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INTERNATIONAL MARINE BIVALVE WORKSHOP 2005: INTRODUCTION AND SUMMARY

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***ABSTRACT.* –** In August–September 2005, a two-week International Marine Bivalve Workshop (IMBW) on marine molluscs, with an emphasis on systematics, anatomy, and natural history of bivalves, was held in Chantaburi, Thailand, to increase understanding of the poorly known molluscan fauna of Kungkrabaen Bay, Gulf of Thailand. The volume here introduced largely presents research initiated at this workshop, as a product of the seven scientist-student teams that worked together in the field. Results of other projects by the participants have been added on general aspects of the regional molluscan faunas as well as on various species of gastropods.

INTRODUCTION

The marine world is a vast region that is largely unexplored. Generations of scientists have studied the oceans, but there is still a large amount of work to be done in understanding this vast system. In general, the plants and animals that inhabit the Northern Hemisphere along the coastlines of developed countries are the best known, but even in these regions, there is much yet to be discovered in the shallow waters and even more at depth. Many parts of the developing world and developed countries of the Southern Hemisphere lack the depth of knowledge that is available in more developed northern countries. In both Hemispheres, it is the tropical regions which generally have the greatest biodiversity. In this era of concern over the loss of diversity, there are simply not enough scientists, equipment and funds to undertake the vast task of examining these extensive systems.

To help overcome our lack of knowledge, a series of marine biological workshops has been held over the last third of a century. The concept is simple. A group of scientists in the host area arranges all of the local logistics, including inexpensive accommodations and meals, use of boats, diving equipment, laboratory facilities, collecting permits and other necessities for undertaking field-based research. International scientists and colleagues from outside of the host country are invited to participate in the workshop. Each scientist provides whatever specialized equipment he/she requires. In return, the scientists are offered a unique opportunity to conduct research in an area that would be difficult or impossible to access on their own.

The workshops generally take place over two to three weeks, with 20–40 scientists working in the same area at the same time. The presence of other scientists working in the field

means that much more material is collected than would be done by an individual or a small group. Professional cooperation established at workshops has continued in many cases for years and has involved field programmes in other parts of the world. All participants at a workshop are expected to conduct a research project on their own or with other participants and to publish their findings in the peer-reviewed workshop proceedings.

Thirteen successful workshops in marine biology have been held in Hong Kong and Australia (Western Australia, Northern Territory and Queensland). An additional number of specialist molluscan workshops have been held in Hong Kong, the Portuguese Azores and California. Recently (Florida Keys 2002; see Bieler & Mikkelsen, 2004), with support by and in the spirit of the U. S. National Science Foundation's "Partnership for Enhancing Expertise in Taxonomy" programme, the workshop concept has been modified to focus on one-on-one training of students and young faculty, by teaming them with recognized specialists–literally–in the field.

In August–September 2005, a two-week International Marine Bivalve Workshop (IMBW) on marine molluscs, with an emphasis on the systematics, anatomy, and natural history of bivalves, was held in Chantaburi, Thailand. The goals and format paralleled those of the IMBW in the Florida Keys in 2002 and had the additional goals of increasing understanding of the poorly known molluscan fauna of Kungkrabaen Bay, Gulf of Thailand, as well as developing international contacts that might lead to future collaboration. Trainees worked in teams with invited expert scientists on selected bivalve species or groups of species that were determined on-site. As with the Florida Keys IMBW, most contributions in this volume represent the scientific results of projects initiated at the workshop, co-authored by the scientists and students comprising the research teams. Additional projects were conducted on general aspects of the regional molluscan faunas as well as on various species of gastropods, hence the more general title of this volume, *Molluscs of Eastern Thailand*.

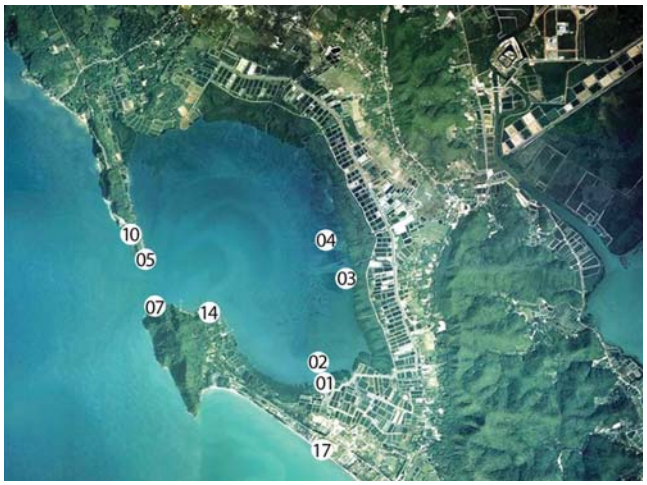

Fig. 1. Satellite view of Kungkrabaen Bay, showing location of collecting stations. The numbers respond to the KKB stations of Table 1. The remaining stations, including dive sites, are located to the southeast of the illustrated area.

The Thailand IMBW focused on the intertidal habitats of Kungkrabaen Bay (Fig. 1), a large bay in the Gulf of Thailand, located in the Ta Mai District of Chantaburi Province (12°32'–12°41'N 101°52'–101°57'E) and part of a Royal Conservation Project. The bay is 4.6 km long and 2.6 km wide, with a fringing mangrove forest 30–200 m wide and up to 20 m high on the inner bay side. The mangroves are healthy and mixed, including *Rhizophora*, *Sonneratia*, *Avicennia* and other genera. A boardwalk through part of the mangroves provided ready access to a variety of habitats. The deepest part of the bay is 8 m, and much of it empties during daily spring tides. The invertebrates, and particularly the molluscs, of these flats are extensively and continuously harvested for food by local inhabitants. The centre of the bay is underlaid by soft sediment with a variety of sediment sizes, ranging from fine mud to coarse sand, with two seagrass species in small quantities. The headlands to the bay are both rocky, with a diverse assemblage of associated molluscs. The outer margins are sandy shores, with a fisheries research station, the Kungkrabaen Bay Royal Development Study Centre, on the eastern shore that facilitated some of our activities. A small rocky "coral" reef supporting mainly soft corals occurs in shallow water near the shore about 1 km south of the fisheries station. Small offshore islands were also visited via small boats.

Seven invited scientists mentored one or more trainees during the workshop. Their specialties varied greatly, and included systematics, functional morphology, ecology and population biology. A student application announcement was posted on the Mollusca Listserver in March 2005. Nine trainees were selected from a field of applicants on the basis of their credentials and interest in the field of bivalve biology; additional local participants joined the research in the field. Including the organizers, the international list of participants included representatives from eight countries. Eleven of the 29 participants in the field were Thai (Fig. 2). The participants were:

Mr. Antonio Agüera García, Malaga, Spain
Dr. Rüdiger Bieler, Field Museum of Natural History, Chicago, Illinois, USA
Assoc. Prof. Kashane Chalermwat, Burapha University, Bangsaen, Thailand
Assoc. Prof. Yaowaluk Chitramvong, Mahidol University, Bangkok, Thailand
Mr. Teerapong Duangdee, Kasetsart University, Bangkok, Thailand
Mr. Pongrath Dumrongrotewatana, Burapha University, Bangsaen, Thailand
Dr. Emily Glover, The Natural History Museum, London, United Kingdom
Mr. Nopadon Kakhai, Kungkrabaen Bay Royal Development Study Centre, Chantaburi, Thailand
Ms. Erin Meyer, Seattle, Washington, USA
Dr. Paula Mikkelsen, American Museum of Natural History, New York, USA
Mr. Bancha Nilkerd, Faculty of Marine Technology, Burapha University, Chantaburi, Thailand

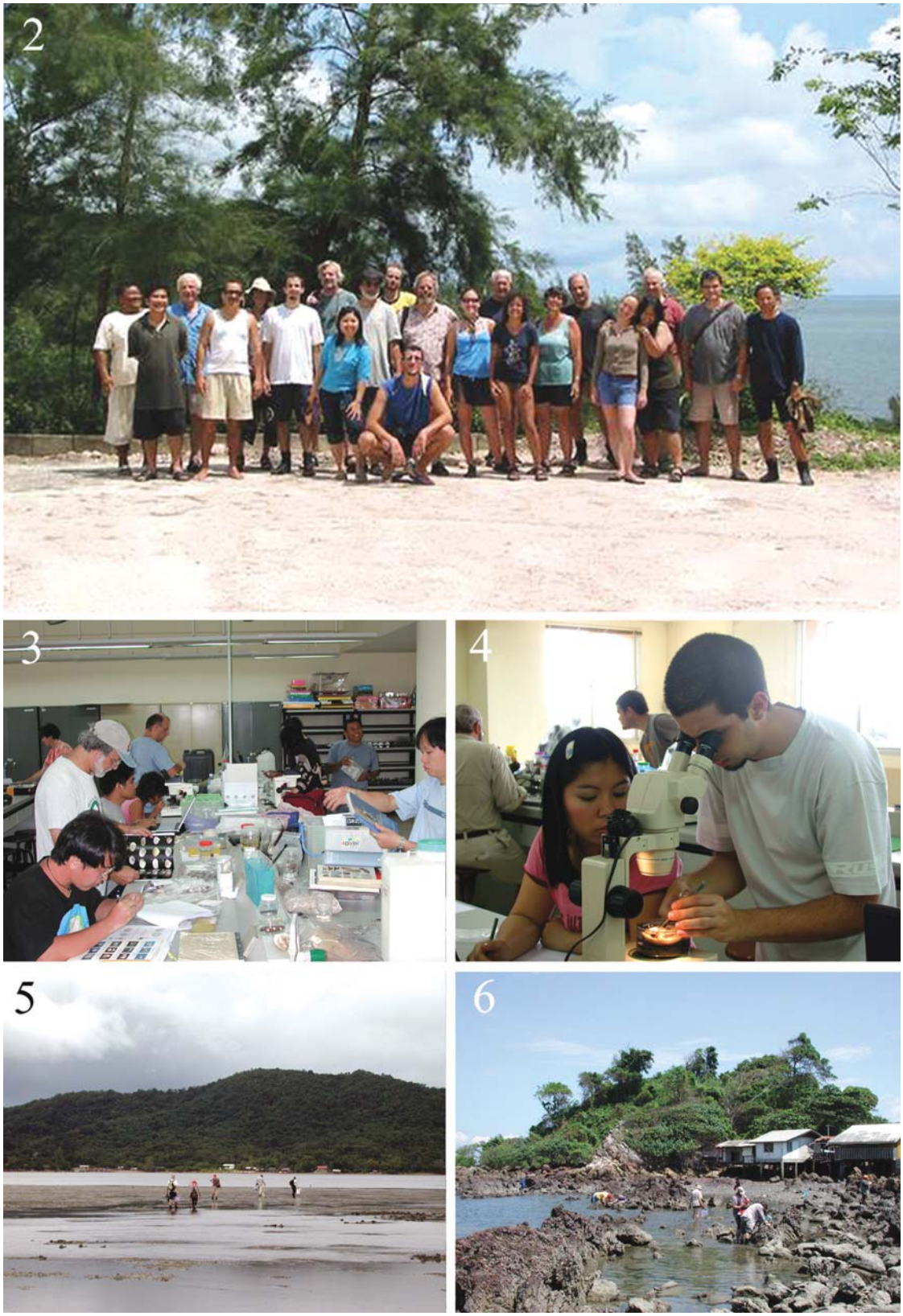

Fig. 2. The participants of the International Marine Bivalve Workshop in Thailand gather at station KKB-22 for a group photo following a snorkeling trip to a small offshore island. Photograph by I. Tëmkin.

Fig. 3. General laboratory scene at Chantaburi Campus of Burapha University. Photograph by R. Bieler.

Fig. 4. Trainees André Sartori and Cheewarat Printrakoon observe bivalves in the laboratory. Photograph by P. M. Mikkelsen.

Fig. 5. Research teams explore the mud flats of Kungkrabaen Bay. Photograph by R. Bieler.

Fig. 6. Bivalve collecting on the rocky headlands of Kungkrabaen Bay. Photograph by R. Bieler.

Dr. P. Graham Oliver, National Museum of Wales, Cardiff, United Kingdom
Prof. Robert S. Prezant, Montclair State University, Upper Montclair, New Jersey, USA
Ms. Cheewarat Printrakoon, Mahidol University, Bangkok, Thailand
Mr. Sumaitt Putchakarn, Institute of Marine Science, Burapha University, Bangsaen, Thailand
Dr. Peter D. Roopnarine, California Academy of Sciences, San Francisco, California, USA
Mr. Kitithorn Sanpanich, Burapha University, Bangsaen, Thailand
Mr. André Fernando Sartori, Universidade de São Paulo, São Paulo, SP, Brazil
Mr. Paul Valentich Scott, Santa Barbara Museum of Natural History, Santa Barbara, California, USA
Mr. Javier Hernán Signorelli, Museo Argentino de Ciencias Natureles, Buenos Aires, Argentina
Dr. Luiz Ricardo L. Simone, Universidade de São Paulo, São Paulo, SP, Brazil
Dr. Chirasak Sutcharit, Chulalongkorn University, Bangkok, Thailand
Dr. Tan Koh Siang, Tropical Marine Science Institute, National University of Singapore, Singapore
Dr. John D. Taylor, The Natural History Museum, London, United Kingdom
Mr. Ilya Tëmkin, American Museum of Natural History, New York, USA
Dr. Piyoros Tongkerd, Chulalongkorn University, Bangkok, Thailand
Dr. Fred E. Wells, Department of Fisheries, Perth, Western Australia
Ms. Samantha Wilkinson, The Natural History Museum, London, United Kingdom
Ms. Harriet Wood, National Museum of Wales, Cardiff, United Kingdom

Accommodations, meals, and laboratories were centred at the Chantaburi Campus of Burapha University, 230 km southeast of Bangkok near the Cambodian border. Laboratories were well equipped with bench space, microscopes, fume hoods, and freezers (Figs. 3–4). Three nine-passenger vans with drivers transported participants from campus to various field locations; the local fisheries department boat served as a dive platform and contracted commercial boats ferried participants to nearby offshore islands. Easily-accessible habitats included extensive mudflats and oyster bars, tidal channels, mangroves, intertidal rocks, sand bars, and offshore rocky reefs. Group and team collecting activities included shovel-and-sieving, snorkeling, scuba diving, and cracking rocks for boring bivalves (Figs. 5–6). Molluscan by-catch from commercial fishing trawls and species harvested by local collectors or being sold at the Chantaburi fish market provided valuable additional material for study. During the last few days, trainees from each research team presented summaries of their results at the workshop. Following the workshop, additional colleagues and student trainees from the senior scientists' home institutions participated in authoring some of the manuscripts.

Twenty-two field sites were visited (Table 1), some of them multiple times by various research teams. Voucher specimens have been widely distributed, being deposited in the National Science Museum (Bangkok), the Chulalongkorn University Museum of Zoology (Bangkok), the Field Museum of Natural History (Chicago), the American Museum of Natural History (New York), the Academy of Natural Sciences (Philadelphia), and the home institutions of participating scientists (including The Natural History Museum, London; National Museum of Wales, Cardiff; California Academy of Sciences, San Francisco; Museo Argentino de Ciencias Naturales, Buenos Aires; Museu de Zoologia da Universidade de São Paulo; and Santa Barbara Museum of Natural History). Oral or poster versions of some of these papers were presented at the Mid-Atlantic Malacologists meeting (Wilmington, Delaware) in 2006, the International Congress on Bivalvia (Barcelona, Spain) in 2006, and the World Congress of Malacology (Antwerp, Belgium) in 2007.

This volume contains 16 articles resulting from the Workshop, including three that focus on gastropods (two of these coincidentally on the muricid *Chicoreus capucinus*, a bivalve predator). Following the individual research interests, molluscan diversity is hereby approached in a variety of ways, by looking at species-level diversity, comparative ecology, morphometric variation, anatomical features, population structure, as well as reproduction and growth. Not surprisingly, the research also resulted in the redescription of numerous taxa, lectotype and neotype designations, plus two genera and three species new to science.

ACKNOWLEDGMENTS

The International Marine Bivalve Workshop (with contributions from other molluscan groups) in Chantaburi, Thailand, was organized by Kashane Chalermwat (Burapha University), Fred Wells (Western Australian Department of Fisheries), Rüdiger Bieler (Field Museum of Natural History, Chicago) and Paula M. Mikkelsen (American Museum of Natural History), and supported by U. S. National Science Foundation grant PEET DEB-9978119 (to RB and PMM). Field transportation in Thailand and chemicals were provided by the Faculty of Science, Burapha University. Major funding specifically for this workshop and its proceedings was provided by the NSF-PEET supplemental award DEB-0503714 to RB and PMM. Additional support was provided by the Faculty of Science of Burapha University, Field Museum of Natural History, American Museum of Natural History, and the home institutions and individual grants of many of the participants.

The workshop could not have been conducted without considerable assistance from staff at all levels of Burapha University. The President of the University, Prof. Suchart Upatham, who is himself a prominent malacologist, was very supportive of the project from the early conceptual stages. In the planning stages, Dr. Pichai Sonchaeng was Director of the Institute of Marine Science and Vice-President of

Table 1. Field stations, International Marine Bivalve Workshop, vicinity of Kungkrabaen Bay, Thailand, August–September 2005.

Sta. no.	Location	Coordinates	Habitat
KKB-01	"boardwalk location" southern part of Kungkrabaen Bay	12°34.42'N 101°54.25'E	mud surrounding mangrove fringe, dry at low tide
KKB-02	"boardwalk location" southern part of Kungkrabaen Bay	12°34.50'N 101°54.24'E	shelly mudflat with *Isognomon* oyster bar, dry at low tide with water channels
KKB-03	"middle of bay station" eastern part of Kungkrabaen Bay	12°35.16'N 101°54.40'E	mud surrounding isolated mangroves, dry at low tide
KKB-04	"middle of bay station" eastern part of Kungkrabaen Bay	12°35.31'N 101°54.29'E	mud in mangrove hammock, dry at low tide
KKB-05	"rocky shore" Laem Ban Tha Klaeng, ocean-side peninsula at northern inlet to Kungkrabaen Bay	12°35.22'N 101°53.05'E	tide pools in cobble beach and shoreline rocks
KKB-06	"midden material" fishermen by-catch collected by trawl offshore of Kungkrabaen Bay area	not available	not available
KKB-07	rocky shore at Laem Ban Kungkrabaen, ocean-side peninsula at southern inlet to Kungkrabaen Bay	12°34.93'N 101°53.15'E	tide pools in cobble beach and shoreline rocks
KKB-08	"Dive #1" near Chong Saba Island, ocean-side south of Kungkrabaen Bay	not recorded	fringing reef, scuba, depth 4.6 m
KKB-09	"Dive #2" near Chao Lao Nai, ocean-side south of Kungkrabaen Bay [NW of site of Dive #1]	12°31.61'N 101°55.32'E	sand plain adjacent to rocks, scuba, depth 4.3 m
KKB-10	rocky shore just NW of KKB-05, ocean-side NW of northern inlet to Kungkrabaen Bay	12°35.39'N 101°52.96'E	tide pools in cobble beach and shoreline rocks
KKB-11	just NW of KKB-010, ocean-side NW of northern inlet to Kungkrabaen Bay	not recorded	sandy beach
KKB-12	Hin Chao Lao Nai, ocean-side	12°32.26'N 101°55.47'E	rocky outcrops with sandy patches between, snorkeling, depth 1.5 m
KKB-13	"Dive #3" Hin Tamae, ocean-side	12°32.86'N 101°54.71'E	reef with mud patches between, scuba, depth 6.1 m
KKB-14	beach near scuba boat dock, ocean-side	12°34.89'N, 101°53.49'E	shelly beach
KKB-15	Chao Lao Beach, ocean-side near pier with fishing nets	12°32.58'N 101°57.83'E	sandy beach
KKB-16	Pak Nam Khem Nu, ocean-side beach at side of road below bridge	12°32.33'N 101°57.01'E	sandy beach
KKB-17	ocean-side beach next to large dirt "parking lot" at side of road	12°33.96'N, 101°54.23'E	sandy beach
KKB-18	far south end of ocean-side beach	12°31.92'N 101°56.61'E	rocks
KKB-19	"Dive #4" Hin Ka Rang Daeng, ocean-side	12°30.81'N 101°54.50'E	patch reef/rubble, scuba, depth 8.8 m
KKB-20	"Dive #5" Hin Tamae Nok, ocean-side	12°32.28'N 101°53.86'E	patch reef/rubble, scuba, depth 9.4 m
KKB-21	"island station" Koh Nam Sao [Island],	12°27.90'N 102°01.39'E	tide pools in cobble beach
KKB-22	mainland beach adjacent to Koh Nam Sao	12°28.57'N 102°02.66'E	sandy beach and tide pools in shoreline rocks

the Chantaburi Campus, and was instrumental in providing resources from both agencies; Dr. Songchaeng left Burapha University before the field component of the workshop to become Director of the Thai Natural History Museum in Bangkok. Mr. Bancha Nilkerd and Mr. Vasin Yuwanatame of the Faculty of Marine Technology on the Chantaburi Campus helped considerably at the workshop, and Mr. Nilkerd was an active participant. Special thanks are due to two other participants from the Institute of Marine Science, Mr. Kitithorn Sanpanich and Mr. Sumaitt Putchakarn, who helped extensively before, during, and after the workshop and participated fully. Another active participant, Mr. Nopadon Kakhai of the Kungkrabaen Bay Royal Development Study Centre, generously provided his detailed knowledge of the

area and access to facilities, particularly the Study Centre boat (he also provided us with the aerial view reproduced in Fig. 1). Although these are the main people to be thanked, we also warmly acknowledge the assistance we received from many other staff of Burapha University and the drivers of the three vans hired for the project.

THAI ABSTRACT

ในช่วงระยะเวลาระหว่างเดือนสิงหาคม ถึง กันยายน พุทธศักราช 2548 คณะผู้วิจัยจากหลายประเทศได้มีส่วนร่วมในการทำงานวิจัยเกี่ยวกับหอยสองฝาภายใต้ชื่อ International Marine Bivalve Workshop (IMBW) โดยมีวัตถุประสงค์ที่จะเน้นการค้นคว้าและเพิ่มเติมองค์ความรู้ด้านอนุกรมวิธาน กายวิภาค และธรรมชาติวิทยาของหอยสองฝา บริเวณอ่าวคุ้งกระเบน จังหวัดจันทบุรี ซึ่งเป็นส่วนหนึ่งของพื้นที่อ่าวไทยตอนบน ทั้งนี้เนื่องจากบริเวณดังกล่าวมีความหลากหลายของมอลลัสก์สูงแต่มีเอกสาร และรายงานทางวิทยาศาสตร์ไม่มากนัก ผลจากความร่วมมือดังกล่าวในครั้งนั้นคือเอกสารฉบับนี้ที่มีการนำเสนอผลงานจากการเริ่มเก็บตัวอย่างและข้อมูลในภาคสนามจาก IMBW ผลงานที่สรุปในเอกสารฉบับนี้เป็นผลงานจากคณะทำงานร่วมที่ประกอบด้วยอาจารย์และนักศึกษารวม 7 คณะทำงาน ที่มีโอกาสทำงานร่วมกันอย่างใกล้ชิดในภาคสนาม นอกจากนี้เอกสารฉบับนี้ยังมีการนำเสนอผลงานที่เกี่ยวข้องกับมอลลัสก์ในกลุ่มหอยฝาเดียวจากโครงการวิจัยอื่นในพื้นที่บริเวณชายฝั่งทะเลภาคตะวันออก ในจังหวัดใกล้เคียงด้วยเพื่อความสมบูรณ์ของเนื้อหา

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