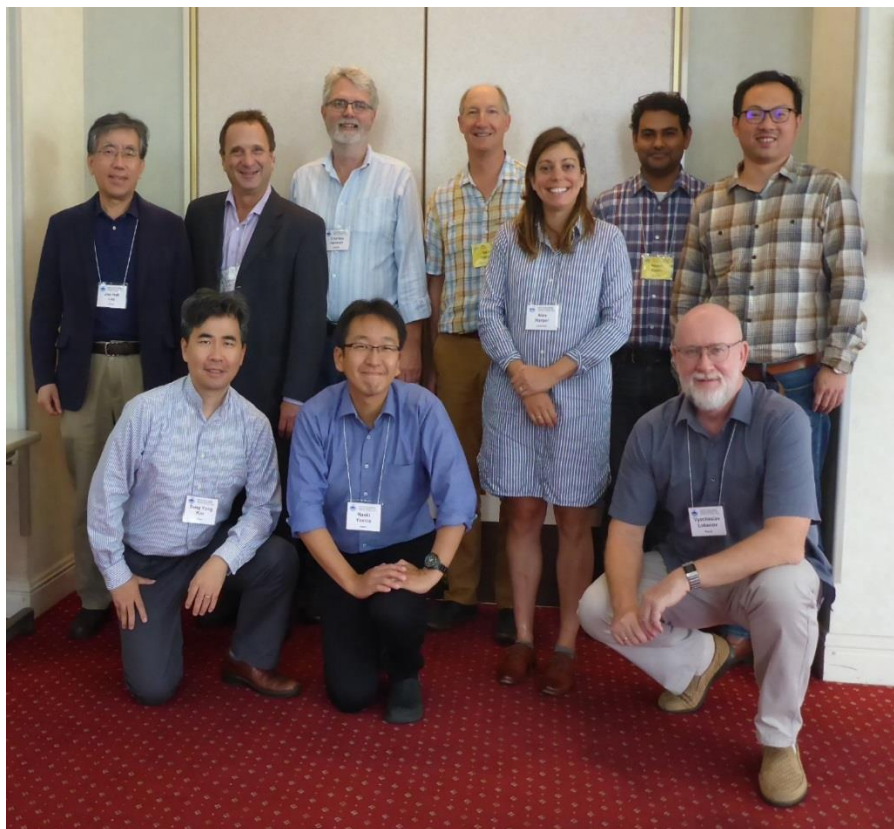


Report of the Advisory Panel on *North Pacific Coastal Ocean Observing Systems*

The Advisory Panel on *North Pacific Coastal Ocean Observing Systems* (AP-NPCOOS) held its meeting from 0900–1230 h on October 28, 2018, in Yokohama, Japan. Nine AP-NPCOOS members and two observers were in attendance (*AP-NPCOOS Endnote 1*). The meeting was chaired by Dr. Sung Yong Kim (Korea) and Dr. Jack Barth (USA).



AP-NPCOOS members attending the 2018 PICES Annual Meeting. Front row, left to right: Co-Chair Sung Yong Kim (Korea), Naoki Yoshie (Japan), Alex Harper (observer, CeNCOOS) and Vyacheslav Lobanov (Russia); Back row, left to right: Jae Hak Lee (Korea), Kim Juniper (Canada), Charles Hannah (Canada), Co-Chair Jack Barth (USA), Akash Sastri (Canada) and Chuanxi Xing (China).

AGENDA ITEMS 2 AND 3

Introductions and Terms of Reference

The meeting started with members and observers introducing themselves. This was followed by the Co-Chairs describing the AP-NPCOOS Terms of Reference and goals for the meeting, primary agenda (*AP-NPCOOS Endnote 2*), and plans for the upcoming year. The Co-Chairs noted that AP-NPCOOS is making good progress on one of the Terms of Reference, namely convening workshops/sessions to engage those involved in coastal ocean observing systems from around the North Pacific.

AGENDA ITEM 4

Report from FUTURE SSC

Dr. Vyacheslav Lobanov reported the activities of the Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems (FUTURE) Scientific Steering Committee (SSC). He reminded us of FUTURE's three goals: 1) What determines an ecosystem's intrinsic resilience and vulnerability to natural and anthropogenic forcing? 2) How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future? 3) How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems? Dr. Lobanov explained examples of (1) Jelly Fish Blooms, (2) Species Alternation on the Western Boundary, (3) The North Pacific Warm Blob, and (4) Transboundary Fisheries Management using the diagram of Predictability and Sustainability of Social-Ecological-Environmental Systems, which provide strong linkages among FUTURE, the FUTURE SSC and the existing PICES expert groups. Many AP-NPCOOS goals and activities are in support of FUTURE goals.

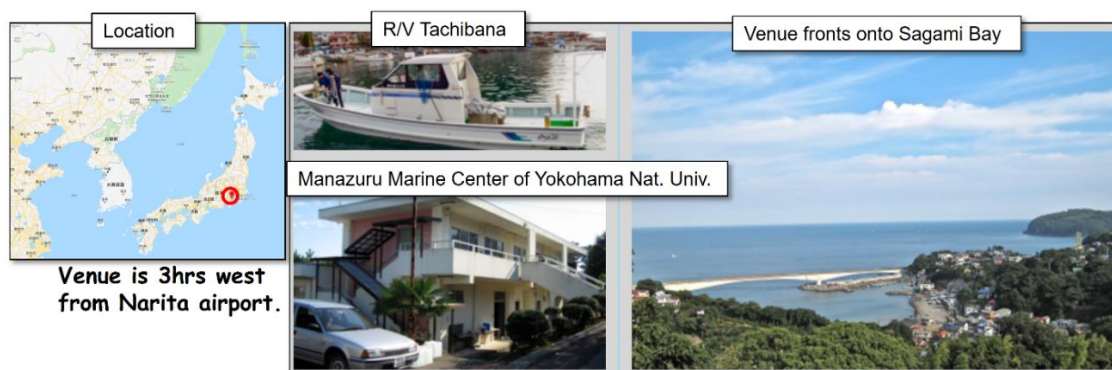
AGENDA ITEM 5

Summer School 2018 update and 2020 plans

- (1) 2018 Summer School
 - a. Held in Victoria, Canada on July 8–14, 2018;
 - b. 28 participants from 14 countries, including 5 of 6 PICES member countries: Canada, USA, Korea, China, Russia;
 - c. 4 University of Victoria grad students enrolled for credit in EOS 518A (SEOS, Geography, Biology): 3 PhD, 1 MSc.

- (2) Program overview
 - a. Pre-course data analysis underway;
 - b. Lectures at Institute of Ocean Sciences (IOS) (Fisheries and Oceans Canada), Vancouver Aquarium and Ocean Networks Canada;
 - c. Technology demonstrations and practical exercises at IOS and Marine Technology Centre;
 - d. Cruises on the R/V *Strickland* in Saanich Inlet;
 - e. Return ferry trips to Tsawwassen:
 - i. Ferry data monitoring, VENUS network, Strait of Georgia oceanography and marine mammal acoustics,
 - ii. Vancouver Aquarium visit for lectures (Peter Ross, Wiley Evans).
 - f. Data sets and Matlab packages for pre-course time series analysis:
 - i. R/V *Strickland* CTD casts: Collected during student cruises on R/V *Strickland*; focus for data QA/QC exercises,
 - ii. DFO mooring data from Charles Hannah.

8 July	9 July	10 July	11 July	12 July	13 July	14 July
<ul style="list-style-type: none"> • Arrivals • EOS students on Strickland 	IOS lectures <ul style="list-style-type: none"> • Intro (Juniper) • BC coastal oceanography (Hannah) • Time series theory (Dewey) 	IOS lectures <ul style="list-style-type: none"> • Time series demo (Dewey) • Acoustics (Dewey) 	Ferry crossing VanAqua lectures <ul style="list-style-type: none"> • Microplastics (Ross) • OA monitoring (Evans) 	TEF Imagery lectures <ul style="list-style-type: none"> • Ecological applications (Juniper) • Machine vision (Hoeberechts) 	Prepare presentations	Participants depart
Welcome dinner	3 Groups <ul style="list-style-type: none"> • Strickland cruise • IOS tours • QA/QC MTC tour	3 Groups <ul style="list-style-type: none"> • Strickland cruise • IOS tours • QA/QC PM lectures <ul style="list-style-type: none"> • SI profiler data intro (Wolf/Kim) • Ferry intro (Sastri) • Passive acoustics (Dakin) 	<ul style="list-style-type: none"> • VanAqua visit • Return ferry 	Participants prepare presentations	<ul style="list-style-type: none"> • Group Presentations • Farewell Dinner – University Club 	

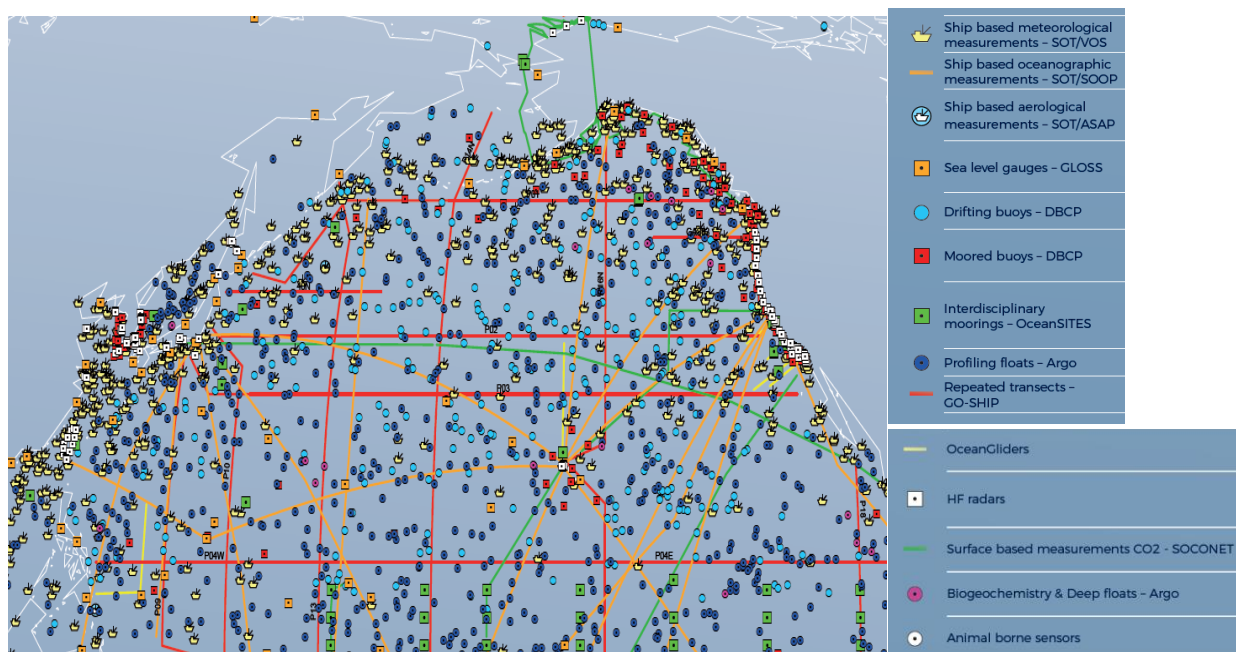


- (3) 2020 Summer School plans; Note: AP-NPCOOS Co-Chairs will apply in early 2019 for PICES support of this summer school.
- Focus: Zooplankton and ocean observation;
 - Why: Zooplankton is a quantitative proxy for marine ecosystem responses to climate change;
 - Host: N. Yoshie, T. Kobari, S. Shimode, *etc.*;
 - Lecturer: K. Takahashi, K. Tadokoro, S. Chiba, *etc.*;
 - Participants: max. 20 students and early career scientists;
 - Where: Venue is near Yokohama: Manazuru Marine Center of Yokohama National University;
 - When: 5 days in the autumn in 2020 co-hosting with WG 37.

AGENDA ITEM 6

WMO/IOC ocean observing report cards: coastal ocean observing?

Dr. Barth presented the 2018 WOC/IMO ocean observing report cards published by the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) of the World Meteorological Organization (WMO) and UNESCO’s Intergovernmental Oceanographic Commission (IOC) (<http://www.jcommops.org/reportcard2018/>). It was discussed as to whether AP-NPCOOS could generate a similar “report card” for PICES member countries’ coastal observing systems as a potential outcome to document the efforts with AP-NPCOOS. One metric could be how well the Essential Ocean Variables (see next item) are being measured by each system. Dr. Barth also encouraged AP-NPCOOS members to attend the upcoming OceanObs’19, September 16–20, 2019, and to present the coastal observational efforts of individual PICES countries. There was a discussion about how to acknowledge PICES and AP-NPCOOS in the documents that we generate and publish. For example, is there a PICES contribution number available to use?



AGENDA ITEM 7

Essential Biological Ocean Variables

Dr. Sanae Chiba provided an update on the Essential Ocean Variables (EOVs) in GOOS Biology and Ecosystems Panel activities. The ‘impact’ and ‘feasibility’ of individual variables as the criteria of EOVs have been evaluated in terms of (1) Relevant to help solve science questions and address societal needs, (2) Contribute to improve management of marine resources, (3) Scientifically credible, (4) Technically practical, cost effective and within human capabilities, and (5) Enduring.

AGENDA ITEM 8

OceanObs’19

See Agenda Item 6.

AGENDA ITEM 9

Northern and Central California Ocean Observing System

Dr. Alex Harper, representing the Central and North California Coastal Ocean Observing System (CeNCOOS), provided an overview of the coastal observational efforts under the U.S. Integrated Ocean Observing System (IOOS). She also presented a review of the Southern California Coastal Ocean Observing System (SCCOOS). Dr. Harper expressed interest in being further involved with PICES and AP-NPCOOS.

AGENDA ITEM 10

Coastal Ocean Observing Systems in PICES member countries

The coastal observing efforts of all six PICES countries were reviewed in brief 15-minute presentations by members of AP-NPCOOS.

- *Canada* (Kim Juniper and Akash Sastri)
 - Line P, Zooplankton time series (S. and N. Vancouver Island, Strait of Georgia, and Hecate Strait);
 - Lighthouse, long-term mooring, and water buoys;
 - VENUS and NEPTUNE for cabled network for onshore and offshore observations;
 - Offshore and inshore water column profilers, ferry observations;
 - HF radar (Salish Sea);
 - Data format, ISO conventions, data delivery, and datum issues for sea level observations;
 - Canadian Integrated Ocean Observing System (Pacific CIOOS, St. Lawrence CIOOS, and Atlantic CIOOS).
- *China* (Chuanxi Xing)
 - Observations and numerical modeling for studies of bottom water circulation, calcium carbonate (CaCO₃) and microplastics in northern Bohai Strait;
 - Bottom water and coastal surface and subsurface circulation affect high concentrations of CaCO₃ in the middle of Bohai Bay and residence time of potential contaminants.
- *Japan* (Naoki Yoshie)
 - Web-based data center including three major resources of ocean observations – Japan Oceanographic Data Center (JODC), Marine Information Clearing House (MICH), and Japan Meteorological Agency (JMA);
 - Fisheries Research Agency – 100-year-long time series of temperature; data regeneration using data assimilation techniques; chapter Y (Japan coastal area);
 - Ocean acidification has been monitored at 10 sites since 1982;
 - New satellite GOCM-C: SST, Chl, CDOM, SS, PAR (2 days and 250 m resolutions);
 - Himawari 8 (Geostationary remote sensing): SST (10 min) and Chl (1 hour) at 2 km resolutions;
 - Seto Inland Sea – a most productive area on fisheries in a semi-enclosed coastal area with long-term monitoring of temperature, salinity, and nutrients.
- *Korea* (Sung Yong Kim and Jae Hak Lee)
 - Geostationary Ocean Color Imagery (hourly during the day and 0.5 km resolution) for red tide monitoring and spatial observations of chlorophyll;
 - Buoys and Argo floats, tide gauges and coastal radar;

AP-NPCOOS – 2018

- Three marine platforms off the west coast of Korea;
- Observations of wave gliders and subsurface gliders.
- *Russia* (Vyacheslav Lobanov)
 - Hydromet Service Coastal Stations
 - Observations of cold water sinks and hypoxia in Peter the Great Bay;
 - Seal tagged monitoring program (2017–2018);
 - NEAR-GOOS monitoring system.
- *USA* (Jack Barth)
 - U.S. North Pacific coastal ocean observing systems: Alaska Ocean Observing System; Northwest Association of Networked Ocean Observing Systems (NANOOS);
 - NANOOS efforts on adding HF radars, the Environmental Sampling Processor (ESP) for HABs, and a new effort to use Autonomous Underwater Vehicles to obtain physical samples for analytical testing for HABs in shoreside laboratories;
 - Glider networks (Scripps Institution of Oceanography, Oregon State University, University of Washington);
 - U.S. NSF Ocean Observatories Initiative (OOI) – Coastal Endurance Array;
 - Improvement of observational performance degradation with an anti-fouling tool of UV light.

The plan to document the efforts of individual PICES member countries under NP-APCOOS is continuing.

- Contents: a successful story of individual countries on coastal ocean observing systems.
- Targeting journals: *Journal of Ocean Technology* or *Journal of Operational Oceanography* or OceanObs'19 (poster)
- Tentative timelines: Journal template distribution (1/1/2019), abstract, a list of authors, and title due (2/1/2019), completion of paper writing (4/1/2019), submission (4/1/2019).

After the summaries of PICES countries coastal ocean observing efforts, AP-NPCOOS discussed the next year's plan to have a half-day business meeting at the PICES2019 in Victoria, Canada. Proposals for a 1-day topic session and a 1-day workshop were submitted for PICES-2019 (*AP-NPCOOS Endnote 3*).

AGENDA ITEM 11

FUTURE and AP-NPCOOS

The next discussion centered around how AP-NPCOOS fits into the PICES FUTURE program. AP-NPCOOS can play a role in each of the three main FUTURE goals:

Completed

- Hosted a summer school and a report focused on hands-on experiences on the data quality control and quality assurance obtained from coastal ocean observing system;
- Report from the third meeting of AP-NPCOOS at PICES-2017 (Vladivostok, Russia); short summaries of coastal ocean observing in each member country.

Anticipated products

- A 1-day topic session on coastal ocean observing systems and how they deliver on the recent Essential Biological and Ecological Ocean Variables:

- *Value:* Serves as focused discussion on how PICES coastal ocean observing aligns with ecosystem monitoring in order to deliver on the FUTURE science goals;
- An appropriate topic for the 2018 Annual Meeting (venue – Canada) where coastal ocean observing is well developed; include “community” observing from indigenous people and others.
- A 1-day workshop on bioacoustics:
 - *Value:* Bioacoustics is an effective way to measure upper trophic levels; these data sets are made valuable by having consistent measurement techniques, quality control and analysis in place;
 - Will allow PICES to coordinate with other bioacoustics efforts such as done by ICES.
- Summer school 2020 (tentatively 5 days):
 - Introduce the idea at the 2018 Annual Meeting, then submit full proposal in early 2019;
 - *Value:* Understand marine ecosystem response to climate change within a more focused view and train and educate early career scientists and students.
- A set of publications focusing on the examples of success stories to fulfill the regional and national needs via coastal ocean observing system efforts and to share hands-on experiences (continued):
 - *Value:* Develop and advise about best practices for coastal ocean observing systems.

AP-NPCOOS Endnote 1**AP-NPCOOS participation list**Members

Jack A. Barth (USA, Co-Chair)
 Charles Hannah (Canada)
 S. Kim Juniper (Canada)
 Sung Yong Kim (Korea, Co-Chair)
 Jae-Hak Lee (Korea)
 Vyacheslav Lobanov (Russia)
 Akash Sastri (Canada)
 Naoki Yoshie (Japan)
 Chuanxi Xing (China)

Members unable to attend

China: Manchun Chen, Zhongsheng Lin
 Japan: Hidekatsu Yamazaki

Observers

Sanae Chiba (Japan, MONITOR Vice-Chair)
 Alex Harper (CeNCOOS)

AP-NPCOOS Endnote 2**AP-NPCOOS meeting agenda**

1. Introduction of AP-NPCOOS (Co-Chairs Barth and Kim)
2. Introduction of AP-NPCOOS members
3. Discussion of how to fulfill AP-NPCOOS Terms of Reference
4. Report from FUTURE SSC (Vyacheslav Lobanov)
5. Summer School 2018 (Kim Juniper) and 2020 (Naoki Yoshie)
6. WMO/IOC ocean observing report cards: coastal ocean observing? (Jack Barth)
7. Essential Biological Ocean Variables (Sanae Chiba, GOOS BioEco Panel)
8. OceanObs'19 (Jack Barth)
9. Introduction to the Northern and Central California Ocean Observing System – CeNCOOS (Alex Harper, CeNCOOS Program Manager)

10. Coastal Ocean Observing Systems in PICES member countries (members); 15-minute presentation by each of 6 member countries (continued)
11. FUTURE and AP-NPCOOS
12. End

AP-NPCOOS Endnote 3

Proposals for PICES-2019

Topic Session on

“Coastal Ocean Observing Systems, Essential Biological Variables, and community-based monitoring”

Convenors: Charles Hannah, Canada, Charles.hannah@dfo-mpo.gc.ca (corresponding) Sung Yong Kim, Republic of Korea, syongkim@kaist.ac.kr Kim Juniper, Canada, kjuniper@uvic.ca

Co-sponsor:

Duration: 1 day

Invited speaker:

The goals of FUTURE require systematic and sustained observations of marine ecosystems, especially in the coastal regions where the interactions between humans and the marine environment are most intense. The goals also require the integration of physical, chemical and biological state of the ocean. The Advisory Panel on North Pacific Coastal Ocean Observing Systems is responsible for advising PICES on the linkages between coastal ocean observing systems and the PICES FUTURE Science Program, and the Pacific Ecosystem Status Report. We propose a Science Session that will assess the current state of coastal ocean observing systems in the north Pacific Ocean with respect to the biological and ecosystem Essential Ocean Variables (eEOVs) recently developed by the Global Ocean Observing System (Miloslavich *et al.* 2018 DOI: 10.1111/gcb.14108), and evaluate the potential for expanding the inclusion of eEOVs in coastal ocean observing in the North Pacific. The session will provide a basis for identifying gaps in observing systems relative to FUTURE’s goals of providing a synthesis of knowledge on : a) ecosystem resilience and vulnerability; b) ecosystems response to natural and anthropogenic forcing; and c) future ecosystem change. We invite contributions from researchers, community-based monitoring programs, and data managers that will address the questions: 1) which eEOVs should be measured; 2) does the technology exist to make the required measurements in a systematic fashion; 3) how do we integrate eEOVs into current and future coastal ocean observing programs?

Workshop on

“Synthesis of bio-acoustics programs for monitoring zooplankton and fisheries in the North Pacific”

Convenors: Lu Guan, Canada, lguan@uvic.ca (corresponding); Mei Sato, Canada, m.sato@oceans.ubc.ca; Hidekatsu Yamazaki, Japan (hide@kaiyodai.ac.jp) Invited

Co-sponsors: Ocean Networks Canada

Duration: 1 day

Invited speakers: TBD

Fixed and mobile echosounders offer greater temporal and vertical resolution for surveying and monitoring zooplankton and fish than traditional sampling. Our ability to extract biological information from echosounder backscatter has improved over the last 2 decades with the continued development and more widespread use of these instruments. Technical advancements include: the use of continuously powered (fixed-cabled) instruments for high-resolution, long term time-series; and improvements in multi-frequency and broadband instruments for fixed and mobile platforms which increase discrimination of backscatter targets on the basis of size, shape and in some instances, species. The goals of this workshop will be to share information on active acoustic biological monitoring programs in the North Pacific, and to form a community of practice to advance use of this tool for ecosystem monitoring. We encourage contributions describing: existing or proposed monitoring programs; instrument-specific applications; approaches for size-class or species identification; assessment of broader-scale trophic interactions; tools for processing large-volume acoustic data sets; and theoretical/modelling studies which take advantage of active acoustics data-sets.