

SPECIAL REPORT

Chemical and Drug Residues in Fish and Fish Products in Southeast Asia – Biotoxins (ASP, AZA and BTX) & Harmful Algal Blooms (HABs) in the ASEAN Region

by SEAFDEC/MFRD

Fish and shellfish are important source of protein and income for people living in the Southeast Asian region. One of the food safety concerns for such seafood is marine biotoxins, which are poisonous substances naturally present in fish and fishery products or accumulated by the animals feeding on toxin producing algae. The consumption of these contaminated fish and shellfish may result in poisoning or even death.

Since 2009, the Marine Fisheries Research Department (MFRD) has implemented a project under the Japanese Trust Fund II with the objective of expanding and improving initiatives in monitoring, detecting, and sharing of information on marine biotoxins to reduce public health risks associated with the consumption of contaminated fish and shellfish. The project which covered several trainings on analytical methods for detecting Diarrhetic Shellfish Poisoning (DSP) toxins, lipophilic toxins, Paralytic Shellfish Poisoning (PSP) toxins, and Tetrodotoxin (TTX), as well as a monitoring survey on PSP toxin in ASEAN-SEAFDEC Member Countries was completed in 2012.

The Japanese Trust Fund VI which is an extension to the JTF II project addressed the needs of SEAFDEC Member Countries and continued with capability building on biotoxins and monitoring. The JTF VI focusing on other biotoxins like the Amnesic Shellfish Poisoning (ASP) toxin (Domoic Acid) and Azaspiracid (AZA) toxin. Brevetoxin (BTX), which was known to cause Neurotoxic Shellfish Poisoning (NSP), was also included as ASP, AZA and BTX, along with DSP and PSP, should be regulated according to CODEX for shellfish.

This project commenced in 2013 with the Regional Technical Consultation Meeting in Singapore on 24-25 July 2013 attended by 19 participants (9 females and 10 males) from the ASEAN-SEAFDEC Member Countries. The Meeting was organized to initiate the project and plan for subsequent project activities and came to a consensus on the national project leader (key project leader, KPL) for each country as well as the methods to be taught during the training course.

In the following year, a Regional Training Course on “Biotoxins Analyses” was organized on 2-6 June 2014 in Singapore. The training was jointly conducted by MFRD, SEAFDEC, and the Veterinary Public Health Laboratory, Agri-Food & Veterinary Authority of Singapore. A total of 21 participants (9 females and 12 males) from all ASEAN Member Countries attended the Training. The resource persons

were two biotoxins experts, namely: *Dr. Toshiyuki Suzuki* from the National Research Institute of Fisheries Science, Fisheries Research Agency, Japan, and *Dr. Dao Viet Ha* from the Institute of Oceanography, Viet Nam. The training course comprised general introduction to marine toxins, analytical tools for the detection, characterisation, and quantification of AZA, BTX and ASP via instrumental analysis as well as hands-on practical sessions on sample preparation and the use of High Performance Liquid Chromatography Tandem Mass Spectrometer (LC/MS/MS) method and High Performance Liquid Chromatography method for the detection of AZA, BTX and ASP.

Upon the completion of the course, the two-year biotoxins monitoring survey was conducted from 2015 to 2016. The survey was extended for another year (end of 2017) due to labor and technical constraints and this extension allowed the countries to complete their survey plans with more substantial data and results. Within the survey period, seven participating countries, namely: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam took part in the monitoring survey and submitted their progress reports on a quarterly basis.

MFRD has also incorporated new activities under this project to enhance regional capabilities on the identification of toxic HAB species and strengthen the Member Countries’



The RTC on Harmful Algal Blooms held in 2015

proficiency in biotoxins monitoring. A Regional Technical Consultation Meeting was held in Singapore from 5-6 August 2015 with a total of 20 participants (11 females and 9 males). The Meeting discussed the individual training needs of each Member Country, identified the Key Project Leaders for each country as well as initiated the process of establishing a network or directory of responsible national authorities and HAB experts in the region.

With the consensus from the Meeting, a five-day Regional Training Course on “Toxic HAB Species Identification” was organized in collaboration with the IOC-WESTPAC on 18-22 July 2016 in Singapore. A total of 22 participants (13 females and 9 males) from the ASEAN Member Countries attended the training conducted by Japanese experts, namely: *Dr. Yasuo Fukuyo*, *Dr. Kazumi Wakita*, and *Dr. Mitsunori Iwataki* and regional experts, namely: *Dr. Sandric Leong* and *Dr. Lim Po Teen*. Positive feedbacks were received from the participants, indicating that the program was well conducted and beneficial to their work. However, the SEAFDEC Member Countries requested for additional training courses on specimen preservation and culturing techniques for identification and monitoring of HAB species. In view of this, the project was extended for two more years (2018-2019).

In the subsequent year, the Regional Training Course on “Identification of HAB Species in the ASEAN Region” was successfully conducted in collaboration with the Institute of Ocean & Earth Science (IOES), University of Malaya (UM) at Bachok Marine Research Station (BMRS) in Kelantan, Malaysia from 10-13 July 2017. The Training comprised lectures and practical activities on specimen preservation methods and techniques and use of fluorescence and electron microscopy and flowcytometry. The 22 participants (13 females and 9 males) who attended the training found that the training was well structured and relatively helpful to their course of work.



Regional Training Course on Identification of HAB Species held in 2017 in Kelantan, Malaysia

Finally, in 2018, MFRD collaborated with the Institute of Ocean & Earth Science (IOES), University of Malaya (UM) again to organize the last of the series of three regional training courses “Culturing for HAB Species Identification and Toxin Characterization” at Bachok Marine Research Station



Regional Training Course on Culturing for HAB Species and Toxin Characterization held in 2018 in Malaysia

(BMRS) in Kelantan, Malaysia from 8-14 July 2018. Lectures and hands-on practical sessions were designed to expose the participants to several aspects of HAB monitoring and studies, and included fundamental knowledge of microalgal culturing and maintenance, species identification and detection using fluorescence, and electron microscopy and flow cytometry. A total of 20 participants (16 females and 4 males) from the AMSs attended the training who also expressed their satisfaction towards the course outline, acknowledging the capabilities of the resource persons.

The biotoxins monitoring survey results from the countries were collated into a Technical Compilation. This compilation covers respective countries’ survey methodologies and recommendations as well as the problems and challenges encountered during the survey, which provides a valuable learning tool for all AMSs. The project concluded with the End-of-Project meeting on 14-15 August 2019 where the technical compilation was also finalized for publication

The successful completion of the project sees the upgrading of regional laboratory capabilities and credibility in ASP, AZA and BTX biotoxins testing as well as the identification of toxic HAB species. In addition, the AMSs had also deepened their knowledge and understanding on the occurrences and incidences of biotoxins in fish and shellfish, and HAB species in the Southeast Asian region through the monitoring survey, and the publication offers a useful tool in the facilitation of information exchange among the AMSs. ✦



Representatives from SEAFDEC Member Countries during the End-of-Project Meeting on Chemical and Drug Residues in Fish and Fish Products in Southeast Asia – Biotoxins and Harmful Algal Blooms in the ASEAN Region held in 2019 in Singapore