



Enhancing Seafood Safety in Developing Countries

North Pacific
Marine Science Organization



The Project

Increased harmful algal bloom (HAB) events are causing damage to fisheries and disturbance of ecosystems in the Pacific Rim. This is a particularly egregious problem for developing countries where fisheries and marine tourism occupy a large portion of their national economies. Starting in 2007, the PICES Section on *Ecology of Harmful Algal Blooms in the North Pacific*, with funding provided by the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF), conducted a project to build the capacity of scientists working on the prevention of impacts of harmful aquatic organisms on fisheries and ecosystems by teaching country-specific training courses most needed to ensure seafood safety in the Pacific Rim developing countries outside the PICES region.

Country Selection

The country selection in the project was based on: (1) the nature and magnitude of the HAB problem, (2) the need for training, and (3) the likelihood of program sustainability. These were assessed by evaluating responses to a specifically designed questionnaire distributed via the IOC (Intergovernmental Oceanographic Commission of UNESCO) network and through conversations with individuals at national and regional meetings. The questionnaires were followed by on-site visits to the most promising candidate countries to more fully evaluate the level of commitment by government officials to sustain the program for the long-term, a process needed to ensure success. The Philippines, Guatemala, and Indonesia were selected for the project.



Instructors and participants for the training course in Manila, Philippines, 2009



Naval school students and officers, shrimp farmers, fisheries agents, port authority officials and instructors for the training course in San Jose, Guatemala, 2010



Participants and instructors for the training course in Lombok Island, Indonesia, 2012

Training Philosophy

A "community research partnership" approach was used so that whatever regional contributions could be made would have a positive impact on the seafood safety of the developing country. A sustainable model for the implementation of the project included the following criteria:

- *Initiation at the community level* to contribute to established research needs of the community;
- *Sustainable participation at the local and regional levels* to show a potential career path for either community workers or regional scientists;
- *Engagement of participants in cross-disciplinary research and management groups* to get a balanced perspective on both the value of the entire project and their own contributions;

- *Building partnerships with stakeholder involvement* to ensure extended interactions and commitments for continuing education and knowledge transfer.

It was found that the best method to use in training was "learning by participation". The overall goal was to empower local communities by providing them with both an initial sentinel expertise in HAB issues and a long-term data record suitable for detecting possible HAB species migrations or invasions. The training programs were tailored to the specific and most pressing needs of the country, with each program being shaped by the partners rather than solely by PICES. Training consisted of several techniques.

Phytoplankton Identification

Phytoplankton identification is critical for seafood safety monitoring. Phytoplankton identification courses, with specific focus on harmful species in the selected countries, provided participants with an entry-level taxonomic expertise. This was done using lectures and hands-on exercises with both living and preserved cells of toxic and problem species characteristic of the region. At the end of the training session, microscopes were distributed among key individuals to take back to their home laboratories.



A PICES instructor works with university students on microscopic identification of marine phytoplankton at the 2010 training class in Guatemala city, Guatemala.

Toxin Screening

In many cases developing countries lack the infrastructure or expertise for toxin detection in seafood. The Philippines and Guatemala currently utilize the mouse bioassay to test seafood but lack the capacity to provide timely analytical results year round. Indonesia currently does not use the mouse bioassay. Through the PICES/MAFF project, analysts in government and university laboratories have been trained in the newer high-level toxin detection methods, including the Jellett test for paralytic shellfish poisoning (PSP) and Abraxis Enzyme-Linked Immunosorbent Assay (ELISA). These methods are certified by the Association of Official Analytical Chemists (AOAC) for PSP toxin screening and, as a platform, offer the ability to screen for other phytoplankton toxins. The strategy is to implement these faster and field-based methods to allow screening of shellfish to reduce the numbers of samples requiring mouse bioassays. Testing now is underway in the Philippines to fully evaluate these new methods against the standard mouse bioassay, and expansion of the rapid test methods to laboratories in outlying regions is planned.



Performing a toxin screening test (Manila, Philippines, 2009)



Performing a Jellett Rapid Test for paralytic shellfish toxins (San Jose, Guatemala, 2010)



Preparing samples for rapid toxin testing (Jakarta, Indonesia, 2012)



A PICES instructor demonstrates methods for nutrient analysis at the 2012 training class in Jakarta, Indonesia

Nutrient Analysis

High-density phytoplankton HAB events are devastating to coastal economies and ecosystem health. They are indicative of an unbalanced ecosystem, where excess nutrient supply at non-natural nutrient ratios exceeds the capacity of the coastal waters to consume and process them without the development of disruptive blooms. The impacts of excessive nutrients include alteration of the natural composition of the phytoplankton communities, new species introductions, altered food chains and perturbed water and sediment quality. The ability to quantify nutrients, including those from anthropogenic sources, was a key aspect of the PICES/MAFF project. Rapid analysis methods that use minimal amounts of toxic chemicals were emphasized during training.



Conducting nutrient analysis (Manila, Philippines, 2009)

Sustainability and Outreach

Creating the proper framework for the implementation of the project is an accomplishment that will pay dividends down the road. There now are plans in place in the Philippines, Guatemala, and Indonesia to provide community partnerships that will lead to sustainable success in monitoring seafood safety for the domestic and export markets.

The project philosophy has been to train the next generation of educators. Training class participants have included teachers, students, professors, community workers, government officials, and members of the press. They are now incorporating the materials from our courses into their classes and community outreach projects.

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