

# IOC/WESTPAC training workshop on introductory scientific diving for benthic dinoflagellate sampling and processing

A week-long IOC/WESTPAC training workshop was held in Phuket, Thailand from 17-21 September 2018, with the participation of more than 30 young researchers, fishery officers and graduate students from six countries in the WESTPAC region (Fig. 1).

In view of the lack of scientific diving training and limited research capacity for benthic dinoflagellates in the WESTPAC countries, this training workshop aimed to train young scientists and the government authorities in the region with the standard protocols for introductory scientific diving, underwater sampling, sample processing, culturing and identification of marine benthic dinoflagellates.

This workshop was an intensive high-level training held in the WESTPAC region on carefully defined scientific subjects, presented by several tutors of international standing. Trainees and invited lecturers were grouped into two concurrent training programmes, respectively on: (1) introductory scientific diving, and (2) sample processing, identification and culturing techniques for benthic dinoflagellates.

The scientific diving programme was led by Dr Leo Lai CHAN (City University of Hong Kong), Lawrence Long CHAN

and their scientific diving team from the Sea Dweller Underwater Academy: Ting HAN, Wing Kin FU, Ki Chun YIP and Walter Ernesto DELLISANTI. This programme was conducted through lectures and both pool and open water training. Dr Leo CHAN delivered lectures on the background and history of scientific diving. He also explained the importance of scientific diving training and its applications in different underwater scientific research. HAN and FU trained the students not only with basic scientific diving techniques such as advance kicking, buoyancy control etc., but also methodologies for collecting biologically relevant data including the use of transects, quadrats, sample bottles and bags, etc. They also trained the students on how to manage risks encountered and perform multitasking missions. YIP and DELLISANTI demonstrated how to use various scientific equipment including 'Coral Watch', 'Coral Finder', Benthic and Epiphytic Toxic Algae (BETA) sampler (Fig. 2), and Coral in Situ Metabolism and Energetics (CISME) (Fig. 3). All students obtained hands on experience with this equipment in both confined and open water environments. At the end of the training workshop, all students were aware that

scientific diving systems serve a two-fold purpose: (1) a research support function that assists the diving scientist with specialized underwater equipment, advice, and diver support, and most importantly (2) a risk management function that protects the safety and health of the individual scientist, and the employing organization from excess liability exposure.

*"The scientific diving training surely provided me with profound insights on what skills we should have and how to achieve scientific missions effectively," said Lalita Putchim, a researcher from Phuket Marine Biological Center, Thailand,*

Another group of trainees focused mainly on marine benthic dinoflagellates, its sampling methods, identification, cell isolation techniques, culture establishment and maintenance. A team of invited lecturers consisting of Drs Po Teen LIM (University of Malaya), Pengbin WANG and Douding LU (Second Institute of Oceanography, State Oceanic Administration of China). This session was conducted through a series of lectures, and hands-on exercises about the application of the single-cell isolation by micropipetting technique, culture media selection and culture preparations.

Lim delivered lectures about HABs in the WESTPAC region, recent emerging HAB related issues and current knowledge gaps in HABs, focusing on ciguatera fish poisoning and the ben-



Fig. 1. IOC/WESTPAC Training course on scientific diving for marine dinoflagellate research, Phuket Marine Biological Center (PMBC), 17-21 September 2018.

thic dinoflagellates. He also shared the sampling methods using artificial substrates as well as his research findings in Malaysian waters. Wang demonstrated the techniques of cell isolation, culture establishment, medium preparation and culture maintenance. Lu, while lecturing on taxonomy of benthic dinoflagellates, emphasized the need to obtain not only morphological data but also molecular evidence to support species delineation.

All participants practiced observing and isolating dinoflagellate cells from the natural substrate samples collected from the nearby shore and coral reefs (Fig. 4). Several genera of harmful dinoflagellates were identified and isolated for culture establishment, including *Ostreopsis*, *Prorocentrum*, *Coolia* and *Amphidinium*. Participants also learned the techniques of medium preparation, setting up culture collection, maintenance and management of culture collection during the practical sessions.

The ensuing plenary discussions culminated in an agreement that participants from China, Indonesia, Malaysia, Thailand, Philippines, and Vietnam would adopt the Benthic HAB artificial substrate sampling method (Tester et al. 2014, Yong et al. 2018) and committed to carrying out comparative studies at the coral reefs and seaweed beds of the respective countries. Participants expect more workshops on ciguatera fish poisoning and benthic dinoflagellates will be organized in the near future in this region to address the emerging issues in seafood safety.

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Fig. 2. BETA sampler training in open water environment.



Fig. 3. CISME training in a confine pool.



Fig. 4. Microscopic observation of benthic dinoflagellate cells from samples extracted from seaweed and sediments.