

## REPORT OF WORKING GROUP 21 ON NON-INDIGENOUS AQUATIC SPECIES

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The Working Group on *Non-indigenous aquatic species* (WG 21) held its first meeting on October 13, under the chairmanship of Ms. Darlene Smith. A list of participants can be found in *WG 21 Endnote 1*. Dr. Graham Gillespie served as the rapporteur. The draft agenda was reviewed and adopted without changes (*WG 21 Endnote 2*).

### Terms of Reference (Agenda Items 4-6)

The participants reviewed WG 21 Terms of Reference (TOR) approved at PICES XIV (October 2005, Vladivostok, Russia). Progress toward accomplishing these Terms of Reference and developing a plan for their completion were discussed concurrently as TOR were reviewed: A summary of discussion is reported after each TOR.

TOR#1 *Complete an inventory of all aquatic non-indigenous species (NIS) in all PICES member countries together with compilation and definitions of terms and recommendations on use of terms. Summarize the situation on bioinvasions in the Pacific and compare and contrast to other regions (e.g., Atlantic, Australia, etc.):*

#### Should the inventory of NIS include freshwater as well as marine species?

This was discussed at some length with the conclusion that the NIS list would include marine and estuarine species but would not include exclusively freshwater species. This decision was based on PICES' focus as a marine science organization and the large magnitude of species if freshwater NIS were included. It was suggested to explicitly indicate that "*The organismal domain of WG 21 will be non-indigenous aquatic taxa that spend any life history stage in marine, estuarine, or brackish systems (this includes anadromous and catadromous taxa)*".

Should WG 21 create a new on-line database or take advantage of existing systems such as NISBASE (<http://www.NISBASE.org/nisbase/index.jsp>) or the Global Invasive Species Information Network (<http://www.gisnetwork.org/pubs.html>)?

WG 21 recognizes that the creation of a new PICES on-line database would require resources, both human and financial. WG 21 members will investigate the existing internet databases and provide their preferences on how to proceed with this issue. [Action]

Drs. Henry Lee and Deborah Reusser will make contact with both the USGS-Gainesville and the Smithsonian about the process of linking into NISBASE. [Action]

#### Definitions of terms and recommendations on use of terms

A number of countries (China, Russia, Japan) do not have definitions described in law or policy, but do have terms that are generally used to describe non-indigenous species that may or may not be harmful. In Canada and the United States the implication of harmful is associated with invasive.

The Chairman will compile definitions from Canada, the U.S. and the ICES Working Group on *Introductions and Transfers of Marine Organisms* (WGITMO), and will seek input from China, Korea, Japan and Russia. Following this meeting draft PICES definitions will be produced for subsequent discussion and agreement.

#### Summarize the situation on bioinvasions in the Pacific and compare and contrast with other regions

This was discussed briefly and requires additional thought as it is potentially a large undertaking. It was noted that "situation" is a somewhat vague term. WG 21 seeks advice

from MEQ on what is meant by “situation”. It was suggested that “situation” could include a summary of national legislation/policy, research programs and management programs. It could also include a description of the major invasive species and the impacts they are having. [Action]

TOR#2 *Complete inventory of scientific experts, in all PICES member countries, on aquatic non-indigenous species subject areas and of the relevant national research programs/projects underway:*

An inventory of scientific experts

It was concluded that if distribution of an inventory of scientific experts was limited to PICES members that this should not be an issue. Should the inventory receive wide distribution, this will need to be re-visited.

The participants discussed the relative scarcity of taxonomic expertise in all member countries, with the situation perhaps most pressing in Western Pacific countries. The Census of Marine Life (CoML) was identified as an example of international exchange of taxonomic expertise, but it was noted that CoML has a limited lifespan. A joint ICES/PICES workshop was discussed as a means to continue centralizing expertise after CoML has completed its term.

The need to explore linkages between classical taxonomy and molecular techniques was also discussed. It was suggested that this would be an ideal theme for a future symposium.

Dr. Adolf Kellermann suggested that the PICES and ICES Working Groups may wish to produce a compilation of vernacular names, and that ICES and PICES could consider joint financial support of such an undertaking. The participants also brought up the possibility of PICES translating critical taxonomic keys into a common language (English). This is not exactly the same as a compilation of vernacular names.

The U.S. has conducted Rapid Assessment Surveys which are week-long field surveys attended by a broad range of taxonomic experts.

ToR#3 *Review and evaluate initiatives on mitigation measures (e.g., ICES Code of Practice for the Introduction and Transfer of Marine Organisms; IMO Ballast Water Management Convention and others such as the Canadian Introductions and Transfers Code):*

Again, this TOR is a significant project. For now, documents will be compiled and made available to WG 21 members. The list of documents was expanded beyond the suggested examples to add material from Australia and New Zealand, the Canadian Shipping Act and U.S. Management Plans and included the following documents:

- Australian guidelines for managing marine pest biofouling risks;
- RAC-SPA Action Plan concerning species introductions and invasive species in the Mediterranean Sea;
- Risk assessment of ballast water mediated species introduction: A Baltic Sea approach;
- Guidelines for controlling the vectors of introduction into the Mediterranean of alien species and invasive marine species: Hull fouling.

It was suggested that the documents be reviewed for commonalities and uniqueness. [This action was not assigned.]

Jeffery Herod is to supply a report developed by a Technical Advisory Group to the California State Lands Commission for Ballast Water Performance Standards. This report includes summary of best available information and IMO guidelines. [Action]

References to California reports:

<http://ucce.ucdavis.edu/files/filelibrary/5802/25917.pdf>

[http://www.slc.ca.gov/Division\\_Pages/MFD/MFD\\_Programs/Ballast\\_Water/Ballast\\_Water\\_Default.htm](http://www.slc.ca.gov/Division_Pages/MFD/MFD_Programs/Ballast_Water/Ballast_Water_Default.htm)

[http://www.slc.ca.gov/Division\\_Pages/MFD/MFD\\_Programs/Ballast\\_Water/Documents\\_of\\_Interest.htm](http://www.slc.ca.gov/Division_Pages/MFD/MFD_Programs/Ballast_Water/Documents_of_Interest.htm)

References to National U.S.A. reports:

<http://www.anstaskforce.gov/Species%20plans/national%20mgmt%20plan%20for%20mitten%20crab.pdf>

[http://www.anstaskforce.gov/Species%20plans/Mitten\\_Crab\\_NMP\\_Implementation\\_Table\\_092905.pdf](http://www.anstaskforce.gov/Species%20plans/Mitten_Crab_NMP_Implementation_Table_092905.pdf)

<http://www.anstaskforce.gov/Species%20plans/Final%20NMP%20for%20the%20Genus%20Caulerpa%20111005.pdf>

*TOR#4 Summarize research related to best practices for ballast water management:*

It was noted that only Canada and the U.S. have ballast water sampling programs.

Suggested sources for information included the U.S. Coast Guard and U.S. Geological Survey (USGS), and Richard Emmett at the USCG Washington DC office was recommended as a contact. The Northeast Midwest Institute website (<http://www.nemw.org>) summarizes ballast water legislation in the U.S.

Dr. Blake Feist has provided contact information for USGS work on development of molecular markers for verifying that ballast water exchange has occurred (Dr. Rusty Rodriguez, USGS/Biological Resources Division, Western Fisheries Research Center, ph.: 206-526-6596, e-mail: [rusty\\_rodriquez@usgs.gov](mailto:rusty_rodriquez@usgs.gov)).

The ICES/IOC/IMO Working Group on *Ballast Waters and Other Ship Vectors* (WGBOSV) is in the process of developing a Technical Manual for Ballast Water Sampling. It was suggested that a draft of the document be distributed to WG 21 members.

Russian participants indicated that they were interested in ballast water sampling methods. Responsibility for collecting and summarizing available material will be assigned later. [Action]

*TOR#5 Coordinate activities of WG 21 on non-indigenous aquatic species with related WGs in ICES through a joint back-to-back meeting of the PICES and ICES Working Groups on invasive species in 2007/2008:*

The participants agreed that the objectives of the coordination of WG 21 and WGITMO and WGBOSV activities would be the sharing of information and avoidance of duplication of effort. This would be facilitated through joint meetings, cooperative document development, and post-meeting information exchange (*e.g.*, through email summaries or web postings).

A joint meeting of ICES and PICES Working Groups was suggested. The most viable option seemed to be a meeting in conjunction with the 5<sup>th</sup> International Marine Bioinvasions Conference (May 2007, Cambridge, U.S.A.). Other possible venues include the spring meeting of WGITMO and WGBOSV (March 2007, Dobrovnik, Croatia) and PICES XVI (October 2007, Victoria, Canada).

Potential agenda items include: discussion of taxonomic issues and development of taxonomic expertise exchanges between ICES and PICES member countries; completion of a ballast water sampling technical manual; development/completion of Codes of Practice for ship hull fouling and port sampling; discussion of rapid response and control options; and consistency of information gathered, collated and distributed.

The possibility of using PICES funds to provide travel support for WG 21 members was discussed. Clarification was to be sought from the PICES Executive Secretary.

*TOR#6 Develop and recommend an approach for formal linkages between PICES and ICES on non-indigenous aquatic species:*

The participants suggested that (1) ICES and PICES Working Groups' Terms of Reference should be shared, and (2) a joint ICES/PICES fund for taxonomic specialist exchange be established. Dr. Kellermann indicated that ICES would seriously consider this.

Other linkages discussed included joint meetings, cooperative document development (*e.g.*, ballast water sampling guidelines, code of practice for hull fouling) and formal communication of minutes or meeting reports through e-mail and the web.

TOR#7: *Publish final report summarizing results and recommendations:*

Not much discussion took place on this point, and no formal dates or targets were set. WG 21 needs to make more progress toward accomplishing the Terms of Reference before diving into discussion of the final report.

Currently WG 21 has a 3-year mandate ending 2008. This is in contrast with WGITMO and WGBOSV which have been operating for many years. Depending on the future success of WG 21 in achieving its Terms of Reference and the extent of interest of PICES member countries, PICES may wish to consider creating a Section on non-indigenous aquatic species following the termination of WG 21.

#### **PICES XVI – Proposal for a Topic Session on invasive species (Agenda Item 7)**

WG 21 members agreed to propose a full-day MEQ Topic Session on non-indigenous species to be held at PICES XVI. During an extensive discussion, the following key areas for the session were suggested (*WG 21 Endnote 3*):

- Evolutionary consequences of invasions: “Know too much about ecology? Evolutionary consequences of marine NIS invasions on native species”. Studies abound documenting ecological impacts (*i.e.*, displacement, mortality, *etc.*) of NIS upon native populations, but there are comparatively few studies that demonstrate evolutionary impacts. As such, abstracts that address the topic of evolutionary impacts of NIS on native biota have to be solicited, and specifically, these abstracts need to demonstrate clear evolutionary responses of native species to selective pressure from invasive NIS. For example, a NIS invading and displacing a native species is an ecological consequence, but a native species evolving new anti-predator defenses in response to the invasion of an NIS is an evolutionary response;
- Ecosystem effects of bioinvasions;

- Impacts of climate change projections (and oceanographic variability) on bioinvasions: “Global climate change and its influence on the range expansion of NIS, and the amplitude and frequency of bioinvasions – it is not just for natives anymore”;
- Criteria used to identify species as native or non-native.

A balance must be reached between having too many topic areas *vs.* a very narrow selection that would reduce participation. Submitted abstracts that closely adhere to the theme would have priority for oral presentation, those that are more generally related to NIS can be accommodated for oral presentation as space allows or presented as posters.

Travel funds are requested from PICES for 2 invited speakers to attend the session. Should the session be approved, invited speakers must be secured as soon as possible. A few names were suggested (James Carlton, Chad Hewitt, Nicholas Bax, John Chapman, Andrew Cohen, David Pimentel, David Lodge, Michelle Mack, Daniel Simberloff, Ted Grosholz).

#### **Discussion of potential joint ICES/PICES meetings (Agenda Item 8)**

Two options for a joint meeting of ICES/PICES were discussed. The first is to take advantage of WG 21 members’ participation in the upcoming 5<sup>th</sup> International Marine Bioinvasions Conference in May 2007 (see Agenda Item 9). The second is to have it in conjunction with PICES XVI in October 2007. The following topics for discussion at the joint meeting were proposed:

- ballast water sampling methods;
- NIS databases;
- taxonomic challenges;
- ICES Code of Practice for ship hull fouling;
- rapid response and control options.

It was suggested that a member of the U.S. Aquatic Nuisance Species Task Force be invited to the joint meeting. The issue of travel funds was raised by a number of WG 21 members.

### **Fifth International Marine Bioinvasions Conference (Agenda Item 9)**

Dr. Judith Pederson provided an overview of the Conference to be held May 21–24, 2007, in Cambridge, Massachusetts, U.S.A. Details can be found on the Conference website at <http://massbay.mit.edu> or <http://www.mit.edu/mitseagrantweb>. Deadline for abstracts submission is January 2007. All WG 21 members are encouraged to attend the conference.

### **Informal round table discussion on priority aquatic invasive species issues in PICES-member countries (Agenda Item 10)**

Canada – Discussion included: developing data standards related to geo-referencing and format and coding standards (including taxonomic issues related to standard species codes) as they relate to information transfer from regional to national initiatives; a summary of programs underway related to ballast water; bioinvasion biology, surveys and monitoring; risk assessment; rapid response plans and citizen engagement. Vectors of particular concern are ballast water, fouling, live seafood and aquarium trades.

China – Priority issues were non-native seagrass (*Spartina*) that invaded from North America in the 1960s and an exotic bivalve that invaded from Hong Kong and competes for food resources with cultured species.

Japan – Discussion focused on benthic community invasion in Tokyo Bay, including high densities of Mediterranean [European?] green crab, North American spider crab and Atlantic quahog clams. Interestingly, these species are dominant in polluted areas which limit their interaction with native species.

Russia – Priority issues were increased natural dispersal of tropical species in response to global warming; increased risk of invasion due to

shipping traffic to a proposed oil terminal; and species of particular concern (tunicates and spionid polychaetes).

U.S. – Discussion points included development of control management plans; increased awareness in the scientific community of NIS issues (the possibility of research projects as vectors); the need to develop information bases for native species (as our native is someone else's invader); and the need to be cognizant of potentially large ecological effects of relatively small species (*e.g.*, *Potamocorbula*).

### **Summary of recommendations to MEQ**

WG 21 seeks MEQ approval of the following recommendations:

1. To hold a joint meeting of WG 21 with the ICES Working Group on *Introductions and Transfers of Marine Organisms* and the ICES/IOC/IMO Working Group on *Ballast Waters and Other Ship Vectors*, in fulfillment of one of its Terms of Reference. The meeting would be convened May 25-26, 2007, in Cambridge (U.S.A.), immediately following the 5<sup>th</sup> International Marine Bioinvasions Conference. Travel funds from PICES are requested to permit 1 Chinese and 1 Russian member to attend the Conference and the joint meeting.
2. To convene a Topic Session at PICES XVI in Victoria, Canada. This session would focus on the following key areas:
  - Evolutionary consequences of invasions;
  - Ecosystem effects of bioinvasions;
  - Impacts of climate change projections (and oceanographic variability) on bioinvasions;
 Travel funds from PICES are requested for 2 invited speakers for this session.
3. To request that Russia nominate Dr. Vasily Radashevsky as a member of WG 21, and that he be named as WG 21 Co-Chairman.

WG 21 Endnote 1

Participation list

Members

Evgenyi Barabanshchikov (Russia)  
Blake Feist (U.S.A.)  
Toshio Furota (Japan)  
Graham Gillespie (Canada)  
Henry Lee II (U.S.A.)  
Bruce Mundy (U.S.A.)  
Darlene Smith (Canada, Chairman)  
Lijun Wang (China)

Observers

Galina Gavrilova (Russia)  
Jeffrey Herod (U.S.A.)  
Anders Jelmert (Norway, ICES WGBOSV)  
Adolf Kellermann (ICES)  
Judith Pederson (U.S.A., ICES WGITMO)  
Vasily Radashevsky (Russia)  
Deborah Reusser (U.S.A.)  
Chiemi Tezuka (Japan)

WG 21 Endnote 2

WG 21 meeting agenda

1. Welcome and introductions
2. Nomination of a rapporteur
3. Adoption of agenda
4. Review of WG 21 Terms of Reference
5. Review of progress in accomplishing the Terms of Reference
6. Develop a plan for completing the Terms of Reference
7. PICES XVI – Proposal for a Topic Session on invasive species
8. Discussion of potential joint ICES/PICES meetings
9. Fifth International Marine Bioinvasions Conference
10. Informal round table discussion on priority aquatic invasive species issues in PICES member countries

WG 21 Endnote 3

**Proposal for a 1-day MEQ Topic Session at PICES XVI on**

***“Non-indigenous species: Climate change, evolutionary consequences and ecological impacts”***

The global community is becoming increasingly aware of the importance of invasions of non-indigenous species in the marine environment. The issue is extremely complex. This session will be limited to three sub-topics of interest to PICES member countries:

- 1) Global climate change is further complicating the study and prediction of bioinvasions and its influence on the range expansion of non-indigenous species (NIS) and the amplitude and frequency of bioinvasions. This is particularly the case in areas where bioinvasions have been halted by climatic conditions. We are seeking presentations that document the impact of climate change on marine bioinvasions.
- 2) Studies abound documenting ecological impacts (*i.e.*, displacement, mortality, *etc.*) of NIS upon native populations, but there

are comparatively few studies that demonstrate evolutionary impacts. As such, we are soliciting papers that address the topic of evolutionary impacts of NIS on native biota, and specifically, presentations that demonstrate clear evolutionary responses of native species to selective pressure from invasive NIS. For example, a NIS invading and displacing a native species is an ecological consequence, but a native species evolving new anti-predator defenses in response to the invasion of a NIS is an evolutionary response.

- 3) Finally, we seek presentations that show the ecological impacts of bioinvasions that have led to declines in wild fisheries and mariculture.

Recommended convenors: Blake Feist (U.S.A.) and Graham Gillespie (Canada).