

## **The Working Group on *Non-indigenous Aquatic Species***

The Working Group on *Non-indigenous Aquatic Species* (hereafter WG 21) held its seventh meeting October 17, 2012 under the chairmanship of Ms. Darlene Smith who presented opening remarks and welcomed participants. WG 21 members from four PICES member countries (Canada, Japan, Korea and the United States) and observers from the Northwest Pacific Action Plan (NOWPAP) attended (*WG 21 Endnote 1*). The agenda for the meeting can be found in *WG 21 Endnote 2*.

### AGENDA ITEM 2

#### **NOWPAP alien species workshop**

Dr. Sangjin Lee provided an overview of NOWPAP activities related to aquatic invasive species. NOWPAP has developed a Medium Interim Strategy 2012–2017 that comprises five areas of focus of which “biodiversity conservation” is of most relevance to WG 21. The biodiversity conservation focus includes:

- information sharing on current situation with biodiversity, including Marine Invasive Species (MIS) and
- application of international regulations for the prevention of alien species invasions.

NOWPAP has initiated a project to hold a regional workshop on “*MIS problems in northwest Pacific region*”. The funding is from the Asia-Pacific Network for Global Change Research. The workshop will be held October 23–24, 2012, in Qingdao, China. Experts from China, Japan, Korea and Russia will participate. The workshop objectives are to:

- exchange information on MIS problems among officials and experts from NOWPAP member states;
- exchange experiences on the prevention and control of MIS problems among officials and experts from NOWPAP member states;
- analyze the needs for policies and measures on MIS problems and recommendations for NOWPAP member states.

Specific topics to be discussed are:

- the current situation of MIS problems in the NOWPAP region;
- experiences and good practices on the prevention and control of MIS problems;
- challenges in prevention and control of MIS problems;
- needs for policies and measures on MIS problems in NOWPAP member states; and
- necessity and ways of cooperation among NOWPAP member states for the prevention and control of MIS problems in NOWPAP region.

### AGENDA ITEM 3

#### **Ballast water monitoring in Korea**

WG 21 member, Dr. Jung-Hoon Kang from the Korean Institute of Ocean Science and Technology (KIOST), provided a presentation on a Planning Project launched September 12, 2012. Under this project 12 ports are to be monitored for 5 years. The project’s objectives are to obtain historical and current data required for risk analysis to control and reduce the hazardous effects of foreign species.

### AGENDA ITEMS 4, 5 AND 6

#### **MAFF-funded projects – final update**

A final project report was submitted to the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF).

A brochure on the PICES Non-indigenous Species Information System, the Atlas of Non-indigenous Marine and Estuarine Species in the North Pacific, and Rapid Assessment Survey Projects were also published.

*Atlas and database*

Dr. Deborah Reusser gave a demonstration of the PICES Nonindigenous Species Information System and the Atlas of Nonindigenous Marine and Estuarine Species in the North Pacific. The database and atlas have been finalized and are available online at the *Coastal Biological Risk Analysis Tools (CBRAT)* website: [https://cbrat.nationalatlas.gov/PICES\\_NISIS\\_download.html](https://cbrat.nationalatlas.gov/PICES_NISIS_download.html). The database and atlas can be accessed as follows:

The PICES Non-indigenous Species Information System

View the install instructions for the PICES\_NISIS Database. The database is a .zip file. Once downloaded, you will need to unzip it and then follow the install instructions for the appropriate operating system. View the Users Guide and Metadata for the PICES\_NISIS Database.

The Atlas of Non-indigenous Marine and Estuarine Species in the North Pacific

This atlas provides summary information on the species in the PICES\_NISIS Database along with statistical analyses for the North Pacific regions on the distributions of non-indigenous species at the ecoregion and regional scale for the six North Pacific Marine Science Organization (PICES) member countries. Articles will be prepared for PICES Press to publicize the database and atlas. The metadata for the database and atlas will be entered into the TCODE information system. The data will be included in the Species at Risk to Multiple Climate Stressors (risk analysis tools) on the CBRAT website. It is anticipated that experts will be able to add additional NIS records in 2013 and that general public access will be available in 2014. Canada noted that it benefited greatly from information in the PICES NIS database to develop responses to non-indigenous species that arrived on debris resulting from the March 11, 2011 Tōhoku earthquake and tsunami.

*Taxonomy project*

The final Rapid Assessment Survey Demonstration Workshop was held February 8–9 at the Seikai National Fisheries Research Institute of the Fisheries Research Agency in Nagasaki, Japan. The workshop was co-vened by:

- Dr. Takeo Kurihara, Seikai National Fisheries Research Institute, Japan,
- Dr. Suchana (Apple) Chavanich, Chulalongkorn University, Thailand and WESTPAC,
- Dr. Sangjin Lee, NOWPAP,
- Dr. Thomas Therriault, Fisheries and Oceans Canada.

Approximately 25 participants from 7 countries (China, Indonesia, Japan, Korea, Philippines, Thailand and Vietnam) participated in the workshop.

AGENDA ITEM 7

**Review of final WG 21 report**

A draft of the final report was reviewed and suggestions made for completion. The revisions will be forwarded to all Working Group members for comment prior to finalization.

AGENDA ITEM 8

**Discussion and recommendations for future NIS activities in PICES**

Having completed its original mandate, WG 21 concluded that non-indigenous species (NIS) will continue to be an issue of significant concern for PICES members. Discussion considered various options for continuing work on NIS. Briefly, WG 21 recommends that PICES should utilize and build upon the NIS database and atlas tools to focus on how future global climate change and anthropogenic vectors will change the distribution of NIS in the North Pacific and to undertake risk identification to inform mitigation measures by PICES member countries. Revised terms of reference and further discussion of NIS activities can be found in *WG 21 Endnote 3*.

**WG 21 Endnote 1****WG 21 participation list**Members

Blake Feist (USA – by correspondence)  
 Graham Gillespie (Canada)  
 Jung-Hoon Kang (Korea)  
 Takeo Kurihara (Japan)  
 Deborah Ann Reusser (U.S.A.)  
 Hajime Saito (Japan)  
 Kyoungsoon Shin (Korea)  
 Darlene Smith (Canada, Co-Chairman)  
 Thomas Therriault (Canada)

Observer

Sangjin Lee (NOWPAP of UNEP)

**WG 21 Endnote 2****WG 21 meeting agenda**

1. Opening remarks and introductions (Darlene Smith)
2. NOWPAP alien species workshop (Sangjin Lee)
3. Ballast water monitoring in Korea (Jung-Hoon Kang)
4. MAFF-funded projects – final update
5. Atlas and database (Deborah Reusser)
6. Taxonomy project (Therriault)
7. Review of final WG 21 report (All)
8. Discussion and recommendations for future NIS activities in PICES (All)

**WG 21 Endnote 2****Terms of reference for a one-year extension of WG 21**

1. Develop a proposal for continued NIS work that builds upon the work completed by WG 21 and that meets the objectives of FUTURE and the MEQ Action Plan and illustrates how it would integrate with other MEQ expert groups to achieve these objectives;
2. Publicize and promote the use of the NIS database and Atlas; and
3. Investigate and make recommendations for collaborations on NIS with other international marine science organizations including NOWPAP, WESTPAC and ICES.

**Future of NIS activities within PICES**

While WG 21 has successfully completed its terms of reference, this does not mean that the problem of marine NIS has been solved in the North Pacific. The natural next step is to build upon the database and accomplishments of this Working Group and move forward in the area of marine NIS interactions with marine ecosystems. With the completion of the comprehensive database on marine NIS distributions in the North Pacific, the database can now be utilized in the next logical step of gaining predictive insight to the changes and impacts of NIS. Of particular interest is how projected global climate change (GCC) will affect the introduction, spread and impacts of NIS. GCC and the associated decrease in Arctic ice cover and opening of new shipping routes also poses questions related to the introduction and spread of NIS. Interest has also been expressed in addressing specific taxa of common interest to many PICES member countries (*e.g.*, tunicates). Collaboration with other international organizations on NIS will be a benefit to PICES. NOWPAP, WESTPAC and ICES are of particular importance in this regard. The option of simply moving forward with

annual or biennial topic sessions was proposed but without a formal group structure this would be difficult to sustain.

WG 21 developed the following options for continuing work on NIS within PICES:

1. Creation of a Section on Marine Biological Pollutants Focused on NIS,
2. Creation of a Working Group on NIS,
3. Creation of an Advisory Panel on NIS,
4. Amalgamation with S-HAB.

Each alternative is discussed in greater detail.

*1. Creation of a new Section on Marine Pollutants*

The NIS group could be the primary focus of biological pollution in North Pacific.

*2. Form a new Working Group with the following terms of reference:*

The following draft terms of reference were prepared by Dr. Blake Feist who has indicated he is willing to co-chair a new working group on NIS.

1. Review and summarize the current knowledge of pelagic marine NIS spatio-temporal distributions in the North Pacific;
2. Collaborate with physical oceanographers to better understand the role of ocean circulation patterns in marine NIS range expansion and how that range expansion may be affected by GCC (Direct link with S-HAB);
3. Use publicly available geospatial databases and the WG 21 NIS database to explore the relationship between biodiversity, anthropogenic forcing and NIS, particularly in coastal ecosystems (potential collaboration with NOAA Fisheries);
4. Generate peer reviewed manuscript describing relative risks imposed by selected pelagic marine NIS proliferation in the North Pacific and how they alter ecosystem services;
5. Plan and coordinate a symposium, workshop or an annual meeting session on the marine NIS

What will set this new Working Group apart:

- It will explicitly integrate with other working groups and sections (S-HAB, WG 28, WG 24, *etc.*).
- It will produce peer reviewed papers as final products, which will better engage academics and provide focus for specific reference terms. This also reduces the risk of setting unobtainable goals.
- It will explicitly incorporate ecosystem level (ecosystem services, food web dynamics, community structure, trophic ecology, *etc.*) priorities that are more useful to PICES member countries.
- It will explicitly incorporate major forecasted shifts in ocean conditions (temperature, primary productivity, pH, hypoxia, upwelling, *etc.*) and how NIS may or may not respond differently from native species to these changes.

*3. Form a new Advisory Panel on NIS with the following terms of reference:*

1. Focus on exchange of information related to changes to diversity, distribution, impacts, issues, mitigation, regulation among PICES member countries and between other international organizations (*e.g.*, NOWPAP, WESTPAC and ICES) ;
2. Provide recommendations on PICES NIS activities including linkages with other relevant working groups and sections;
3. Develop and implement proposals for workshops and theme sessions at future PICES meetings;
4. Develop and implement data, information, and technical standards for NIS in the NP (*e.g.*, monitoring tools, risk assessment procedures, mitigation or control options, *etc.*);
5. Model after ICES approach for annual reports from countries including updates of data to the PICES NISIS database.

#### 4. *Amalgamate with S-HAB*

While the S-HAB has indicated an interest on focusing on climate change in their draft terms of reference, the Section intends to remain focused on phytoplankton. The NIS issue goes well beyond phytoplankton so if this was a desired direction, MEQ would need to clarify if a new Section would resemble the MAFF Project teams.

#### *Relevance of continued NIS activities to FUTURE*

WG 21 has developed tools that would allow FUTURE to use information on NIS as an index of a specific anthropogenic stressor. However, to implement this in the context of FUTURE (see below) it will be necessary to update this index as a time series for each ecoregion. This index could be included in the next NPESR. Further, a continued NIS expert group would allow exploration of climate change models on the most probable changes in NIS distributions around the North Pacific and to identify likely changes in NIS vectors (*e.g.*, new shipping routes, expanding trade, *etc.*). The last component this new expert group could address is how PICES member countries have been affected by NIS and what community responses have occurred due to NIS incursions in the North Pacific.

#### *FUTURE scientific priorities*

- The effects of climate and climate change on physical, geochemical and biological processes at geographical scales ranging from the North Pacific basin and its marginal seas to the coastal regions of interest to PICES member countries;
- Direct and indirect effects of human activities, such as fishing, aquaculture, introduced species, habitat alteration, pollution, and greenhouse gas emissions and their consequences for member countries.

#### *FUTURE research themes*

1. How might changing physical, chemical and biological processes cause alterations to ecosystem structure and function?
2. What thresholds, buffers and amplifiers are associated with maintaining ecosystem resilience?
3. How has the important physical, chemical and biological processes changed, how are they changing, and how might they change as a result of climate change and human activities?
4. What factors might be mediating changes in the physical, chemical and biological processes?
5. How are human uses of marine resources affected by changes in ecosystem structure and function?
6. How do multiple anthropogenic stressors interact to alter the structure and function of the systems, and what are the cumulative effects?
7. What will be the consequences of projected coastal ecosystem changes and what is the predictability and uncertainty of forecasted changes?