PICES WG 21 Rapid Assessment Surveys

by Thomas Therriault and Graham Gillespie

Since its inception in 2006, PICES' Working Group on *Non-indigenous Aquatic Species* (WG 21) has been advancing our understanding of marine non-indigenous species in the North Pacific Ocean. In 2007, the Japanese Government (Ministry of Agriculture, Forestry and Fisheries of Japan, through the Fisheries Agency of Japan) provided a voluntary contribution to PICES for a 5-year (2007–2012) project entitled "*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*" to develop international systems to collect, exchange and store relevant data, and to foster partnerships with non-PICES countries and international organizations. The project has two distinct components, one on harmful algal blooms carried out by the PICES Section on *Ecology of Harmful Algal Blooms in the North Pacific*, and the other on marine non-indigenous species conducted by WG 21. Two specific initiatives have been identified within the latter component. The first initiative is the development of a comprehensive database for non-indigenous species with Dr. Henry Lee II (U.S. Environment and Protection Agency, Lee.Henry@epa.gov) serving as the principal investigator. The second is a taxonomy initiative led by Dr. Thomas Therriault (Fisheries and Oceans Canada, Pacific Biological Station, Thomas.Therriault@dfo-mpo.gc.ca). The taxonomy initiative will focus on rapid assessment surveys for native and non-native species in a variety of habitats in commercial ports of PICES member countries, and on a collector survey to characterize the distribution of fouling organisms at a number of locations in each PICES member country. The rapid assessment survey will be discussed in this article, but look for future PICES Press articles on the much anticipated collector survey to be conducted in 2009!

In an ideal world, scientists would have the resources to maintain a vigilant watch for the arrival of non-indigenous species. However, the reality is that no country has the resources, financial or personnel, to do this. Thus, a rapid assessment survey (RAS) is one means to identify native, non-native and cryptogenic species present at a specific location at a specific time. By conducting RAS over time, an important baseline is developed which allows researchers to identify the arrival of new species. For the PICES project, we have elected to survey commercial ports in PICES member countries, as ports have a greater probability of containing non-indigenous species. Not only do these locations serve as a recipient environment for organisms transported by commercial shipping (ballast water, ballast sediment, hull fouling), they also often have high levels of secondary traffic (recreational or small craft, aquaculture transfers) and tend to be more disturbed than natural environments, a factor that could enhance invasion success. Although it may not be possible to characterize all habitat types within a port, our survey focuses on major ecosystem components, namely intertidal and subtidal habitats. Intertidal habitats are sampled using both a timed walk and quadrat/grab sampling methods, and subtidal habitats are sampled using (tunicate) collectors, trapping for macrofauna (primarily fish and crabs) and a survey of the fouling communities on floating docks and their associated structure. The intent of this qualitative survey (not a quantitative one) is to capture the species composition within each location surveyed, not characterize the abundance of any specific species. Population estimates can be made in subsequent surveys, if needed, but are not the principle reason for conducting a RAS. The assignment of native, non-native or cryptogenic status occurs following species identification based on literature accounts, general rules for classification of status, and discussion by WG 21 members.

Although many invertebrate species (not all) would be in greater abundances during the warmer, summer months, we decided it would be more informative for participants if sampling were carried out in conjunction with PICES Annual Meetings. Since many of the RAS participants also attend these meetings, logistical and economic benefits are also realized. Thus, our RAS will be conducted in the host PICES member country the week prior to the Annual Meeting (generally mid-October), as was the case with our first RAS in China. It is possible that some taxonomic groups might not be encountered or species missed, but this is expected and represents one limitation of these types of surveys. If the intent was to fully characterize a location, then sampling should be repeated during other seasons, but this significantly increases the resources needed and the number/type of species added is relatively minor.

The goal and success of this type of survey requires the participation of taxonomic experts with broad knowledge of their taxonomic group, in addition to the participation of taxonomic generalists who are able to help with sampling and species identification (primarily *via* the use of identification keys). Also, this type of survey can provide some training to taxonomic generalists, but more importantly can serve as a forum where taxonomic experts can discuss the organisms encountered. For example, experts with extensive knowledge from the North American side of the Pacific can discuss species found in Asian RAS with taxonomic experts familiar with these species there. It also provides an opportunity to highlight and potentially resolve taxonomic issues that can arise among countries, given differences in language and taxonomic advancements since the development of identification keys. For example, some taxa recently have been re-described based on either traditional morphological techniques or more modern genetic ones. Our RAS forum provides an opportunity for taxonomists to discuss these changes and/or advances. Given logistical constraints of

The 2008 PICES Rapid Assessment Survey team.

these types of surveys, our RAS uses members of WG 21 and as many taxonomic experts from the host country as possible. Participation of students is encouraged for logistical support and training. For some taxonomic groups experts might not exist in the host country, and so these "key" taxonomic experts are sought to participate. If you are a taxonomic expert wishing to be involved in our planned RAS in Korea in 2009, please feel free to contact Dr. Therriault about potential participation.

Taxonomy for some species will be controversial, and reference collections are important to document the occurrence of non-indigenous species, thus it is imperative that voucher specimens be maintained for future reference. Within our project, the host PICES member country is maintaining organisms encountered during the RAS in suitable archives. Further, all species records will be entered into the PICES WG 21 Non-indigenous Species Database.

PICES WG 21's first RAS was conducted in October 2008 in China, with two commercial ports targeted, Dalian on the Yellow Sea and Bayu Quan on the Bohai Sea. One unforeseen obstacle to sampling international ports was security concerns raised by port authorities. Thus, the port sampling was graciously co-ordinated by our Chinese hosts under the supervision of Dr. Lijun Wang from the National Marine Environmental Monitoring Center of the State Oceanic Administration (SOA). A total of 18 samples were collected according to the RAS sampling guidelines and preserved for identification by our international team of taxonomic experts. In addition to ourselves and Dr. Wang, this team consisted of Darlene Smith (National Headquarters, Fisheries and Oceans Canada), Zhisong Cui and Li Zheng (First Institute of Oceanography, SOA, China), Hiroshi Kawai (University of Kobe, Japan), Vasily Radashevsky, Eduard Titlyanov and Tamara Titlyanova (Institute of Marine Biology, FEB RAS, Russia), Liudmila Budnikova (Pacific Research Institute of Fisheries and Oceanography, Russia), Blake Feist (Northwest Fisheries Science Center, NMFS, U.S.A.) and Judith Pederson (MIT Sea Grant Program, U.S.A.). Further, Dr. Wang also provided our RAS team with laboratory space, equipment, and reference materials, at the brand new National Marine Environmental Monitoring Center facilities in Dalian, and his hospitality ensured the RAS team was happy and productive during our visit to China.

Preliminary results of the Dalian RAS include algae (45 taxa), arthropods and molluscs (25 taxa each), polychaetes (6 taxa), fish (5 taxa), bryozoans, cnidarians, echinderms, platyhelminths and poriferans (2 taxa each) and one taxon each of hydrozoan, nemertine and tunicate. Most taxa were identified to the species level, although many are provisional identifications. Some taxa could only be identified to the genus, family or order levels until further investigation. However, we were able to classify three species as non-indigenous: shells were collected from the bivalve molluscs *Argopecten irradians*, *Mizuhopecten yessoensis* and *Mactra chinensis*. The former two species are actively cultured in China, and the latter is readily

available in local markets. As only shells were collected, we cannot be certain whether these species have established viable populations in Dalian. It is possible that other non-indigenous species were encountered in some of the other taxonomic groups, notably algae, amphipods, and polychaetes, but identifications and classifications are pending. As our surveys continue, generating distributional data for a number of taxa among PICES member countries, it will be possible to better understand the extent of non-indigenous marine species in coastal waters of the North Pacific Ocean.

Dr. Thomas Therriault (Thomas.Therriault@dfo-mpo.gc.ca) is a Research Scientist with Fisheries and Oceans Canada (DFO) at the Pacific Biological Station in Nanaimo, BC. Tom is working on aquatic invasive species (research, monitoring, risk assessment, and rapid response planning) both within DFO and through the Canadian Aquatic Invasive Species Network (CAISN). He also conducts research on forage fishes, notably eulachon and Pacific herring, from conservation and ecosystem perspectives. Tom is a Principal Investigator on the Taxonomy Initiative of PICES' WG 21 on Non-indigenous Aquatic Species *that will include rapid assessment surveys for non-indigenous species in PICES member countries.*

Graham Gillespie (Graham.Gillespie@dfo-mpo.gc.ca) is a Research Biologist with Fisheries and Oceans Canada (DFO) at the Pacific Biological Station in Nanaimo, BC. Graham is the Head of the Intertidal Bivalve and Crab Programs, conducting stock assessments for commercially important species, providing scientific advice for the SARA-listed Olympia oyster and participating in ecosystem-level research involving these groups. He also coordinates an Aquatic Invasive Species project which examines distribution, dispersal and impacts of intertidal non-indigenous species on the Pacific coast of Canada. He is a member of PICES' WG 21 on Non-indigenous Aquatic Species.

PICES Interns

We offer sincere thanks to **Mr. Key-Seok Choe** (left), the 2008 PICES intern from the Korea Ocean Research and Development Institute, who completed his term at the Secretariat at the end of January, and has returned to Korea. We appreciate his dedicated work during this past year and wish him great success in his career.

We are pleased to announce that **Mr. Yongling Zhu** (right) will join the Secretariat in February as the 2009 PICES Intern. He has a Masters Degree in Business and Administration and has worked at the Second Institute of Oceanography of the State Oceanic Administration (Hangzhou, People's Republic of China) since 1998. We look forward to his involvement in PICES activities.