

EXPEDITION ANAMBAS: AN OVERVIEW OF THE SCIENTIFIC MARINE EXPLORATION OF THE ANAMBAS AND NATUNA ARCHIPELAGO, 11-22 MARCH 2002

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Abstract. – In March 2002, scientists from the South China Sea region conducted a major biodiversity expedition to the waters off the Anambas and Natuna Islands in Indonesia. The two week expedition obtained over 3000 specimens representing a large diversity of plant and animal species. Many were new records for the area, and some were also new to science. The expedition, a direct result of the Workshop on Managing Potential Conflicts in the South China Sea, is seen as the first of others that will foster closer collaboration between regional scientists and managers. The present report provides a summary of the events leading up to the expedition as well as data on the various collection sites.

INTRODUCTION

In decades to come, Expedition Anambas might appear simply as an exploratory marine scientific expedition with the purpose of discovering new species of marine life and making contributions to scientific knowledge of regional biodiversity. However, it also carried with it, the lofty and some say idealistic objective of attempting to foster co-operation by scientists working in and around the South China Sea (SCS). The ultimate aim of the exercise was to promote a political environment amenable to the resolution of jurisdictional conflicts in the SCS.

The events surrounding the expedition, the motivation and the speed of its commission and execution are certainly unique to marine science explorations, and bear some elaboration. In fact, the origins of the expedition lie in an informal political process which has its origins in the Third United Nations Conference on the Law of the Sea.

ORIGINS

The South China Sea informal working group

Since 1990, a series of workshops entitled “Managing

Potential Conflicts in the South China Sea” (WMPC-SCS) have been hosted in various cities in Indonesia by their Department of Foreign Affairs. These non-governmental gatherings, attended by various diplomatic, military and academic participants in their private capacities, have explored ways to nurture cooperation among the authorities bordering the South China Sea.

This project was the “brainchild” of former Ambassador Hasjim Djalal of Indonesia, a leading authority on ocean affairs and one of the more influential participants at the Third United Nations Conference on the Law of the Sea, and Chairman of Pusat Studi Kawasan Asia Tenggara (= Pusat Studi). With Professor Ian Townsend-Gault, Director of the South China Sea Informal Working Group at the University of British Columbia, the strategy for implementation was drafted and up to 2001, the project was supported by a series of grants from the Canadian International Development Agency.

The WMPC-SCS is structured to having several Technical Working Groups (TWGs) on different fields of current issues such as law of the sea, marine scientific research, marine pollution, safety of navigation etc. Each TWG in turn sets

up, according to the need of the time, either a GEM (Group of Experts Meeting) or a SGZoC (Study Group on Zones of Cooperation).

At the 5th WMPC-SCS (Bukit Tinggi, Indonesia, 26-28 October, 1994), “participants agreed to give Ambassador Djalal the authority to seek support and funding for the “Proposed Collaborative Research Project on Biological Diversity in the South China Sea,” drafted at the Third Meeting of the Technical Working Group for Marine Science Research in the South China Sea held in Singapore, April 1994” and “to form a “Group of Experts” on biodiversity to assist, when called upon, in the drafting of any changes needed to the “Proposed Collaborative Research Project on Biological Diversity in the South China Sea” proposal as may be suggested by potential donors.”

The 7th WMPC-SCS (Batam, Indonesia, December 1996), outlined a workplan that included an eight day “Training Programme on Biodiversity” that was to be organized and hosted by Singapore.

Training Programme on Biodiversity, Singapore, 1997

The resultant programme, the “Workshop on Biodiversity Assessment and Inventories of Key Organisms in the South China Sea” was held at the National University of Singapore from 3rd to 10th May 1997. For the first time, a coordinated effort produced a regional inventory of the more important marine species, resulting in the landmark publication, *The Biodiversity of the South China Sea*. This was published on 31st March 2000 as a special volume of *The Raffles Bulletin of Zoology* (Supplement No. 8).

In their final statement, the participants of this workshop agreed that while biodiversity inventories were critical for effective ecosystem monitoring, baseline data for many areas in SCS remain poor. A multinational expedition into the South China Sea was unanimously agreed to be the best form of extension of this biodiversity programme. Besides providing an opportunity as a confidence building measure, it would provide the benefit of information exchange between practicing scientists from throughout the region.

Expedition Anambas: Proposal, 1999

In response to this, a proposal was prepared in 1999 by staff of the National University of Singapore. The most poorly explored areas are also the most contentious. Hence an expedition to promote confidence would have to be conducted in an area of uncontested waters of the South China Sea, potentially rich in biodiversity and yet poorly explored.

The following sites had been identified by participants of the 1997 workshop in Singapore: 1. Waters off the Mekong Delta, Vietnam; 2. Gulf of Thailand, Thailand; 3. Waters off Palawan Island, Philippines; and 4. Environs of Natunas and Anambas Islands, Indonesia.

After subsequent discussions with Professor Hasjim Djalal, it was decided that the selection of the Natunas and Anambas archipelago, the undisputed group of islands within Indonesian territorial waters, best fulfilled the requirements of the workshop process and the expedition. In addition, no marine exploration has been conducted there for at least a century! The concept of “Exercise Anambas” was thus born. Often abbreviated to Ex Anambas, it would come to be referred to interchangeably as Expedition Anambas or Expedisi Anambas.

Bogor Declaration, 10th WMPC-SCS, 1999

At the end of the 10th WMPC-SCS (Bogor, Indonesia, December 5-8, 1999), the participants issued a declaration. In Article 17, they “called for renewed efforts to secure support for and the continued implementation of the agreed co-operative projects, particularly as regards Biodiversity, Sea-level and Tide Monitoring, Information and Networking, Marine Ecosystem Monitoring, and the preparation of the Geoscience Database. In this connection, they welcomed the proposal from a Regional Expert to organise a joint biodiversity baseline study in Indonesian waters. Participants requested Professor Djalal to take up this offer and to secure support for its implementation.”

Professor Hasjim Djalal subsequently circulated the Ex Anambas proposal to this informal workshop community to gain support, whilst simultaneously continuing the fund raising effort for a biodiversity project he had already begun some years earlier. The original proposal with its October 2000 date now seemed idealistic.

Acceptance, 11th WMPC-SCS, 2001

After a presentation and discussion of the Ex Anambas proposal by Professor Djalal, the Indonesian Institute of Sciences (LIPI) and the National University of Singapore at the 11th WMPC-SCS (Cengkareng, Jakarta, Indonesia, 26-28th March 2001), participants agreed to adopt this proposal as a confidence building measure.

In January 2002, Professor Djalal announced that there was adequate funding from participating authorities. The timing was right and the expedition proposal, originally set for a month, would have to be trimmed to 10 days. He urged the scientists to put into effect the long discussed plans for an expedition immediately. With almost immediate effect, a scientific committee was formed, and the two chief scientists for the exercise identified, Dr. Kasijan Romimohtarto representing Indonesia, and Dr. Peter K. L. Ng representing Singapore. And in March 2002, the modern Indonesian research vessel, “*Baruna Jaya VIII*” set sail for the Natuna-Anambas archipelago.

Staffed with regional scientists and funded by the regions’ authorities, it had already created history. After more than a century, researchers in multi-national teams explored 60 sites in coastal habitats, beaches, rocky shores, mangroves, coral reefs as well as adjacent freshwater systems. Together, they

dived, trawled and used traps and nets to collect some 3,000 specimens. The expedition had achieved its practical goals with resounding success.

The participants achieved strong bond and warm collegiality among themselves while performing their tasks. Under difficult conditions and with preparation, they applied themselves to the mission at hand. In fact, at the post-expedition workshop, the scientific group would jointly issue a vote of thanks to the ship and crew of *Baruna Jaya VIII*. Every phase of the expedition has been carried out with full spirit of friendship and cooperation not only among the participants themselves but also with ship's crew.

EXPEDITION DETAILS

Objectives

The biodiversity program had two primary objectives:

1. To promote the spirit of cooperation and understanding among the participants of the program, with the hope of that this spirit would eventually spread to the community of marine scientists around the South China Sea.
2. To establish a scientific collection of the biological specimens as the basis for further studies of biodiversity and other studies of the region.

Expedition Vessel, the R.V. *Baruna Jaya VIII*

This expedition was conducted from the oceanographic ship *Baruna Jaya VIII* of the Research Center of Oceanography of the Indonesian Institute of Sciences, led by Captain M. Daniel and a very professional crew.

Pre-expedition arrangements

Allocation of habitat teams. – The expedition was limited by time and pre-existing knowledge of the study site. Expedition participants were thus allocated into teams to enable simultaneous investigations of multiple habitats. They were would be distributed by zodiac boats and fan out to specific sites from the ship's anchor point.

Specimen deposition. – The host country of the expedition, Indonesia, facilitated the nomination of expedition depositories of Bogor Museum (LIPI, Indonesia) and the Raffles Museum of Biodiversity Research (NUS, Singapore) to ensure post-expedition research. A document detailing the specifics of this arrangement (e.g. type specimens are returned to the host country subsequent to scientific publication, equitable sharing of vouchers between institutes and participating researchers etc.) was prepared and submitted as a Standard Operating Procedure to the scientific authorities representing the two countries on behalf of the expedition.

A Scientific Committee (including both the Chief Scientist of the expedition and scientists from Singapore and Indonesia) was established in order to oversee specimen loan, to rapidly

evaluate requests and jointly issue invoices in order to facilitate research and results. Participating scientists were informed of the arrangement, and if nominated as project heads for the investigation into specific faunal groups, had the specimen loan to them expedited.

The Scientific Committee would also oversee subsequent access by regional and international scientific community, and facilitate mechanisms (over long-term) to invite experts to work with specific groups of expedition material for publication.

Publication mechanism. – It was agreed at the inception of Expedition Anambas that the mission had to be driven by science and publication of the results was mandatory. It was established that the scientists working on the specimens would have to agree to some form of schedule. This was to ensure the need to get results published by a reasonable timeline would be appreciated at the outset. To make the results more widely accessible, the scientific output had to be in an international scientific journal indexed by the Science Citation Index. The Raffles Museum's international journal, *The Raffles Bulletin of Zoology*, fulfilled this criterion and was adopted as the publication medium.

Pre-expedition briefings. – The participating scientists had to fully understand the nature of the expedition. This was established during the pre-expedition briefings conducted by the Chief Scientist in Singapore and subsequently on board the ship in Batam before it set sail.

The Study Area

Expedition Anambas was conducted in the waters of the Anambas and the Natuna Islands group (Fig. 1). The two sets of islands consist of about 70 small islands spread in an area of about 120 miles east-west by 70 miles north-south. Some of the islands are hilly or mountainous, with major human populations established in two small towns named Tarempa in Jemaja Island, Anambas and Ranai in Natuna Besar Island, Natuna.

The depth of the water is generally not more than 60 meters. The sea bottom is generally flat or slightly sloping down from south to north. The sediment covering the bottom mostly sandy mud in the open sea. Reefs are mostly fringing the island but one or two solitary reefs may be found.

The salinity during the northeast monsoon is relatively high with values around 33.0 psu due to the influence of the 34.5 psu Pacific water that enters the Basi Channel between Luzon and Taiwan and brought by the northeast monsoon winds and the southwest surface currents to this area from the north. During the southwest monsoon, the salinity drops to the values between 31.0 to 32.0 psu due to the influence of the waters from the Java Sea, brought to the area by the southwest monsoon winds and the northeast surface currents. The low salinity of waters of the Java Sea waters is due to the dilution effect of the large rivers flowing out of Kalimantan and Sumatra.

The sea water temperature is generally around 26°Celsius during the northeast monsoon (influenced by the Pacific) and 28.5°Celsius during the southwest monsoon (influenced by the Java Sea). The temperature near the bottom generally reflects the condition at the surface due to mixing and homogenizing effects of the winds and currents.

Methods of Collection

Apart from the standard equipment and apparatus for diving, the diving team used gill-nets, scoop-nets and ichthyocides to collect biological samples. The inter-tidal team used large gill-nets, scoop-nets, cast nets, tray nets, and fishing rods for this purpose. Trawls were conducted in suitable seabed profiles while the ship was slowly moving and a bottom trawl was used to collect biological samples.

Cruise Participants

Other than the crew of RV *Baruna Jaya VIII*, 29 participants from China, Chinese-Taipei, Thailand, Malaysia, Philippines, Vietnam, Indonesia and Singapore were on board. Due to unforeseen problems, the two chief scientists from Indonesia and Singapore could not join the cruise per se. Dr. Abdul Gani Ilahude was subsequently designated the cruise expedition leader, to be assisted by Mr. N. Sivasothi. The cruise participants are:

Dr. Abdul Gani Ilahude, Indonesia, oceanographer, Cruise Expedition Leader;
Mr. Mohammad Adrim, Indonesia, fish taxonomy and ecology;
Ms. Iin Inayat Alhakim, Indonesia, marine biology: polychaete ecology and taxonomy;
Ms. Pradina Purwati, Indonesia, marine biology: echinoderm taxonomy and ecology;
Mr. Yahmantoro, Indonesia, diver;
Mr. Agus Budianto, Indonesia, diver;
Mr. Satria Djambek, Indonesia, Ministry of Foreign Affairs Officer: chief protocol officer;
Mr. Aris Heru Utomo, Indonesia, Ministry of Foreign Affairs; Captain Lettu Muddan, Indonesia, Security Officer;
Mr. Hasbanul Arif, Indonesia, Correspondent;
Dr. Tang Sengmin, China, marine biology: plankton;
Mr. Huan Rengwan, China, fisheries management and law;
Dr. Chen I-Shiung, Chinese-Taipei, fish taxonomist;
Mr. Chuang Shih-Chang, Chinese-Taipei, fisheries and prawn biology;
Dr. Mohammad Zaidi Zakaria, Malaysia, fisheries biology;
Dr. Yusri bin Yusuf, Malaysia, fish taxonomy and ecology;
Ms. Miledel Christine C. Quibilan, Philippines, reef ecology;
Ms. Ma Gregoria Joanne P. Tiquio, Philippines, seagrass biology;
Dr. Anuwat Nateewathana, Thailand, marine biology: cephalopod specialist;
Ms. Parnhathai Nopchinwong, Thailand, soft coral biology;
Dr. Nguyen van Nguyen, Vietnam, marine biology;
Dr. Hoang Xuan Ben, Vietnam, marine biology;
Mr. N. Sivasothi, Singapore, mangrove ecologist, Co-Expedition Leader;

Dr. Darren Yeo Chong Jinn, Singapore, marine biology: carcinology;
Mr. Tommy Tan Han Tong, Singapore, logistics officer;
Ms. Daisy Wowor, Indonesia, coastal biology, prawn taxonomist;
Dr. Tan Heok Hui, Singapore, marine biology: ichthyology;
Ms. Lai Chiu Yun, Singapore, coastal biology and carcinologist;
Ms. Zeehan Jaafar, Singapore, coastal biology and ichthyologist.

Itinerary and log

The location and cruise track are shown on Fig. 1. See Appendix 1 for specific collection site details.

- 8 March The RV *Baruna Jaya VIII* (herein after abbreviated as: BJ8) left the Fish Port Muara Baru-Jakarta at 2.35 pm for Batam.
- 10 March Most participants arrive in Singapore and attend an expedition briefing by the Chief Scientist, Dr. Peter K. L. Ng.
- 11 March The ship berthed at Batu Ampar pier, Batam at 12.00 noon. At 3.45 pm BJ8 left Batam for the Anambas Islands, after a farewell ceremony

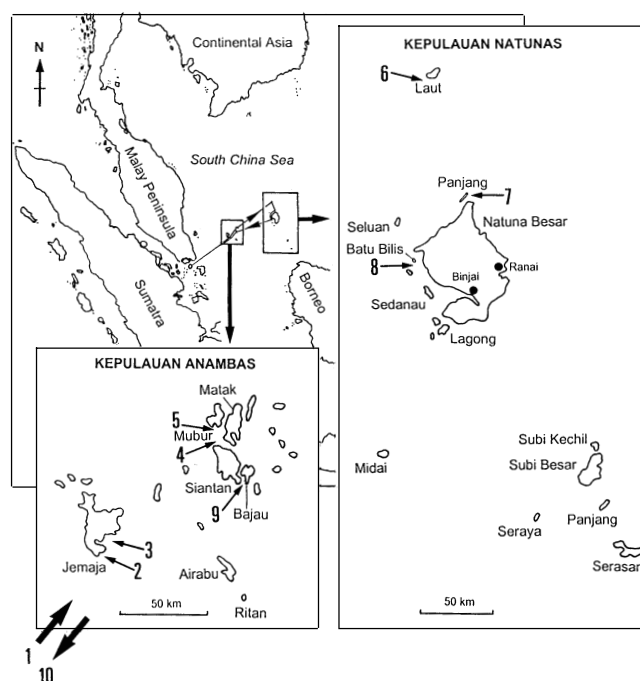


Fig. 1. Approximate location of the *Baruna Jaya VIII* anchor points during Ex Anambas from Day 01 to Day 10 of cruise trek. [P. = Pulau = Island; T. = Teluk = Bay]. Day 01 = P. Batam, 11 Mar 2002; Day 02 = T. Tiru, P. Jemaja, 12-Mar 2002; Day 03 = P. Jemaja: T. Jebung, 13-Mar 2002; Day 04 = P. Siantan, north: T. Tarempah, 14-Mar 2002; Day 05 = P. Mubur, south: T. Ayer Bandong, 15-Mar 2002; Day 06 = P. Laut, south coast, 16 March 2002; Day 07 = P. Panjang, 17-Mar 2002; Day 08 = P. Bunguran, west coast, 18 Mar 2002; Day 09 = P. Bajau, 19 Mar 2002; Day 10 = P. Batam. See also <http://rmbr.nus.edu.sg/exanambas>

organized by the Batam Manucipality Administration graced by the Foreign Minister of the Republic of Indonesia, Mr. Hasan Wirayuda.

Once BJ8 set sail, participants met for an operations meeting. They discussed the general plan of the field work, working group assignment, site selection, collection methods, preservation and storage of collected specimens, work areas etc.

12 March BJ8laid anchor east of Panisan, a small island in the Anambas Group. The crew prepared and operated four rubber boats to transport participants back and forth between BJ8and the collection sites. Biological collection was made on the reefs and inter-tidal zone at Tiru Bay, Jamaja Islands close by to Panisan.

Work and trawling were made during the night while on the way to the next collection site at Jebung Bay.

13 March BJ8 anchored at Jebung Bay, still on Jamaja Islands. Biological collections were made at this site and at Tanjung Dua.

14 March BJ8 anchored at north of Tanjung Momang. Collection works and specimen observation (by diving team) were made at the coastal water of Siantan and Matak islands, still of the Anambas Group.

15 March BJ8 anchored at three different sites around Tarempa on the Siantan island, the district capital of the Anambas Group. Collections were made on Siantan and at Ayerbandong bay of Mubur island.

16 March BJ8 moved to and laid anchor south of Pulau Laut, an island belonging to the Natuna Islands group. Biological collections were made at the reef zone south coast of Pulau Laut and at Batu Penyu reef.

17 March BJ8 laid anchor east of the northeast end of Pulau Panjang, another member of the Natuna Group. Collections were made at several sites east and west of this island.

18 March BJ8 laid anchor at the site situated between the islands of Salor, Batubilis and the Bunguran subgroup, all are of the Natuna islands group. Collections were made at several reef sites and at inter-tidal, sandy-bottom coasts at Salor and Bunguran islands.

19 March BJ8 moved back to the Anambas Group and laid anchor south of Dumang peninsula of the

Bajau island, Jemaja subgroup. Last biological collections were made at the reef and inter-tidal zone on this island.

20 March BJ8 was on its way back to Batam, arrived at Batu Ampar harbor at 10.00 WIT. Participants from Singapore, securing and safeguarding the safety of the biological collection, disembarked back to Singapore at around 12.30 WIT followed by the participants from Malaysia, Philippines, People's Republic of China, Chinese-Taipei, Thailand, Vietnam and Indonesia later that day.

BJ8 left Batu Ampar port at 16.00 WIT and arrived back at the Fish Port, Muara Baru Harbor, Jakarta, on the 22 March afternoon.

21-22 March Participants attended the post-expedition workshop when biological collections were sorted out, preserved, labeled and catalogued.

Post-expedition workshop and associated activities

At the National University of Singapore, the collections from the expedition were formally handed over to the Scientific Committee and prepared for detailed sorting and further identification. This committee was led by the chief scientist, Dr. Peter Ng, together with staff from the Oceanology office of LIPI. To facilitate, Ms. Daisy Wowor was asked by LIPI and the Indonesian Ministry of Foreign Affairs to help manage the specimens. The committee ensured the allocation of specific faunal groups to the relevant experts for further studies and scientific publication.

The agreements formulated before the expedition were implemented. These include the assurance that holotypes of new species will be returned to Indonesia by all participating scientists. In addition, a voucher set of specimens must be retained in the Bogor Museum after the studies are complete. Scientists who have worked on the material are entitled to retain specimens for their institutions provided there are sufficient specimens for the Bogor and Raffles Museums. Their retention of these specimens is on condition that they are solely for academic research and must not be used for commercial or associated activities. The material must also be available for regional scientists to examine should the occasion demand it. All specimens handed or sent over to experts are considered loans administered by the Bogor and Raffles Museums.

Following the post-expedition workshop, scientists made follow-up visits to the Raffles Museum to sort and study specimens as part of the expedition commitments. The National Museum of Marine Biology in Taiwan sent two of its staff, Dr. Ho Ping-Ho and Dr. Chen Zheng-Ping, to work on the crabs and fish respectively, with Singapore experts. Indonesia's Pusat Studi funded Dr. Kasim Moosa, Dr. Dwi Listyo Rahayu, Dr. Woro Kastoro and Ms. Pradina Purwati (all Indonesians) for research spells in the Raffles Museum

to complete their studies on various organisms. Pusat Studi also provided support for Ms. Iin Inayat Alhakim (Indonesia) for her study stint in Darwin, Australia, when she was working with Dr. Christopher Glasby. The Raffles Museum provided research fellowships for Dr. Lawrence Liao (Philippines) and Dr. Shane Ah Yong (Australia) to do expedition-related work in Singapore.

Results

The cruise successfully collected some 300 kilograms of biological specimens consisting of about 1000 species of various marine organisms from 60 sites. The first reports are published in this volume. Reports, updates and galleries as released by expedition members or their organizations, will be made available at this webpage maintained by the Raffles Museum of Biodiversity Research, NUS: <http://rmbr.nus.edu.sg/exanambas>

SCIENTIFIC OVERVIEW

The expedition, while short in duration, nevertheless uncovered numerous new records and even some new species. Certainly, they add to the extensive records compiled in the precursor volume to this one (Ng & Tan, 2000). The 12 papers in this volume range from new species descriptions to checklists and annotated checklists, reporting on non-flowering and flowering plants; polychaete worms; and selected groups of molluscs, crustaceans, aquatic insects, echinoderms and fishes. Noteworthy is the fact that the authors come from all the participating authorities in the South China Sea, reflecting the diversity of scientific ability available regionally. While many of the authors did not participate in the actual cruise per se, they nevertheless generously agreed to help sort, study and report on the material. We are also glad to have had the help of several experts outside the region. Working closely with their Southeast Asian colleagues, they have helped make the results even better.

While the number of species reported is not large by international standards, the present species lists are still significant in their own right because the Anambas and Natuna archipelagos have hardly been studied or reported on. Other than for sporadic forays into the interior of these islands by limnologists, ornithologists, mammalogists, and herpetologists over the last 100 years, little is known; and the marine biota is essentially unknown. While there have been studies of the seas around these islands, many have been hydrological in nature, and the few natural history surveys did not produce any formal publications. Consequently, what we know about the marine biota of these islands has hardly changed for over a century. Not surprisingly, almost all the taxa reported here are regarded as new records for the study area. However, immediately apparent to the informed reader would be that the collections made during the expedition were mainly of common and easily observable/collectable taxa, and that many small, rare or cryptic species were overlooked. This is not surprising, as limitations on time and resources

meant that the expedition team suffered an unavoidable lack of specialised collecting for certain groups of organisms. This is unfortunate, but in view of the circumstances, inevitable. In spite of this, the expedition still revealed some surprises, which constitute significant findings in this volume. Four new species are described herein from the Anambas and/or Natuna islands, viz., two new species of crabs (see Yeo et al., 2004) (present volume); and two new species of fishes (see Winterbottom & Chen, 2004; Tan & Lim, 2004) (both in present volume). A fifth new species (a species of gobiid fish) described was actually from outside the study area (Sulu Sea) but still within the realms of the South China Sea. Also significant are the 27 new records for the South China Sea (23 polychaetes; two stomatopod crustaceans; two echinoderms) (see Al-Hakim & Glasby, 2004; Ah Yong & Moosa, 2004; Purwati & Lane, 2004) (present volume).

The ecologically important macro-marine algae and sea grasses are listed by Liao et al. (2004) (present volume). This study was led by Professor Lawrence Liao from the Philippines, who is an expert on these plants, and the report includes a total of 74 marine algae taxa (23 red algae, 22 brown algae, 29 green algae) and three sea grass species (in two families, two genera), with all save one being new records for the study area.

The polychaete worms of Natuna islands are treated by Al-Hakim & Glasby (2004) (present volume). Dr. Christopher Glasby, an acknowledged international polychaete expert from Australia, has worked closely with his Indonesian counterpart, Ms. Iin Inayat Alhakim, to identify 129 taxa (in 38 families). Of these, 52 were positively identified to species level, including 23 species that are new records for the South China Sea. Twelve genera and one family were also recognised as new records for study area.

Vietnamese entomologist Mr. Tran Anh Duc worked closely with his Singapore mentor, Mrs. Yang Chang Man (Tran & Yang, 2004, present volume), and provided an account of the aquatic bugs (Heteroptera) obtained from the expedition, listing 22 taxa (16 identified to species level) (in 14 genera and 6 families). Of these, 21 species are new records for the study area.

Four groups of crustaceans are treated in separate papers. Stomatopod crustaceans are dealt with by Ah Yong & Moosa (2004) (present volume). Dr. Kasim Moosa, Indonesia's dean of carcinology and Dr. Shane Ah Yong, an expert on mantis shrimps from Australia, have teamed up to record 12 species (in seven genera and two families), all new records for study area, and two not listed in a previous South China Sea stomatopod checklist. The remaining three crustacean papers deal with decapod crustaceans. Eight species of pontonine shrimps (Palaemonidae) are reported on by Chinese carcinologist Dr. Li Xinzhen (2004) (present volume). Fourteen species of hermit crabs from three families (Anomura) are reported on by Dr. Dwi Listyo Rahayu from Indonesia (Rahayu, 2004, present volume). In addition, Dr. Rahayu, with her two Singaporean counterparts, Drs. Peter Ng and Darren Yeo, list 87 species of true crabs from 15

families (Brachyura) from the study sites (Yeo et al., 2004, present volume), including two new species (in the genera *Heteropilumnus* and *Parasesarma*).

Selected groups of gastropod and bivalve molluscs are covered by Singaporean malacologist Dr. Tan Koh Siang and his Indonesian associate, Dr. Woro Kastoro (Tan & Kastoro, 2004, present volume). While these authors lament on the lack of more specialised collections, they nevertheless record 91 species of gastropods (in 24 families) and 43 species of bivalves (in 18 families). These figures, however, tend to compare rather poorly with those of other expeditions, and the lack of rare or cryptic taxa is telling. This aspect is perhaps one of the major weaknesses of the expedition; a failure to make more sustained collections with more exhaustive collecting methods, and with specialist scientists familiar with the ecology and biology of their study subjects. Invariably when the latter tasks are done, many more species are uncovered.

Echinoderms are represented in this volume by an annotated checklist of asteroids by Indonesian echinoderm specialist Ms. Pradina Purwati and Brunei-based echinoderm expert Dr. David Lane (Purwati & Lane, 2004, present volume). They record 28 species of asteroids (sea stars) from the Anambas and Natuna islands, including 27 species that were collected during the expedition. Two of these records are new for the South China Sea.

Three papers on fishes appear in this volume. The first by Canadian goby expert Dr. Richard Winterbottom and Taiwanese ichthyologist Dr. Chen I-Shiung (Winterbottom & Chen, 2004, present volume) describes two new species of gobiids of the genus *Trimma*, one of which was collected during the Anambas Expedition. Singapore ichthyologists Dr. Tan Heok Hui and Mr. Kelvin Lim (Tan & Lim, 2004, present volume) also record 82 species of inland and nearshore fishes from these islands, including a new species of fighting fish of the genus *Betta*, apparently endemic to Pulau Natuna Besar (formerly Pulau Bunguran). More important is the overall synopsis of the marine fish species found or observed during the expedition, a mega-task managed by Singapore ichthyologist Mr. Kelvin Lim working with fellow ichthyologists from Indonesia (Mohammad Adrim), Chinese-Taipei (Drs. Chen I-Shiung, Chen Zheng-Ping), Malaysia (Dr. Yusri bin Yusuf) and Singapore (Dr. Tan Heok Hui, Ms. Zeehan Jaafar). This report (Adrim et al., 2004, present volume) lists 430 species or about 12% of the over 3365 fish species recorded from the South China Sea by Randall & Lim (2000).

In perspective, the 12 papers published here represent just a start to documenting the diversity of plants and animals from these islands. The material from these collections will surely result in many more studies being published in the coming years. One such study is a recent preliminary report on the herpetofauna of the Anambas and Natuna islands by Leong et al. (2003). Still many more groups of animals collected remain unreported. For example, in a newsletter article (Yeo & Ng, 2003) reporting on new species from the expedition,

a new species of blue-ringed octopus and a new species of reef crab (*Cymo*) was reported. The study of the new octopus, part of a complex of similar looking species, is still being carried out by Dr. Anuwat Nateewathana of Thailand. Many of the squids and cuttlefishes found are interesting new records for the area as well, and will only be reported upon much later by him. The new *Cymo* is currently being studied by Dr. Ho Ping-Ho of Taiwan. There are also many records of shrimps from the coastal areas, the study of which is now being finished by Dr. Cai Yixiong (Singapore/China) and Dr. Arthur Anker (Germany). In addition, we are also aware of several new records and new species of crustaceans from the Anambas and Natuna islands which live inland and will only be described at a later date by the expedition participants.

CONCLUSION

Expedition Anambas has made a useful contribution to the knowledge of the marine life of the region. The contributions have been made all the more valuable by the speedy and coordinated nature in which useful information has been made available to the international community. The immediate results were made available on the expedition webpage at <http://rmbr.nus.edu.sg/exanambas> within months of return and the scientific publication is now ready in March 2004. The *Workshop on Managing Potential Conflicts in the South China Sea* has initiated an expedition which has contributed to improving ties and scientific exchange between the region's scientists. The collaborations that ensued have extended beyond the expedition material as contacts were established between institutions in the region.

This development should be encouraged by the workshop process. In light of the success of Expedition Anambas, it is timely to examine the recommendations of the 1997 workshop to recommend methods to encourage collaboration between regional scientific marine experts. It is hoped this will not be the last initiated by the Workshop. The immense biodiversity of South China Sea and its management will continue to be a challenge to scientists in decades to come.

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Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 1 of 9: Summary Sheet of all locations

Date	Day	Ship anchor	Freshwater [DW]	Littoral 1 [JL]	Littoral 2 [ZJ]	Reef [ID]	Trawls [TT]
11-Mar	01	Pulau Batam					
12-Mar	02	Anambas: P. Jemaja: Teluk Tiru	P. Jemaja: Teluk Tiru	P. Jemaja: Teluk Tiru	P. Jemaja: Teluk Tiru	P. Jemaja: Teluk Tiru	Anambas: southern coast of Pulau Jemaja: northern
		northwards - 2 trawls				mouth of Teluk Tiru and	
13-Mar	03	Anambas: P. Jemaja: Teluk Jebung	P. Jemaja: Teluk Jebung	P. Jemaja: Teluk Jebung	P. Jemaja: Teluk Jebung	P. Jemaja: Teluk Jebung	Anambas: east coast of Pulau Jemaja: mouth of
14-Mar	04	Anambas: P. Siantan, north: Teluk Tarempah	P. Siantan, north: Teluk Tarempah	P. Siantan, north: Teluk Tarempah	P. Siantan, north: Teluk Tarempah	Teluk Jebung - 3 trawls	Anambas: Teluk Tarempa
15-Mar	05	Anambas: P. Mubur, south: Teluk Air Bandung	P. Siantan, north-east: Air Terjun	P. Siantan, north-east: Air Terjun	P. Mubur, south: Teluk Air Bandung	P. Mubur, south: Teluk Air Bandung	Anambas: Teluk Tarempa
16-Mar	06	Natuna: Pulau Laut, south coast	P. Laut: Teluk Air Payang	P. Laut: south coast	P. Laut: south coast	P. Laut & rocky islet southeast of P. Laut	
17-Mar	07	Natuna: Pulau Panjang	no freshwater coast	P. Panjang, northeastern coast	P. Panjang: northeastern coast	P. Panjang	
18-Mar	08	Natuna: Pulau Natuna Besar, west coast	P. Natuna Besar: Sg. Segeram & Sg. Datuk Kaya	P. Natuna Besar: Sg. Segeram	P. Salor, northeastern coast & P. Batubilis, southern tip	P. Salor, northeastern coast	Natuna: west coast of Pulau Natuna Besar - 2 trawls
19-Mar	09	Anambas: Pulau Bajau, south-western tip northern part of T. Dumang = Teluk Bululan	Pulau Bajau, south-western tip: Teluk Dumang & bay in corner of Pulau Behala	combined with Littoral 2	Pulau Bajau, south: Teluk Dumang: north-western	P. Bajau: south-western tip: Teluk Dumang	
20-Mar	10	Pulau Batam					

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 2 of 9: Freshwater locality data (Part 1 of 2)

Site No	Date	Time In	Time Out	No. Coll.	Collectors	Location	GPS	Habitat description
EA-DW01	12-Mar	1110	1330	2	DW, TT	Anambas: Pulau Jemaja: Teluk Tini: Air Neraja waterfall, Desa Ulu Maras, Kecamatan Jemaja, Kabupaten Natuna, Province Riau	02°54.57'N, 105°46.88'E	Waterfall with big rocks and downstream with sandy substrate with small rocks; surrounded by secondary forest and old field
EA-DW02	12-Mar	1600		2	DW, TT	Anambas: Pulau Jemaja: Teluk Tini: Sungai Air Maras, Desa Ulu Maras, Kecamatan Jemaja, Kabupaten Natuna, Province Riau	02°54.57'N, 105°46.88'E	Shallow stream, sandy substrate, moderate flow, surrounded by secondary forest and old fields; small bridge
EA-DW03	13-Mar	1000		2	DW, ZZ	Anambas: Pulau Jemaja: Teluk Jebung: inland freshwaterstream of the northern mangrove inlet	02°56.98'N, 105°50.17'E	Shallow stream, sandy substrate, lot of algae, slow moving waters, middle of a cultivated land, upstream of mangrove
EA-DW04	13-Mar	1000	1111	4	SS, SJ, CIS	Anambas: Pulau Jemaja: Teluk Jebung: northern mangrove inlet	02°58.35'N, 105°40.18'E	Brackish water stream, surrounded by <i>Lumnitzera</i> , <i>Rhizophora</i> and <i>Sonneratia</i>
EA-DW05	13-Mar	1630		4	DW, TT, SS, DY	Anambas: Pulau Jemaja: Teluk Jebung: coastal part of the southern mangrove inlet	02°56.54'N, 105°48.52'E	Sand flat at Nipah-lined river mouth, surrounded by <i>Rhizophora</i> mangrove on sand
EA-DW06	14-Mar	1030		4	DW, DY, CIS, SJ	Anambas: Pulau Siantan: inland of Teluk Tarempa: Sungai Air Suki, Desa Tarempa Barat, Kecamatan Siantan, Kabupaten Natuna, Province Riau	03°12.86'N, 106°12.99'E	Stream at edge of forest, substrate stone and gravel, moderate to fast flowing waters
EA-DW07	15-Mar	1045		3	DW, ZZ, CIS	Anambas: eastern Pulau Siantan: inland of Teluk Temburun, Air Terjun Temburun, Desa Temburun, Kecamatan Siantan, Kabupaten Natuna, Province Riau	03°10.99'N, 106°16.31'E	Waterfall, fast flowing, granitic, and moderately flowing stream, surrounded by old and active cultivated fields ("ladang"), recreational area
EA-DW08	16-Mar	1205		4	DW, ZZ, CIS, SS	Natuna: Pulau Laut: Teluk Air Payang: Desa Air Payang, Kecamatan Bunguran Barat, Kabupaten Natuna, Province Riau	04°41.98'N, 107°57.15'E	Seasonal freshwater stream, muddy substrate, big boulders, surrounded by Nipah and village cultivated land
EA-DW09	16-Mar	1437		4	DW, ZZ, CIS, SS	Natuna: Pulau Laut: Teluk Air Payang: Sungai Air Papan, Desa Air Payang, Kecamatan Bunguran Barat, Kabupaten Natuna, Province Riau	04°42.86'N, 107°57.79'E	Seasonally open stream (meromictic), closed by sandbar, coconut plantation, inland Nypa grove; taree stagnant, substrate sandy with accumulated leaf litter, forming seasonally anoxic substrate
EA-DW10	16-Mar	1500	1630	1	SS	Natuna: Pulau Laut: Teluk Air Payang: Desa Air Payang, Kecamatan Bunguran Barat, Kabupaten Natuna, Province Riau	04°42.86'N, 107°57.79'E	Sandflats, peppered with sea grass, and some corral rubble and rocks
EA-DW11	18-Mar	0945		4	DW, THH, Zaidi, CIS	Natuna: Pulau Natuna Besar: Sungai Segeram, Kecamatan Ranai, Kabupaten Natuna, Province Riau	03°58.11'N, 108°03.37'E	Freshwater stream, pH 7.2, large flat granite rocks, slow to moderate flowing water, open area, surrounded by heath forest, logged forests and old fields

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 3 of 9: Freshwater locality data (Part 2 of 2)

Site No	Date	Time In	Time Out	No. Coll.	Collectors	Location	GPS	Habitat description
EA-DW12	18-Mar	1435		3	DW, THH, CIS	Natuna: Pulau Natuna Besar: Sungai Datuk Kaya, tributary of Sungai Segeram, Kecamatan Ranai Kabupaten Natuna, Province Riau	03°56.46'N, 108°03.95'E	Blackwater tributary, pH 3.6, sandy substrate with a lot of leaf litter, closed canopy, surrounded by heath forest
EA-DW13	18-Mar	1530		1	Sedanau villager	Natuna: Pulau Natuna Besar: a pool near Sungai Datuk Kaya, tributary of Sungai Segeram, Kecamatan Ranai Kabupaten Natuna, Province Riau	03°56.46'N, 108°03.95'E	A pool in a forested area, pH 4.7, stagnant water, sandy substrate, totally closed canopy, in heath forest
EA-DW14	19-Mar	1130		2	DW, ZZ	Anambas: southern Pulau Bajau: landward site off northernmost bay of Teluk Dumang (?=Teluk Buluan [local name]), Kampung Belimbing, Desa Nyamuk, Kecamatan Siantan, Kabupaten Natuna, Province Riau	north of dive site at 03°56'16.9"N, 106°17'53.5"E	Stream (about 50m long) from groundwater source (half-meter wide, closed canopy) to coast (about 2 metres wide, open canopy), surrounded initially by dense Sago forest, later sparse coconut plantation, sandy substrate, slow moving water

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 4 of 9: Littoral locality data (Part 1 of 3)

Site No	Date	Time In	Time Out	No. Coll.	Collectors	Site characteristic	Location	GPS	Habitat description
EA-JL01	12-Mar	1030	1345	4	Joelle, Ben, Zaidi, Huang	More than 20 <i>Metopograpsus</i> , <i>Tridachna</i> numerous, biscuit stars, water skater, 5 <i>Selatium</i> St. Andrew's cross spider	Anambas: Pulau Jemaja: northern edge of Teluk Tiru, opposite Pulau Punisan		Coastal mangrove, dense <i>Rhizophora</i> , no major estuary, sandy substrate
EA-JL02	12-Mar	1515	1530	3	Joelle, Ben, Zaidi		Anambas: Pulau Jemaja: Teluk Tiru: northern-coast of Pulau Punisan		50m <i>Rhizophora</i> patch adjacent to sandy beach and dead inter-tidal coral
EA-JL03	13-Mar	0930	1630	3	Joelle, Ben, I-In	<i>Metopograpsus</i> , fish	Anambas: Pulau Jemaja: Teluk Jebung: northern and eastern mangrove inlets		Deep sheltered sandy bay with fringing <i>Rhizophora</i> , <i>Bruguiera</i> inland and sandy dead coral
EA-JL04	14-Mar	1500	1600	4	Joelle, Zeehan, Nguyen, I-In	Sea cucumbers, stomatopod, Brittle stars, <i>Eriphia</i> , <i>Metopograpsus</i>	Anambas: Pulau Matak: southeastern coast of the Niulwan Peninsular, off Selat Peninting		Fringing <i>Rhizophora</i> mangrove, 50m patch, low tide at 1400h
EA-JL05	15-Mar	0900	1615	4	JL, DY, I-In, Eddy	<i>Epixanthus</i> x2, one freshly moulted, <i>Caradina</i> , gobies, <i>Perisesarma</i> , leaf oysters, <i>Thais</i> , <i>Nerita</i> , <i>Turbo</i>	Anambas: eastern Pulau Siantan: Teluk Temburun: Sungai Temburun, waterfall (=Air Terjun)		Fringing mangrove (<i>Rhizophora</i> , <i>Nipah</i>), at edge of waterfall, water drains into pool, rocky substrate
EA-JL06	16-Mar	1030	1615	4	JL, Nguyen, Ben, Satria	Sea cucumber, <i>Thalamita</i> , molluscs, some <i>Uca</i> , gobies, shrimp	Natuna: Pulau Laut, south coast		Coastal fringe mangrove, with extensive sand spit to the east
EA-JL07	17-Mar	0945	1230				Natuna: north-eastern coast of Pulau Panjang (north-west of Pulau Natuna Besar)		Beach, rock pools and small patch of mangrove
EA-JL07	17-Mar	1800	2015	3		Ozius, frogs, crickets, mudskippers, <i>Nerita</i>	Natuna: north-eastern coast of Pulau Panjang (north-west of Pulau Natuna Besar)		Beach, rock pools and small patch of mangrove; night sampling
EA-JL08	18-Mar	1200	1400	4	JL, TT, CSC, Tang	<i>Hemigobius mingi</i> , <i>Mugiligobius</i> sp., halfbeak, shrimps, sesarmines	Natuna: Pulau Natuna Besar: Sungai Segeram: north bank about 150m inland		Slow moving brackish stream, leaf litter
EA-JL09	18-Mar	1200	1400	4	JL, TT, CSC, Tang	Ucas, mangrove jack (TT)	Natuna: Pulau Natuna Besar: Sungai Segeram: 20m north of the river, about 150m inland		Mangrove estuary, sandstone banks, about 50m wide

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 5 of 9: Littoral locality data (Part 2 of 3)

Site No	Date	Time In	Time Out	No. Coll.	Location	Site characteristic	GPS	Habitat description
EA-ZJ01	12-Mar	1020	1400	11	Anambas: Pulau Jemaja: northern edge of Teluk Tiru, opposite Pulau Punisan			Sandy-mudflat, coral rubble and rocks. Offshore coral reef, adjacent fringing mangrove, extended sand spit with rocks.
EA-ZJ02	12-Mar	1505	1700	12	Anambas: Pulau Jemaja: Teluk Tiru: northern-coast of Pulau Punisan			Sheltered bay, shallow reefs, <i>Acropora</i> coral, sandy beach, small mangrove patch
EA-ZJ03	13-Mar	0920	1600	12	Anambas: east coast of Pulau Jemaja: north-eastern shore of Teluk Jebung		02°57.83'N, 105°49.92'E	Sheltered bay with fringing mangroves (<i>Rhizophora</i> sp.), adjacent to larger patch of mangroves; sandy beach with rubble, offshore reefs not extensive.
EA-ZJ04	13-Mar	1300	1430	4	Anambas: east coast of Pulau Jemaja: north-eastern corner of Teluk Jebung: western-most of a pair of islands off Tanjung Jebung	<i>Carpilus maculatus</i> , <i>Eriphia</i> sp.		Open waters with fringing reefs, mainly <i>Acropora</i> sp.
EA-ZJ05	14-Mar	1340	1410	13	Anambas: Pulau Matak: southeastern coast of the Niulwan Peninsular, off Selat Peninting		03°13.67'N, 106°15.95'E	Shallow reefs, sandy shore with some coral and some rocky shore with barnacles. Coastal forest.
EA-ZJ06	15-Mar	1030	1400	10	Anambas: south-western Pulau Mubur: Teluk Air Bandung: eastern shore of Pulau Kecil	Fewer <i>Diadema</i> than surrounding areas	03°17.95'N, 106°13.11'E	Sandy beach with big rocks, coral rubble and shallow reefs, sheltered bay, coastal forest.
EA-ZJ07	15-Mar	1430	1530	10	Anambas: south-western Pulau Mubur: Teluk Air Bandung: eastern shore of Pulau Kecil	<i>Diadema</i> absent, few mollusc, reef fish, echinoderms	03°17.95'N, 106°13.10'E	Sheltered bay, rocky shore, lot of rocks damaged for harvesting for house building, shallow reefs offshore

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 6 of 9: Littoral locality data (Part 3 of 3)

Site No	Date	Time In	Time Out	No. Coll.	Location	Site characteristic	GPS	Habitat description
EA-ZJ08	16-Mar	1030	1600	7	Natuna: southern coast of Pulau Laut, sand/mudflats east of sand spit linking to the small island Pulau Sengat, and offshore coral reefs	1.5m <i>Sphyræna barracuda</i> caught by local fisherman in area, <i>Chelonia mydas</i> , Hawksbill turtle, Brown terns	04°15.90'N, 108°12.27'E	Extensive sandflats, extensive reef flats, coral sparse, fish and other organisms few, sand bar connects main island to small island offshore
EA-ZJ09	17-Mar	0945	1230		Natuna: north-eastern coast of Pulau Panjang (north-west of Pulau Natuna Besar)	Lot of macroalgae especially <i>Sargassum</i> , <i>Grapsus</i> , <i>Eriphia</i> , blennies.	04°15.90'N, 108°12.27'E	Rocky headlands with small sandy bays, reefs offshore.
EA-ZJ10	17-Mar	1830	2000		Natuna: north-eastern coast of Pulau Panjang (north-west of Pulau Natuna Besar)	Gill net obtained many coral associated fishes	04°15.90'N, 108°12.27'E	Rocky headlands with small sandy bays, reefs offshore; night sampling
EA-ZJ11	18-Mar	1030	1230	6	Natuna:northeastern coast of Pulau Salor (off the west coast of Pulau Natuna Besar)	Blennies, gobies	03°53.73N, 107°55.20E	Rocky-sandy shore with small rocks, adjacent to small village of about 5-6 houses
EA-ZJ12	18-Mar	1600	1800	9	Natuna: southern tip of Pulau Batubilis (off the west coast of Pulau Natuna Besar)	Gerridae, Labridae, Valencienna	03°56.26N, 107°57.50E	Sandy beaches with beach vegetation, slightly rocky on the eastern coast, offshore reefs
EA-ZJ13	19-Mar	1040	1245	12	Anambas: south of Pulau Bajau: Teluk Dumang: north-western corner of Pulau Behala	Labridae	03°56.20N, 107°57.51'E	Small stretch of sandy beach with offshore reefs; other parts of island rocky with fringing reefs; coastal forests.

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 7 of 9: Coral Reef locality data (Part 1 of 2)

Site No	Date	Time In	Time Out	No. Coll.	Collectors	Site characteristic	Location	GPS	Habitat description
EA-D01	12-Mar	1125		10	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC, CIS	False anemone fish, crown of thorns	Anambas: Pulau Jemaja: Teluk Tiru: northern-coast of Pulau Punisan	02°52'54.4"N, 105°47'38.5"E	Fringing reef, maximum length 6-8m. Acropora, boulder reef, white coral sand.
EA-D02	12-Mar	1550		10	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC, CIS	Fox-faced rabbit fish	Anambas: Pulau Jemaja: Teluk Tiru, northern edge of bay, near southern tip of Tanjung Linang	02°53'10.0"N, 105°48'30.1"E	Fringing reef, maximum length 8m. Acropora, dead coral, white coral sand.
EA-D03	13-Mar	1107		11	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC, DY, TT	<i>Trapezia</i> , crinoid shrimp, <i>Halophila</i> , Goby	Anambas: east coast of Pulau Jemaja: north-eastern corner of Teluk Jebung: off Tanjung Jebung		Reef slope, up to 15m with signs of reef damage by dynamite
EA-D04	13-Mar	1525		10	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC, CIS	Cone, shellfish, spider conch, crinoids, sea stars, brittle stars, sponges, zebra moray, blue-faced angel fish	Anambas: east coast of Pulau Jemaja: north-eastern corner of Teluk Jebung: off Tanjung Jebung	02°57'13.6"N, 105°50'47.4"E	Reef slope, white coral sand, boulder and branching corals
EA-D05	14-Mar	1000		9	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC	Coral snapping shrimp, <i>Thais</i> , Nudibranch, Coral goby, ? Larbid <i>Anthias</i>	Anambas: south-western coast of P. Matak: islet south-east of Tanjung Yang, in Selat Peninting	03°14'34.9"N, 106°14'32.6"E	Disturbed fringing reef, with large population of <i>Diadema</i> , visibility <5metres
EA-D06	14-Mar	1530		9	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC	Snails, scallop, sea stars, nudibranch, damselfish (black & white), tomato clownfish, urchin clingfish; saw Trapezia crab	Anambas: south-western coast of P. Matak: islets near Tanjung Yang, in Selat Peninting	03°15'19.9"N, 106°13'48.3"E	Shallow disturbed fringing reef, with a large population of <i>Diadema</i> , visibility <5 metres, much damaged and dead coral
EA-D07	15-Mar	1045		9	THH, Adrim, Manto, Agus, Mags, Anjo, Tek, CSC, Ben	Some strange pointed coral, in shallows razorfish (<i>Aeoliscus strigatus</i>), humphead bannerfish (<i>Heterochus varius</i>), top shell, starfish (<i>Lindria</i>), <i>Parioglossus</i> , corasse, goby, <i>Pseudochromis diadema</i> , Regal & 6 bar emperor	Anambas: south of Pulau Mubur: Teluk Air Bandung: east coast of Pulau Mantas	3°17'45.3"N, 106°12'09.8"E	Reef crest with lot of living coral, steep wall with algae and silt, >30m deep
EA-D08	15-Mar	1545		9	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC	Top shell, nudibranch, sponges (blue, pipe organ), seastar, urchin, scorpionfish (from coral rubble), parrot, striped surgeon fish, shrimp, razorfish (>30)	Anambas: south-eastern peninsular of Pulau Mubur: Teluk Air Bandung: off Tanjung Kran	03°18'05.5"N, 106°12'29.4"E	Fringing reef, fairly steep slope, reef crest and reef slope to rocky shore

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 8 of 9: Coral Reef locality data (Part 2 of 2)

Site No	Date	Time In	Time Out	No. Coll.	Collectors	Site characteristic	Location	GPS	Habitat description
EA-D09	16-Mar	1015		11	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC, DY, TT	Top shell, sea cucumber, colonila tunicate, sea star <i>Lindeia</i> , 6-bar angelfish, <i>Chelmon rostratus</i> , <i>Chaetodon trifasciatus</i> , <i>Amphiprion perideranion</i> , <i>A. ocellatus</i>	Natuna: Pulau Laut, south coast	04°38'54.8"N, 107°57'43.3"E	Fringing reef, extensive reef and sand flats (pasir puth)
EA-D10	16-Mar	1614		11	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC, DY, TT	Crinoid shrimp, Gorgonian shrimp, nudibrach, sea star <i>Lindeia</i> , regal emperor, blue mask emperor, sweetlips, batfish, bannerfish, butterflyfish, moorish idol, panther grouper, electric blue damsel, octopus (head ca. 25cm)	Natuna: rocky islet south-east of Pulau Laut	04°37'39.8"N, 107°58'18.1"E	Fringing reef off rocky (laval) islet, lot of <i>Poritis</i> , <i>Acropora</i> , soft coral,
EA-D11	16-Mar	2050		6	THH, Adrim, Agus, Yusri, DY, TT	Lot of majid crabs, shrimps, hermit crabs, <i>Trapezia</i> crab, sea urchin, sea stars, unicorn surgeon, grouper, parrot fish with bumphead, saw porcupine fish	Natuna: rocky islet south-east of Pulau Laut	04°37'39.8"N, 107°58'18.1"E	Fringing reef off rocky (laval) islet, lot of <i>Poritis</i> , <i>Acropora</i> , soft coral,
EA-D12	17-Mar	1026		9	THH, Adrim, Manto, Agus, Yusri, Mags, Tek, CSC, CIS	Snails, tiger cowry, crinoid and shrimp, urching, tunicate, sweetlips x 2, spotted puffer, boxfish, cuttlefish, 6-bar angel fish	Natuna: Pulau Panjang, north-west of Pulau Natuna Besar	04°13'57.0"N, 108°11'05.3"E	Fringing reef, extensive reef flats, white fine sand, slightly damaged reefs, large <i>Poritis</i> head, >4m across
EA-D13	18-Mar	0910	1230	8	Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, DY	Seastar, ascidian, sponge, crinoid and shrimp (D13-A), sea cucumber	Natuna: northeastern coast of Pulau Salor, west of Pulau Natuna Besar		Patch reef, with reef flat at 4-5m depth and steep slope to sandy bottom at 15m
EA-D14	19-Mar	1030		10	THH, Adrim, Manto, Agus, Yusri, Mags, Anjo, Tek, CSC, CIS	Macroalgae (sea grapes), <i>Epinephelus angus</i> (from trap), gobies, black gobioidon, <i>Pseudochromis diadema</i> , Whip coral goby, black and green nudibranch	Anambas: off the south-western tip of Pulau Bajau: Teluk Dumang	03°06'16.9"N, 106°17'53.5"E	Fringing reef, <i>Acropora</i> , branching <i>Poritis</i> ; shallows, reef flat with much algae

Appendix 1. Ex Anambas, 11-20 March 2002. Location data of sampling sites. Page 9 of 9: Trawl locality data

Site No	Date	Time In	Time Out	Collectors	Location	GPS	Habitat description
EA-TT01	12-Mar	2010	2202	Tommy Tan et al.	Anambas: southern coast of Pulau Jemaja: northern mouth of Teluk Tiru and northwards	02°52.80'N, 105°50.43'E (in, 30m); 02°51.23'N, 105°48.15'E (out, 32m)	Night trawl
EA-TT02	12-Mar	2253	2345	Tommy Tan et al.	Anambas: southern coast of Pulau Jemaja: northern mouth of Teluk Tiru and northwards	02°52.43'N, 105°50.52'E (in, 30m) to 02°54.63'N, 105°50.97'E (out, 30m)	
EA-TT03	13-Mar	1955	2100	Tommy Tan et al.	Anambas: east coast of Pulau Jemaja: mouth of Teluk Jebung	02°55.81'N, 105°50.16'E (in, 20m) to 02°53.71'N, 105°50.38'E (out, 29m)	Night trawl
EA-TT04	13-Mar	2128	2235	Tommy Tan et al.	Anambas: east coast of Pulau Jemaja: mouth of Teluk Jebung	02°53.03'N, 105°50.55'E (in, 31m) to 02°55.39'N, 105°51.15'E (out, 24m)	Night trawl
EA-TT05	13-Mar	2028	2100	Tommy Tan et al.	Anambas: east coast of Pulau Jemaja: mouth of Teluk Jebung	02°55.30'N, 105°50.27'E (in) to 02°53.71'N, 105°50.38'E (out), surface	Night insect trawl (surface)
EA-TT06	14-Mar	1920	2022	Tommy Tan et al.	Anambas: Teluk Tarempa	03°15.31N, 106°09.50E (in, 46m) to 03°15.28'N, 106°11.79'E (out, 42m)	Night trawl
EA-TT07	18-Mar	2045	2138	Tommy Tan et al.	Natuna: west coast of Pulau Natuna Besar	03°56.00'N, 107°52.00'E (in), 03°56.34'N, 107°54.41'E (out), surface	Insect trawl, surface
EA-TT08	18-Mar	2036	2140	Tommy Tan et al.	Natuna: west coast of Pulau Natuna Besar	03°56.01'N, 107°51.78'E (in, 41m), 03°56.34'N, 107°54.41'E (out, 23m)	Night Trawl