

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 annual meeting from 0900–1800 h on November 4, 2016, in San Diego, USA. Nine of 13 AP-NPCOOS members and 3 observers attended the meeting (*AP-NPCOOS Endnote 1*).

The AP-NPCOOS meeting was preceded by Workshop W7 on “*Delivering quality multi-parameter data from the coastal ocean*” held from 0855 to 1800 h on November 3 (for a summary of W7, [Session Summaries](#) in the [2016 PICES Annual Meeting Report](#)).

AGENDA ITEMS 1, 2, 3

Introductions and Terms of Reference

The meeting started with all members and observers introducing themselves. This was followed by the Co-Chairs, Drs. Jack Barth and Sung Yong Kim, describing the AP-NPCOOS Terms of Reference and goals for the meeting and the upcoming year *AP-NPCOOS Endnote 2* and *AP-NPCOOS Endnote 3*. The Co-Chairs noted that with Workshop W7 and the AP-NPCOOS business meeting, progress was already being made 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 briefed AP-NPCOOS on the activities of the Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems (FUTURE) Scientific Steering Committee (SSC), of which he is a member. 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 that we must all work to establish strong linkages among FUTURE, the FUTURE SSC and the existing PICES expert groups, of which AP-NPCOOS is one. In particular, he asked AP-NPCOOS members to think about how AP-NPCOOS fits into the FUTURE conceptual diagram. AP-NPCOOS recommends that “AP-NPCOOS” be added to the FUTURE diagram.

FUTURE and AP-NPCOOS

AP members discussed how AP-NPCOOS fits into the PICES FUTURE program. AP-NPCOOS can play a role in each of the three main FUTURE goals:

- List of best practices for sensor selection, deployment, biofouling mitigation, calibration, and data quality control (including URLs)
Value: “one stop shopping” for PICES member country coastal ocean observing efforts
- Report on “principles” of successful coastal ocean observing, including how to build an observing system with a diverse set of participants but a common goal
Value: speed up ability of coastal ocean observing systems to provide information critical to FUTURE goals

AGENDA ITEM 5

Coastal Ocean Observing Systems in PICES member countries

The coastal observing efforts of six 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
 - Data format, ISO conventions, Data delivery, and datum issues for sea level observations
- USA (Jack Barth)
 - North Pacific regional COOS - NANOOS, CeNCOOS, SCCOOS, AOOS
 - Monitoring ocean acidification, HAB, and visualizing climatology
 - Collaborated glider observations across the regional programs
 - OOI – Endurance Array includes cabled, onshore, and offshore platforms for monitoring
 - Best practice examples of NOAA Alliance for Coastal Technologies (ACT) and Quality Assurance of Real Time Ocean Data (QARTOD)
- 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
 - Three marine platforms off west coast of Korea
 - Early operational stages (test) of wave gliders and subsurface gliders
- Japan (Hide Yamazaki and Naoki Yoshie)
 - Three major resources of ocean observations – Japan Oceanographic Data Center (JODC), Marine Information Clearing House (MICH), and Japan Meteorological Agency
 - 9 major universities operate 21 research vessels (R/Vs) for oceanographic research and education; 3 major agencies operate 27 RVs
 - ROV/AUV (unmanned underwater vehicles) are in development and operation.
- Russia (Vyacheslav B. Lobanov)
 - Primary regions for ocean observations – Japan/East Sea (Collaborated sampling lines), Peter the Great Bay (seasonal surveys and mooring), and Okhotsk Sea (oil and gas, tsunami studies):
 - Wavescan oceanographic buoy (deployed in November 2015)
- China (Chuanxi Xing)
 - Coastal Ocean Observing System using mooring network in Bohai Sea

AGENDA ITEM 6

AP-NPCOOS issues and next steps

After the summaries of PICES countries coastal ocean observing efforts and discussion on the documentation of hands-on experiences, the AP-NPCOOS discussed the need for action on several topics.

Handbook of Best Practices from the European FixO3 project

Dr. Kim introduced an example of best practices from the Europeans – “Fixed-Point Open Ocean Observations O3” and Dr. Barth discussed potential ways that AP-NPCOOS members could document their hands-on experiences in their North Pacific coastal ocean observing systems.

PICES Summer School

The discussion on AP-NPCOOS-hosted summer school on coastal ocean observing systems led to the following recommendations:

- 2018 summer (will seek official approval from Science Board):
 - can be hosted in Canada;

- will be patterned after the 2013 summer school in Newport, Oregon, which had U.S. NSF support, used OSU facilities and dorms;
- other funding resources;
- 36 participating students (see the PICES website for the [2013 Summer School](#) on “*Ocean observing systems and ecosystem monitoring*”);
- The next meeting, either in 2019 or 2020:
 - the host country should be from the west side of the North Pacific;
 - host will need to provide marine facilities (classrooms, labs, small vessel, access to seawater), funding, teaching and assistant staff, and lodging;
- For approval by Science Board/Governing Council, the summer school proposal is required to be submitted 18 months prior to the workshop dates; we discussed whether every other year would be more practical, but every year would alternate east and west every other year;
- Interested in the 2019 or 2020 summer school: Russia, Japan, Korea; China needs to seek approval.

Proposals for PICES-2017

AP-NPCOOS agreed to propose a topic session for the next PICES Annual Meeting in Vladivostok, Russia (see *AP-NPCOOS Endnote 4*).

Inter-sessional activities

AP members discussed the desire to hold any inter-sessional activities this coming year and it was decided to not hold any inter-sessional meetings or workshops while the AP was just getting spun up. Instead, AP-NPCOOS will work on the planned activities below.

AP-NPCOOS planned activities, outcomes and recommendations

AP-NPCOOS discussed activities and desired outcomes for the following year, and made the following recommendations:

Recommendation: AP-NPCOOS agreed to pursue writing a set of journal articles for publication in the *Journal of Operational Oceanography* describing our coastal ocean observing system in individual PICES countries. These would describe the unique stories of how the coastal ocean observing systems were created, the goals they seek to address, and how they are constructed and maintained. AP-NPCOOS will discuss an agreed upon submission date via email. The goal will be to collect them, perhaps with a brief introduction, and submit before the next PICES Annual Meeting in September 2017.

Recommendation: Since AP-NPCOOS members were unanimous about the need to educate the next generation of coastal ocean observers, it was decided to conduct a survey of classes, cruises, summer schools and other teaching and training efforts on coastal ocean observing taking place in PICES member countries.

Recommendation: Based on the need for regular training of the next generation of coastal ocean observers and the success of the 2013 PICES-sponsored summer school on “Ocean observing systems and ecosystem monitoring” held in Newport, Oregon, AP-NPCOOS recommended that PICES sponsor an annual coastal ocean observing summer school that rotates around the PICES countries. This could start in 2018. The PICES Secretariat would provide some organizational support and help arrange travel funds. The host country would be responsible for helping support the on-site summer school costs. It was noted that a survey should be conducted with students after they complete the class to see how they are using what they learned in their research and job activities. Dr. Kim Juniper from Ocean Networks Canada (ONC) expressed interest in ONC helping to support the annual summer school in some way. Subsequent to the AP-NPCOOS meeting, he formulated a proposal for holding a 2018 Summer School in Canada and it was submitted to Science Board for approval.

Recommendation: AP-NPCOOS members recognized that the list of standard variables that are universally measured include sea level, temperature, salinity, currents, and chlorophyll-fluorescence. It is important that other more ecologically directed ocean variables be measured too. What are these next ecological/biological variables?

Perhaps dissolved oxygen, pH/pCO₂/alkalinity, and/or something about zooplankton and fish? It was recognized that many international organizations are working on identifying “Ecological Essential Ocean Variables (eEOVs).” AP-NPCOOS agreed to find out recent progress by other organizations (GOOS, GEO programs, Framework for Ocean Observations, *etc.*). The next step would be to review how PICES member countries measure these variables and to standardize across our observing efforts. This should be done in coordination with MONITOR, TCODE, BIO, POC, *etc.* AP-NPCOOS could provide advice to PICES member countries on how they might make and standardize measurements. AP-NPCOOS should advise PICES to be part of this internationally agreed set of EOVs once consensus is further along. Tony Koslow and Andrew Ross (Fisheries and Oceans Canada) agreed to help get this activity started.

AP-NPCOOS membership

AP-NPCOOS unanimously recommended Dr. Naoki Yoshie (Japan) to be added as a member of AP-NPCOOS. AP-NPCOOS will bring this request to MONITOR and TCODE.

Miscellaneous

AP-NPCOOS discussed some miscellaneous topics, but they were not acted upon. They are listed here for potential future action:

- How much of western Pacific PICES countries’ data goes into NEAR-GOOS? What are the minimum useful data that should go into NEAR-GOOS?
- Recommendation to collect basic environmental data from fisheries surveys; identify existing surveys that have this data and those surveys that should have them added;
- Map coastal ocean observing motivators (fisheries, pollution, shipping, erosion, storm surge, *etc.*) with FUTURE goals;
- Inventory of time series that are long enough to provide trends;
- Coastal weather stations (inventory, capability, data to weather centers, *etc.*).

AGENDA ITEMS 7 AND 8

Tour of Scripps

The AP-NPCOOS meeting concluded with a tour to the Scripps Institution of Oceanography’s Nimitz Marine Facility, located at Point Loma, to tour the newest U.S. oceanographic research vessel the R/V *Sally Ride*. The tour then visited the Coastal Data Information Program (CDIP), the Southern California Coastal Ocean Observing System (SCCOOS), an underwater glider laboratory (Prof. Daniel Rudnick) and a mooring Laboratory (Dr. Uwe Send), all located at the Scripps Institution of Oceanography. It was agreed by all AP-NPCOOS members that the tours were very helpful in learning about and comparing best practices for coastal ocean observing.



Introduction to the R/V *Sally Ride* during the AP-NPCOOS tour (left) and R/V *Sally Ride* (right).

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

Jack Barth (U.S.A., 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)
 Chuanxi Xing (China)
 Hidekatsu Yamazaki (Japan)

Members unable to attend

China: Manchun Chen, Zhongsheng Lin,
 Wenhai Lu, Yingze Sun

Observers

Marlene Jeffries (Ocean Networks Canada)
 Naoki Yoshie (Japan)
 Genki Terauchi (NOWPAP)

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

1. Introduction of AP-NPCOOS (Co-Chairs Barth and Kim)
2. Introduction of AP-NPCOOS members (members)
3. Discussion of how to fulfill AP-NPCOOS Terms of Reference
4. Report from FUTURE SSC (Lobanov)
5. Coastal Ocean Observing Systems in PICES member countries (members); 15-minute presentations by 3 member countries
6. Discussion of AP-NPCOOS issues, questions (below), the “Handbook of Best Practices” from the European FixO3 project, and next steps
7. Transit to Scripps Institution of Oceanography (SIO) and NOAA Southwest Fisheries Science Center (SWFSC) (transportation provided)
8. Tour Southern California Coastal Ocean Observing System (SIO, SCCOOS) and CalCOFI (SWFSC)
9. End

*AP-NPCOOS Endnote 3***Preparation materials in advance of AP-NPCOOS meeting****1) Questions to consider for our AP-NPCOOS Annual Meeting**

- What are “best practices” for coastal ocean observing platforms, sensors and sensor calibration, data quality control, user interfaces to data and information products, data delivery to users, data archiving? (Term of Reference #1)
- How can AP-NPCOOS advise/assist FUTURE? (Term of Reference #3) FUTURE is the PICES Scientific Program “[Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems](#)”
- What is relationship of AP-NPCOOS and CREAMS? And MONITOR? And TCODE?
- How might AP-NPCOOS advise/assist PICES in preparation of the North Pacific Ecosystem Status Report (<http://pices.int/projects/npesr/default.aspx>)? (Term of Reference #3)
- How might AP-NPCOOS relate to global programs like GOOS, Argo, POGO, etc? It might be helpful to visit the GOOS page (<http://www.ioc-goos.org/>). (Term of Reference #3)
- What are the motivations and applications for your country’s coastal ocean observing (e.g., fisheries, shipping, aquaculture, etc.)?

- What is unique to AP-NPCOOS that is not being covered elsewhere in PICES or internationally? For example, AP-NPCOOS is definitely “coastal,” but what about other unique aspects?
- What open-ocean observing assets are most relevant to your coastal issues and how are they linked into your coastal ocean observing systems? If they are not lined in efficiently, how might that be done?

2) Request for materials in advance of AP-NPCOOS meeting. Due to Co-Chairs by October 28, 2016.

- Please provide a map and list of updated coastal ocean observing assets for your country. This might include moorings, shore stations, ship-based measurements (especially cross-shelf sections), autonomous vehicles, cabled observatories, etc. Please include the list of sensors and variables that are being measured, and how frequently they are observed. We know this is a big effort, but ask that you do the best you can to provide an overview and as many details as possible. We can build on these maps and lists over time.
- Please provide a list, either from your country or ones you know of internationally, of “best practices” documents. These might include documents on sensor maintenance, calibration, quality control, data delivery, etc. Examples include the “[PICES Special Publication 3: Guide to best practices for ocean CO₂ measurements](#)”) or the documents produce by the US NOAA-IOOS Quality Assurance of Real Time Oceanographic Data project (<https://ioos.noaa.gov/project/qartod/>).
- Please provide a list of technical groups, meetings, workshops in each country that deal with coastal ocean observing and provide their contact information.

AP-NPCOOS Endnote 4

**Proposal for a 1-day Topic Session on
“Acute impacts on coastal ocean ecosystems: How do we best measure, monitor, understand and predict?”
at PICES-2017**

Convenors: Akash Sastri (Canada), Naoki Yoshie (Japan)

Potential Committee co-sponsors: MONITOR, TCODE, MEQ, POC and BIO

Acute impacts on coastal ocean ecosystems by, for example, by harmful algal blooms, hypoxia, ocean acidification, and chronic warming, are prevalent in North Pacific coastal waters. These can occur both in semi-enclosed basins and open coastal areas, and in regions with and without strong anthropogenic impact. These acute impacts share a common characteristics in that they all involve linked physical, biological, and chemical processes as well as, in some cases, human-related actions. To achieve a complete understanding of these acute impacts on coastal ocean ecosystems requires multi-parameter observations from a variety of in-water platforms. Measurements include those from physical, chemical and biological sensors and from discrete water samples and net tows. Time series are necessary to define the time scale of the acute impact and the seasonal and interannual conditions present at the time of the impact. These critical in-water measurements are often combined with remotely sensed observations and with numerical models to gain further understanding of the origin and evolution of the acute impacts. We invite contributions that identify acute impacts on coastal ocean ecosystems in North Pacific coastal waters and that use multi-sensor time series and models to understand and predict these phenomena. Contributions may include the description of multi-parameter coastal ocean observing systems designed to address the causes and evolution of acute impacts on coastal ocean ecosystems. We are particularly interested in studies that address these acute coastal ocean ecosystem impacts from a transdisciplinary point-of-view.