

PICES Seafood Safety Project: Guatemala Training Program

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A PICES Seafood Safety Project was initiated in 2007 in response to the need to develop a system for harmful aquatic organism data collection and exchange in the Pacific Ocean, to assist both in the prevention of impacts on fisheries and to build the capacity of scientists studying this topic in developing countries in the Pacific Rim. The Project is funded by a voluntary contribution from Japan's Ministry of Agriculture, Forestry and Fisheries (MAFF), through the Fisheries Agency of Japan (JFA), and is conducted by the PICES Section on *Ecology of Harmful Algal Blooms in the North Pacific*, with Dr. Vera Trainer (Northwest Fisheries Science Center, U.S.A.), who is co-chairing this Section, as the Principal Investigator. The Project focuses on preparing and teaching country-specific training courses most required to ensure seafood safety in Pacific countries outside the PICES region, *i.e.*, in Southeast Asia and in Central America and South America. The first PICES HAB training class was held from January 15–23, 2009, in Manila, Philippines, and was highly successful (PICES Press, 2009, Vol. 17, No. 2, pp. 5–7).

Selection of country and sustainable model

In 2009–2010, the community research partnership approach to seafood safety training, adopted by the Project (see the above cited article for details), has been expanded to Guatemala. The choice of Guatemala as a country fulfilling the project guidelines was determined through assessment of a response from Dr. Leonel Carrillo Ovalle, (Center for Marine Studies and Aquaculture (CEMA) at the University of San Carlos, Guatemala) to a questionnaire distributed via the IOC (Intergovernmental Oceanographic Commission of UNESCO) network, and conversations with Drs. Leonardo Guzman, Chairman of IPHAB (IOC International Panel on Harmful Algal Blooms) and member of HAB-FANSA (IOC HAB Working Group for South America) and José Luis Peña Manjarrez, Chairman of ANCA (IOC HAB Working Group for Central America and Caribbean) at the IPHAB Conference (April 22–25, 2009, Paris). Based on our discussions with these individuals representing Central America and South America, it was concluded that Guatemala was a perfect match to the criteria used for country selection in the PICES Seafood Safety Project, such as (1) the magnitude of the HAB problem, (2) the need for training, and (3) the likelihood of sustainability.

The sustainable model for the implementation of the PICES-led initiative in Guatemala included:

- *Initiation and implementation at the community level:* Dr. Carrillo Ovalle, our primary in-country contact, has developed strong partnerships with all the institutions

responsible for management of red tides, known as “marea roja” in Guatemala.

- *Engagement of participants in cross-disciplinary research and management groups:* Through cross-fertilization, individuals can gain a balanced perspective on both the value of the project and of their own contribution.
- *Building partnerships for extended interactions and commitments:* Continued education and knowledge transfer are essential for the proper capacity building, and our communications with Dr. Carrillo Ovalle will persist through monthly Skype calls to assist with data interpretation and to assess further needs.

Development of training program in Guatemala

During our initial visit to Guatemala in September 2009, we had discussions with personnel at several institutions:

- University of San Carlos (USAC): Dr. Leonel Carrillo Ovalle, Professor-Investigator at CEMA/USAC and representative of Guatemala and a country focal point at IOC;
- National Institute for Seismology, Volcanology, Meteorology and Hydrology (INSIVUMEH), the organization responsible for emergency response to natural disasters (earthquake, volcanoes, harmful algal blooms, *etc.*) in Guatemala: Engineer Eddy Sanchez, Director of INSIVUMEH and President of the National Commission on Red Tides, and Engineer Mario Bautista, General Deputy Director of INSIVUMEH;
- Fisheries and Aquaculture Management Unit (UNIPESCA): Mr. Manuel Cabrera (Director), Mr. Manuel de Jesús Ixquiac (Coordinator), Mr. Ruben Bran Lopez (seafood safety inspector responsible for, monitoring of biotoxins), and Vinicio Juarez (GIS specialist responsible for the mouse bioassays);
- Naval Academy: Head of Academy, and Captains A. Porrás and L. Veliz. There is a letter of understanding between the Naval Academy and CEMA that allows for cooperation in training and resource use (*i.e.*, small boats used for sampling);
- Universidad Del Valle (private university in Guatemala City): Dr. Lucia Gutierrez.

Our visit confirmed that the greatest need for training included:

- training in screening methods for detection of paralytic shellfish poisoning (PSP) toxins;
- a review of phytoplankton identification, with specific focus on harmful species in Guatemala;
- instructions in basic concepts in oceanography, as there is no oceanography program in Guatemala.



Participants and instructors of the PICES Seafood Safety Project training class at the University of San Carlos, Guatemala City, Guatemala, February 2010.



Naval school students and officers, shrimp farmers, fisheries agents, port authority officials and instructors pose for a group photograph at the completion of the training class at the Naval Academy at the Pacific Naval Command, San Jose, Guatemala, February 2010.

Training classes

From February 15–19, 2010, we held training classes at the USAC in Guatemala City, and at the Naval Academy in San José on the Pacific coast of Guatemala near the border to El Salvador. There were 31 participants at the 4-day intensive course at USAC: 25 CEMA/USAC students, 4 inspectors from UNIPESCA and 2 members of the National Health Laboratory (LNS-Laboratorio Nacional de Salud). Participants of the 2½-day training class at the Naval

Academy, including the Pacific Coast Guard Commander, 2 Caribbean Command members, 4 Pacific Command members, 4 UNIPESCA inspectors, 3 members of the Quetzal Port Authority, the lab manager for an Acumaya shrimp farm and 2 agronomists. The quality of teaching and the students’ understanding of concepts were assessed through impromptu quizzes and a final exam. A notebook was provided to all participants, which included an agenda, a summary of HAB syndromes in humans, a phytoplankton key, individual micrographs of HAB species of concern in



Clockwise from top left: (1) Manuel de Jesús Ixquiac, UNIPESCA, Dr. Vera Trainer (NOAA/PICES), Leonel Carrillo Ovalle (CEMA, University of San Carlos) after a television interview about the PICES training class in Guatemala City; (2) Drs. William Cochlan (San Francisco State University/PICES, far left) and Mark Wells (University of Maine/PICES) explaining the volume calculation for a depth-integrated net tow to CEMA students; (3) Mr. Brian Bill (PICES instructor) works with University of San Carlos students on microscopic identification of marine phytoplankton; (4) Mr. Julian Herndon (PICES instructor) explains the parts of the microscope to health department officials (he also was the official Spanish translator for the class); (5) Drs. Charles Trick (University of Western Ontario/PICES, left) and Mark Wells explaining the use of a Secchi disk; (6) Dr. Alison Robertson (U.S. Food and Drug Administration) explaining sample purification techniques, used prior to toxin detection, by high performance liquid chromatography.

Guatemala, and handouts on toxin detection methods, including the Jellett PSP test and Abraxis shipboard Enzyme-Linked Immunosorbent Assay (ELISA).

A follow-up training class held from April 26–29, 2010, was organized in collaboration with the U.S. Food and Drug Administration (Dr. Alison Robertson) and focused on High Performance Liquid Chromatography (HPLC) and Mass Spectrometry (MS) for domoic acid and saxitoxins. A total of 8 scientists were present, including chemists and biologists from CEMA/USAC, LNS and UNIPESCA. Training included lectures on the chemistry of marine toxins and the theory of chromatography, and practical laboratory exercises on sample extraction and clean-up for both paralytic shellfish toxins and domoic acid, data analysis and interpretation of HPLC chromatographs, and enzyme-linked immunosorbent assay for paralytic shellfish toxins. Oyster samples collected from the Guatemala Pacific coast were analyzed and compared to reference standards.

The close collaboration of university scientists with peers in industry and government management groups form the basis for a strong project in Guatemala. Over the next year, Jellett PSP rapid tests and ELISA will be evaluated by

LNS. A combination of techniques will be used to assess the accuracy of toxin screening methods. Chemical methods (HPLC and LC/MS) will provide structural confirmation of toxins present in samples tested by biologically-based methods (ELISA, Jellett and the standard mouse bioassay). A Memorandum of Understanding will be implemented to clarify project goals and to assure steady progress. Monthly Skype calls with our CEMA colleagues will allow PICES investigators to provide advice on data analysis and interpretation.

The training program went very well, and we are pleased in our efforts to improve the Guatemalan trainees' understanding of marine coastal systems and provide practical means to safeguard seafood products from harmful algae in this country. This training was, in our opinion, a very effective and worthwhile use of PICES experts' time and funds to assist one of the developing nations. We would like to acknowledge MAFF and JFA for funding this project, allowing us the opportunity to conduct much needed important work. We also thank our colleague, Dr. Yasukatsu Oshima of Kitasato University for kindly providing reference materials for this class.