

## Report of the Advisory Panel on *Marine Non-indigenous Species*

The Advisory Panel on *Marine Non-indigenous Species* (AP-NIS) met for the third time at PICES-2019 on Sunday October 20, 2019 from 09:00-17:45 in Victoria, British Columbia, Canada. Dr. Therriault (Canada) was confirmed as the Chair for AP-NIS at the 2019 inter-sessional Science Board meeting in Yokohama, Japan.

Dr. Therriault called the meeting to order and following introductions, members/observers (*AP-NIS Endnote 1*) adopted the draft agenda (*AP-NIS Endnote 2*) with the addition of one item under Agenda Item 13, Other Business, related to the TCODE committee request to review and update AP-NIS-related data inventories. The Terms of Reference (ToR) for AP-NIS were reviewed as per Agenda Item 3 and no changes were suggested at this time although the AP recognizes that an updated ToR around the new PICES Data Policy and data management will likely be required for PICES-2020 in China.



Participants of the AP-NIS meeting at PICES-2019. From left: Tatsuya Yurimoto, Kyoungsoon Shin, Jeanette Davis, Thomas Therriault, Keun-Hyung Choi, Toyomitsu Horii, Weol-Ae Lim, Yuka Murayama, Hideaki Maki.

### AGENDA ITEM 2

#### **Recognition of PICES Special Publication from ADRIFT project**

PICES has been very active on non-indigenous species (NIS) issues since WG 21 (*Non-indigenous Aquatic Species*) was created at PICES-2005 in Vladivostok. Dr. Therriault highlighted the recently published [PICES Special Publication 6](#) from the ADRIFT (Assessing the Debris Related Impact From the Tsunami) project and noted the special display in the reception area hosted by the Royal British Columbia Museum which is the custodian for another ADRIFT legacy product, which is the collection of organisms encountered on Japanese Tsunami Marine Debris (JTMD).

### AGENDA ITEM 3

#### **Review AP-NIS Terms of Reference**

While reviewing the ToR, members discussed the intent of hosting NIS-related workshops and topic sessions, including joint/shared events with partner organizations (e.g., ICES, NOWPAP, etc.). At

PICES-2019 AP-NIS hosted a very successful workshop on monitoring and early detection of NIS (W9; see [Summary of Scientific Sessions and Workshops at PICES-2019](#)) that was co-convened by AP-NIS members Drs. Therriault (Canada), Davis (USA), and Kawai (Japan). In addition, several AP-NIS members participated in W13 (*New frontiers: The application of molecular approaches in marine ecology and fisheries science*) where early detection of NIS was highlighted. Thus, AP-NIS drafted a topic session proposal for PICES-2020 in Qingdao, China (**AP-NIS Endnote 3**) to further explore eDNA for NIS applications. This is a rapidly growing field that many PICES member countries are already engaged in. For example, both Canada (DFO) and the United States (NOAA, DOI, USGS) have various eDNA working groups and the topic was deemed highly relevant by all PICES member countries represented at the AP-NIS business meeting.

#### AGENDA ITEM 4

##### **Information sharing on NIS within PICES and beyond (ToR 1)**

ToR 1 for AP-NIS is “Continue to share information on marine non-indigenous species (NIS) in the North Pacific via an updated NIS database”. At PICES-2018 in Yokohama, Japan, AP-NIS agreed the best way forward was to utilize the AquaNIS database that is supported and used within ICES and has the ability to encompass NIS records for the North Pacific. AP-NIS recognizes that although it will likely be impossible to revive the WG 21 database to extract records, it may be possible to use the accompanying [Atlas of Non-indigenous Marine and Estuarine Species in the North Pacific](#) to ensure important NIS records are not missed. Ultimately it will be up to each member country to ensure the completeness and accuracy of NIS records for their respective ecoregions. AP-NIS can serve as a review committee for unclear or disputed records. Some NIS records have already been uploaded in AquaNIS and AP-NIS members agreed to have additional records from each country available for upload by PICES-2020. Recognizing resource and logistical challenges, it was noted that uploading all records will take some time and it was suggested this could be done using a phased approach on a taxa by taxa basis (*e.g.*, molluscs, ascidians, *etc.*) focusing first on the easily obtained information. Although records can be uploaded at an AP member’s convenience, this topic will be discussed by the Working Group on Introductions and Transfers of Marine Organisms (the relevant ICES WG host for AquaNIS) at their meeting in Poland in March 2020, which is a good target date for the next iteration of PICES updates. Dr. Therriault agreed to work with Dr. Sergej Olenin and his team to resolve any technical issues that may arise. Also, it appears AquaNIS currently does not support NIS images so Dr. Therriault will explore options to either have images embedded with records or linked (when available).

#### AGENDA ITEMS 5 AND 6

##### **Changing NIS distributions and pathways (ToR 3) and Policy, Regulation and Management of NIS in the North Pacific (ToR 2)**

At PICES-2018 AP-NIS agreed that it was important to exchange information around four key topics related to Changing NIS distributions and pathways (ToR 3) or Policy, Regulation and Management of NIS in the North Pacific (ToR 2). These included: 1) New introductions of marine NIS, 2) Spread of existing/known marine NIS, 3) Vectors and pathways, and 4) Management and policy. Each country provided their respective updates under these Agenda Items and included information not already presented about NIS records uploaded to AquaNIS or other databases. Although a standardized reporting template has been discussed, AP members are still considering the most effective way to do this. At PICES-2019 no member country had detected a “new” NIS but several countries reported the spread of existing ones. Of note, Canada reported the continued spread of European Green Crab in the Salish Sea and NIS tunicates on the North Coast of British Columbia. Despite control efforts for *Spartina* in Korea, this species continues to spread and has altered important mudflat habitats. In some cases the source of propagules remains unknown and could be spreading from established populations elsewhere in Korea or

China. Jellyfish blooms continue to be an issue in Asian marginal seas and citizen science/fisher engagement has resulted in more accurate sightings information. Poisonous jellyfish are of particular concern in Korea. In Japan, a tunicate (*Asciella aspersa*), a pycnogonid (*Nymphonella tapetis*) and a gastropod (*Laguncula pulchella*) are spreading around bivalve aquaculture sites. Within the US, NIS algal mats have plagued some coral reefs in Hawaii as spread continues despite management interventions. Overall, shipping, especially biofouling issues, are the most pressing vector/pathway challenge for AP-NIS member countries. Although international ballast water is now required to be treated under the IMO Convention, biofouling is not. Further, most PICES member countries have identified increased shipping as a risk, both from international and domestic sources that would include fishing vessels and recreational boats. This topic will be discussed in more detail at a future meeting. Also, ICES has produced a [viewpoint article](#) on biofouling that should be of interest to the PICES community and something similar could be developed by PICES.

#### AGENDA ITEM 7

##### **Best Practices (ToR 2)**

ToR 2 states the need to exchange information on “best practices for monitoring, early detection, rapid response, and control/containment options”. At PICES-2018 AP-NIS members agreed that the initial focus would be on monitoring and early detection and that rapid response and control would be the focus in the second phase (likely post-2020 or beyond). Thus, as noted in Agenda Item 3, a workshop was held at PICES-2019 to better understand the types of NIS monitoring taking place in member countries. In addition to any recommendations that may arise from the workshop, AP-NIS agreed it was important to have a list of priority species (and vectors/pathways) for discussion at PICES-2020. This will allow the identification of mutual species of interest and allow expertise on these species to be exchanged among PICES member countries. It is anticipated this will lead to the development of topical materials (*e.g.*, white papers, brochures, education/outreach materials) around such topics as NIS impacts, distributional changes, biosecurity, and seafood safety that can be used both within and outside the PICES community.

#### AGENDA ITEM 8

##### **Workshops/topic sessions/training courses**

The AP discussed previous NIS activities and developed a proposal for a 1-day topic session to be convened at PICES-2020 (see Agenda Item 3). It was noted how much discussion at PICES-2019 had focused on the Arctic, typically beyond the PICES domain, and that the Arctic Council via two of its working groups (PAME and CAFF) had developed a NIS Strategy for the Arctic. AP-NIS members suggested PICES was well positioned to help with implementation given experience and previous products developed, and suggested broader engagement with these groups where possible. Dr. Therriault also provided an update on the United Nation’s Second World Ocean Assessment for which he is the convenor for Chapter 25 on Non-indigenous Species.

#### AGENDA ITEM 9

##### **AP-NIS Special Project**

AP-NIS discussed options for a special research project. Previous PICES NIS activities have benefitted from directed outside funding (*i.e.*, MarWeB and FishGIS via MAFF or ADRIFT via MOE in Japan) but there is currently no such fund for new NIS work. There is some scope for low-cost activities building on work already underway by AP-NIS members. For example, there is work around biofouling, and several PICES member countries have some domestic capacity for NIS detection in ports or other high-risk marine environments. These can be discussed in more detail at the next AP-NIS meeting at PICES-2020. Once

member countries have had a chance to update NIS records in AquaNIS (see Agenda Item 4), there is the possibility to conduct novel research on North Pacific marine invasions.

It was suggested that AP-NIS establish a simple means to exchange information on upcoming NIS meetings, workshops, symposia, and conferences that could allow additional exchanges among AP-NIS members. Dr. Therriault agreed to discuss possible options with the PICES Secretariat about hosting a members-only webpage where such information could be maintained and exchanged.

AGENDA ITEM 11

**Funding requests**

See Agenda Item 8.

AGENDA ITEM 12

**World Ocean Assessment 2**

See Agenda Item 8.

AGENDA ITEM 13

**Other business**

As the FUTURE SSC liaison with AP-NIS, Dr. Therriault provided an update on FUTURE activities. Further, he introduced the MEQ Action Plan for comment and the PICES Data Policy and request to review/populate the PICES data repository. It appears the NIS-related databases have been captured in the inventory already and submissions to AquaNIS are not currently within scope for the inventory as PICES is not the primary organization responsible. The potential implications of this should be discussed at PICES-2020 to ensure AP-NIS is adhering to the intent of the PICES Data Policy.

***AP-NIS Endnote 1***

**AP-NIS participation list**

Members

Thomas Therriault (Canada, Chair)  
Keun-Hyung Choi (Korea)  
Jeanette Davis (USA)  
Weol-Ae Lim (Korea)  
Kyoungsoon Shin (Korea)  
Tatsuya Yurimoto (Japan)

Members unable to attend

China: Lijun Wang, Li Zheng  
Japan: Masaya Katoh, Hiroshi Kawai

Observers

Hideaki Maki (Japan)  
Yuka Murayama (JANUS)  
Toyomitsu Horii (Japan)

*AP-NIS Endnote 2***AP-NIS meeting agenda**

1. Welcome, introductions, opening remarks
2. Recognition of PICES Special Publication from ADRIFT project
3. Review AP-NIS ToR
4. Information sharing on NIS within PICES and beyond (ToR 1)
  - a. **Action Item** from PICES-2018: Members to have some records for review and upload to AquaNIS
  - b. Discuss any challenges related to record gathering/reporting for AquaNIS
5. Changing NIS distributions and pathways (ToR 3)
  - a. **Action Item** from PICES-2018: Members to report:
    - i. New introductions of marine NIS
    - ii. Spread of existing/known marine NIS
    - iii. Vectors and pathways updates
  - b. Discuss options for reporting template (could also include 6a)
  - c. Discuss possible Pacific Basin Environmental Niche Modeling
6. Policy, Regulation and Management of NIS in the North Pacific (ToR 2)
  - a. **Action Item** from PICES-2018: Members to report:
    - i. Management and policy updates
  - b. Updates from IMO activities
7. Discussion on Best Practices (ToR 2)
  - a. Risk Assessments (**Deferred**)
    - i. Rapid/Screening/Detailed
    - ii. Potential implications for trade
  - b. For Monitoring/Early Detection (Current Focus)
    - i. Traditional surveys, eDNA, *etc.*
    - ii. National programs vs. citizen science
    - iii. Outcomes from Workshop at PICES-2019 (W9)
    - iv. Discuss possible systematic monitoring among PICES member countries
    - v. Discuss possible education/outreach materials for NIS Monitoring
  - c. For Rapid Response (**Deferred**)
    - i. Past experiences with NIS incursions
    - ii. Use/support for Incident Command Systems
    - iii. Lessons learned/new approaches
  - d. For Management/Control (**Deferred**)
    - i. Existing or planned control of NIS in the North Pacific
    - ii. Lessons learned/new approaches
8. Potential for hosting workshops/topic sessions/training courses, *etc.*
  - a. Potential to host workshop/topic session at PICES-2020 (China)
  - b. Potential to host topic session at MBIC-2021 (USA)
  - c. ICES/PICES/NAFO Shellfish Symposium (Norway)
  - d. Potential capacity building activities (WG 21 did some of this)
  - e. Potential to collaborate with other groups (*i.e.*, ICES/NOWPAP, *etc.*)
    - i. ICES is thinking of hosting an eDNA workshop for NIS monitoring in 2020 or 2021
9. Discussion of a Special Project to be undertaken by AP-NIS
  - a. Possible focus on biofouling issue in the North Pacific
  - b. Possible species or vector of common interest
10. Develop draft Workplan for AP-NIS
11. Discuss potential info/funding requests for MEQ

12. Update on World Ocean Assessment 2
  - a. Chapter specifically devoted to Marine Invasive Species (Chapter 25)
13. Other business
14. Adjourn

*AP-NIS Endnote 3*

**Proposal for a Topic Session on “*Using eDNA to assess and manage  
Non-indigenous species in the North Pacific*”  
at PICES-2020**

Convenors: Jeanette Davis (USA), Keun-Hyung Choi (Korea), Thomas Therriault (Canada), Satoshi Nagai (Japan)

Duration: 1 day

Non-indigenous species (NIS) cause ecological and/or economic harm and are a threat to biodiversity. The spread of aquatic NIS has increased in the last decade due to globalization and other related human activities and preventing all introductions is not possible. Thus, early detection is the most valuable cost-effective control and eradication option, yet many species are difficult to detect using traditional survey techniques, especially over large spatial areas. The use of environmental DNA (eDNA) as a new and rapidly growing tool to detect, monitor, and quantify species for biodiversity and conservation management is of considerable interest. In comparison to traditional methods, eDNA sampling is more sensitive, less harmful to the environment, cost-effective, safer for both species and field staff, and more targeted for identifying species of interest. Therefore, eDNA is a promising tool for early detection of NIS. However, the effectiveness for this technique across many NIS taxonomic groups and habitat types is unexplored and could have important management implications. This topic session will explore the use of eDNA to detect and assess NIS status in the North Pacific. The goal is to evaluate the landscape of how eDNA monitoring is being applied in the NIS community globally and to share information relevant to management and policy. Since different environments and species will require different sampling standards, there are potential opportunities for lessons learned and shared methodologies for data collection, analyses, and comparison.