your work.
Thank you for your contributions!**

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