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 20, 2019, in Victoria, Canada.   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 meeting participants at PICES-2019, Victoria, Canada. From left to right: Charles Hannah, Akash Sastri, Kim Juniper (Canada), Jack Barth (USA), Naoki Yoshie and Toru Kobari (Japan), Vyacheslav Lobanov (Russia), and Sung Yong Kim (Korea).

AGENDA ITEMS 2 AND 3
Introductions and Terms of Reference

The meeting started with members and observers introducing themselves. The Co-Chairs reviewed the goals for the meeting, meeting agenda (***AP-NPCOOS Endnote 2***), updated Terms of Reference which included a fourth term of reference (***AP-NPCOOS Endnote 3***), and plans for the upcoming year involving the newly prioritized Social-Ecological- Environmental Systems (SEES) framework in FUTURE. 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
FUTURE SSC update

Dr. Vyacheslav Lobanov reported the activities of the FUTURE Scientific Steering Committee (SSC). He presented a newly prioritized SEES approach in describing several case studies in the North Pacific (*e.g*., Extra-tropical impacts of ENSO, ocean acidification and deoxygenation ecosystem impacts, Tsunami impacts, Climate mitigation and geo-engineering, Marine mammal recovering populations). Several members of the FUTURE SSC participated United Nations (UN) Decade North Pacific Regional Workshop held from July 31 to August 2, 2019 as a part of UN Ocean Decade of Ocean Science for Sustainable Development (2021–2030). Many AP-NPCOOS goals and activities are in support of FUTURE goals.

AGENDA ITEM 5
2020 PICES Spring School

Dr. Naoki Yoshie provided members with a progress report on a PICES Spring School on "*Coastal ocean observatory science*" organized by AP-NPCOOS and Working Group (WG 37) on *Zooplankton Production Methodologies, Applications and Measurements in PICES Regions*.

(1) Primary plans
    a. Focus: Coastal ocean observatory science;
    b. Why: To understand the interactions between physical and biogeochemical environments and marine ecosystem in coastal regions
    c. When: March 4–8, 2020 (5 days)
    d. Where: Kagoshima University, Kagoshima, Japan
    e. Hosts: N. Yoshie (Ehime University, AP-NPCOOS, Chair of LOC), T. Kobari (Kagoshima University, WG 37), and Gen Kume (Kagoshima University)
    f. Lecturers: Daisuke Hasegawa (Tohoku National Fisheries Research Institute, Japan), Aiko Tachibana (Tokyo University of Marine Science and Technology, Japan), Gen Kume (Kagoshima University)
    g. Participants: max. 20 students and early career scientists;
    h. $15K support from PICES;
    i. Application deadline: November 15, 2019

See *AP-NPCOOS Endnote 4* for venue map and schedule. See PICES website at: https://meetings.pices.int/meetings/summer-schools/2020/Kagoshima/scope for more details.

AGENDA ITEM 6
Report on OceanObs'19

The Co-Chairs presented an overview and outcomes of OceanObs'19 held September 16–20, 2019 in Honolulu, Hawaii, and primary discussions in integrated ocean observations, respectively. Dr. Kim presented the structure of the meeting, including general information, daily themes, community white papers, and meeting recommendations, which will be substantiated as the living action plans in following UN decade meetings. Dr. Barth summarized the recommendations of three breakout sessions on integrated ocean observations and highlighted the scope of OceanObs'19 conference statement (*e.g*., from coast to open ocean) and essential ocean variables.

The coastal observing efforts of the following PICES member countries were reviewed in brief 7-minute presentations by members of AP-NPCOOS.

- Canada (S. 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).

- 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;
  - Fisheries Research Agency – 100-year-long time series of temperature; data regeneration using the data assimilation technique; chapter Y (Japan Coastal area);
  - Ocean acidification 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; a long-term monitoring of temperature, salinity, and nutrients.

- Korea (Sung Yong Kim)
  - Geostationary Ocean Color Imagery (GOCI-I; hourly during the day and 0.5 km resolution) and higher resolution GOCI-II expected. These satellite products are used for red tide monitoring and spatial observations of chlorophyll;
  - Buoys and Argo floats, tide gauges and coastal radar;
  - 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 coldwater sinks and hypoxia in Peter the Great Bay;
  - Seal tagged monitoring program (2018–2019);
  - NEAR-GOOS monitoring system.

- USA (Jack Barth)
  - US 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 harmful algal blooms (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);
  - US National Science Foundation Ocean Observatories Initiative (OOI) – Coastal Endurance Array;
  - Improvement of observational performance degradation with an anti-fouling tool of UV light.

AGENDA ITEMS 7 AND 8
Review of PICES Inventory Data Policy and updated Coastal Ocean Observing Systems and EOVs

Work plan for 2019–2020
- Essential Ocean Variables (EOVs) and PICES Data Policy
  o Continue collection of information from PICES member countries for EOVs table,
  o Make AP-NPCOOS efforts accessible on the Advisory Panel's PICES web page (*e.g.*, geographical maps of platforms and available data),
  o Report to TCODE/MONITOR our activities on data inventory; approach is to focus on a few "sentinel stations" where many EOVs are measured regularly; could be moorings and/or ship stations.
- Topics that AP-NPCOOS will get involved in (motivated by FUTURE case studies discussion)
  o Ocean acidification (OA)/deoxygenation ecosystem impacts,
  o Survey how will coastal communities be impacted (aquaculture),
  o Provide "outlook" for OA regionally.

AGENDA ITEM 9
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 themes:

Proposed sessions/Anticipated outcomes aligned with FUTURE goals
- A 1-day Topic Session on "*Applications of artificial intelligence to advance the understanding of North Pacific ecosystems*" at PICES-2020 (***AP-NPCOOS Endnote 5***)
  o *Value:* Introduce examples to turn huge 'data' into valuable 'information' to a broader audience with more science and meaningful applications; substantiated by interest from the AI/machine learning community on coastal ocean observations workshop at PICES-2019.
- 2020 PICES Spring School (Co-sponsored by AP-NPCOOS and WG 37; see Agenda Item 5)
  o *Value:* Understand contemporary techniques used in observatory science to assess physical, biological, chemical, and biogeochemical processes in the coastal ocean and train and educate early career scientists and students.

AP-NPCOOS Endnote 1

AP-NPCOOS participation list

Members	Members unable to attend
Jack A. Barth (USA, Co-Chair)	China: Manchun Chen, Zhongsheng Lin, Chuanxi Xing
Sung Yong Kim (Korea, Co-Chair)	Japan: Hidekatsu Yamazaki
Charles Hannah (Canada)	Korea: Jae-Hak Lee
S. Kim Juniper (Canada)	
Vyacheslav Lobanov (Russia)	Observers
Akash Sastri (Canada)	
Naoki Yoshie (Japan)	Kim Houston (Canada)
	Toru Kobari (Co-Chair WG 37, Japan)

AP-NPCOOS Endnote 2

AP-NPCOOS meeting agenda

1. Introduction of AP-NPCOOS (Jack Barth and Sung Yong Kim, Co-Chairs)
2. Introduction of AP-NPCOOS members
3. Discussion of how to fulfil AP-NPCOOS Terms of Reference (Jack Barth and Sung Yong Kim)
4. Report from FUTURE Scientific Steering Committee (Vyacheslav Lobanov)
5. Spring/summer school in 2020 (Naoki Yoshie)
6. Report on OceanObs'19
   – An overview (Sung Yong Kim)
   – Integrated Ocean Observations (Jack Barth)
   – EOVs and report card (Jack Barth/Sung Yong Kim)
7. Review of PICES Inventory Data Policy
8. Updated Coastal Ocean Observing Systems and EOVs in PICES member countries: 10-minute presentation by each of six member nations (members)
9. FUTURE and AP-NPCOOS
10. Visitor presentation if any
11. Summary of meeting, discussion, and next meeting plans
12. End

AP-NPCOOS Endnote 3

Addition of fourth Term of Reference

4. Review the PICES Data Inventory and identify data and/or data products developed under the direction of the AP-NPCOOS not currently recorded in the Data Inventory and inform MONITOR and TCODE, the TCODE Chair and the Secretariat.
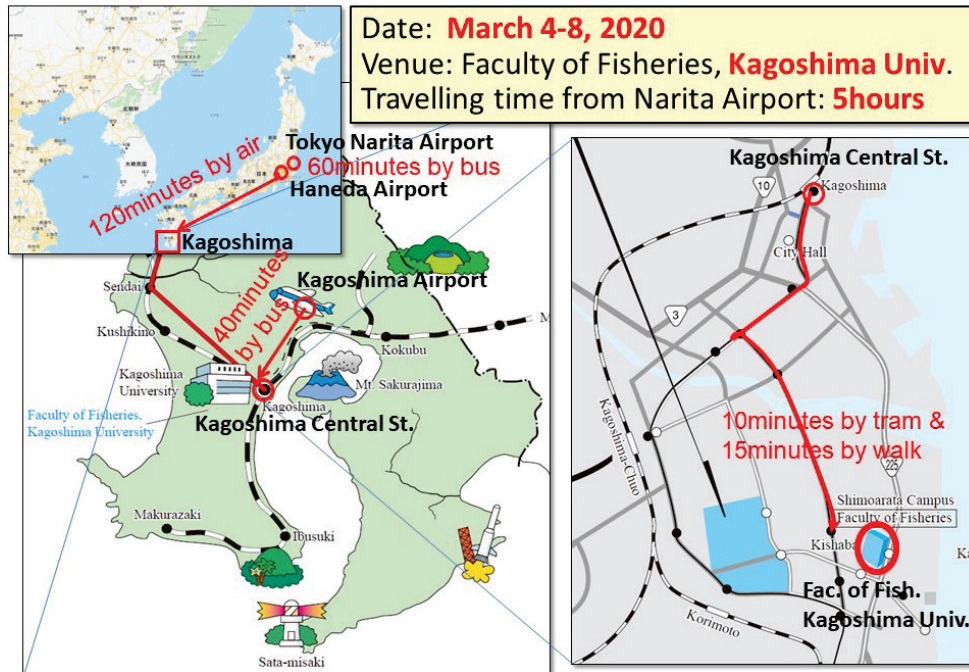
AP-NPCOOS Endnote 4

PICES Spring School

March 4–8, 2020
Kagoshima University, Kagoshima City, Japan

Venue

Schedule

Mar. 4	Mar. 5	Mar. 6	Mar. 7	Mar. 8
Travelling from Narita Airport (about 5hrs)	Group A, B, C 07:30-17:30 Onboard Observation T/S *Nansei Maru*	Group A, B, C 09:00-12:00 Seminar Three lectures 13:30-17:30 Laboratory works Data processing Measurements of Chl, Zoo, Fish	09:00-12:00 Laboratory works Data analysis Preparation of presentation	08:30-12:00 Presentation Each groups 15 minutes Q & A 10 minutes
15:00 Registration 15:30 Opening 16:00 Check in residence 16:30 Reception	Group D, E, F 09:00-12:00 Seminar Three lectures 13:30-17:30 Laboratory works Data processing Measurements of Chl, Zoo, Fish	Group D, E, F 07:30-17:30 Onboard Observation T/S *Nansei Maru*	13:30-18:30 Inspection Tour 1. Sakurajima volcano 2. Kagoshima aquarium	13:00-13:30 Closing

AP-NPCOOS Endnote 5

Proposals for a Topic Session on
"*Applications of artificial intelligence to advance the understanding of North Pacific ecosystems*"
at PICES-2020

Convenors: Charles Hannah (Canada) Naoki Yoshie (Japan), Igor Shevchenko (Russia), Jinkun Yang (China)

Duration: 1 day

Invited speaker: TBD

The development and application of artificial intelligence (AI) and machine learning to marine science issues is advancing rapidly. The combination of modern instrumentation with real time delivery, satellite data streams, biogeochemical model output, and shipboard data collection means that many marine ecosystems are data rich but information poor. AI offers the opportunity to speed up the process of turning data into information that can be used for decision making, but also has advantages over more traditional statistics for detecting patterns and offers the potential to find meaningful ecological relationships between ecosystem state variables for which there is no theoretical framework to connect them. For this session we encourage submissions that use AI for investigating the important drivers/variables in ecological datasets, as well as computer vision applications dealing, for instance, with satellite imagery, acoustics, plankton, and corals/sediment. We invite submissions at all levels of biological organization (individuals to ecosystems), and are particularly interested in studies that integrate different types of observation technology and data types. Papers focusing on methodological advancements, ecosystem applications and the data management processes required to get ecosystem related data into forms that make it easy to use the new tools. This session is not focused on a particular problem but rather seeks to have a lively session that would help identify more practitioners of these modern tools who are already working on PICES related problems. The proposed topic session is an outcome from the very successful PICES-2019 Workshop on Application of Machine Learning to Ecosystem Change Issues in the North Pacific. This Topic Session would continue the process of building an AI community within PICES. This session is a contribution to two of the PICES Strategic goals • Goal 4: Advance methods and tools. Machine learning and AI are new tools with enormous potential that should be explored in the PICES context. • Goal 6: Engage with early career scientists to sustain a vibrant and cutting edge PICES scientific community. Big data and AI represent the cutting edge of the process to convert data into information in the modern world; therefore, encouraging the development and application of these new tools is one way to attract early career scientists to PICES.

Potential support by: POC, TCODE, FUTURE