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PANGLAO 2004 – INVESTIGATIONS OF THE MARINE SPECIES RICHNESS IN THE PHILIPPINES

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ABSTRACT. **–** The Panglao Marine Biodiversity Project (PANGLAO 2004) was carried out between May–July 2004 to document the fauna and measure species richness of an ecologically complex coastal site in the Central Philippines. It involved 70 participants from 16 countries sampling molluscs and crustaceans using a wide variety of methods, viz. intertidal collection, SCUBA collection (hand-collection, scrubbing and suction), traps, tangle netting, dredging, and trawling using a 1.5 m beam trawl. The area surveyed covers about 15,000 hectares (150 km²) of the municipal waters of Panglao, Dauis, Cortes, Tagbilaran and Baclayon. Preliminary estimates suggested that some 1,200 species of decapod crustaceans and between 5,000–6,000 species of molluscs were sampled. This reflects the diversity of the collecting techniques used, as well as the variety of skills of all the participants involved for collecting, sieving, fractioning, and sorting.

KEY WORDS. **–** Philippines, PANGLAO 2004, marine species richness, collecting stations, expedition.

INTRODUCTION

Marine biologists have long ago recognized a biodiversity gradient in the Pacific Ocean, with a Southeast Asian heart, gradually vanishing into an eastern Polynesia "cold spot" (Hawaii, Pitcairn and Easter Islands). Recognition of this gradient, however, is based on a very limited number of hard data sets, scattered between animal groups and geographical locations. Two major field projects deployed in New Caledonia and the Loyalty Islands have demonstrated that the real magnitude of marine biodiversity in complex coral reef ecosystems is generally underestimated: sites in the range of 50 to 300 km² have more species than the whole Mediterranean or the whole of New Zealand. The purpose of the present project is to acquire new data on species richness in the Philippines that occupy a key position at the "heart" of the Indo-Pacific richness gradient. This project is innovative in the way it addresses spatial scales of the study sites (mosaic of bottom types in a 50–300 km² area) and the taxa it targets (sessile invertebrates: molluscs and decapod crustaceans). The results have a major bearing on two major biodiversity issues: the global magnitude of marine species diversity, and the theoretical background for the selection of marine protected areas.

Biodiversity in coral reefs are often compared to tropical forests because they are the most biologically rich ecosystems on our planet, in terms of both number of species and complexity of interactions between them. Of some 275,000 marine species (algae, animals) recorded thus far, it was estimated that 195,000 live in coastal tropical seas and 93,000 of these in coral reefs (Bouchet, 2006). A third of all marine species live in coral reef environments and yet their composition and spatial organization remains poorly documented.

With respect to species composition, the inventory of marine biodiversity keeps adding species at a rate of 1,800 new species annually, of which 43% are from the tropical Indo-Pacific. The global inventory is far from complete, especially for minute, rare, commensal, associate and parasite species which together represent the largest number of species in complex ecosystems. Despite this deficit, little field work has been organised to collect biodiversity in poorly-known regions. New species discovery is often an accidental by-product of research initially conducted for other purposes. Most integrated studies on tropical marine biodiversity focus on a few indicator taxa (fishes, corals) and neglect others, mainly because they have a reputation of being too diverse and/or too difficult for non-specialists, sometimes even for specialists.

Recognition of this gradient, however, rests on a limited number of data sets that are of uneven quality (mostly fish), and scattered animal groups and geographical locations. At the other end of the spatial scale, the approach of quantitative ecologists renders possible comparisons of diversity indices that do not have predictive power beyond very small areas, usually in the order of square metres. Between these two extremes, landscape ecology approaches biodiversity at a spatial scale that is more relevant to management and conservation. But this is not the level that is normally used by taxonomists for consolidating species inventories.

SITE IDENTIFICATION, SELECTION AND FUNDING

The Philippines had been identified as the centre of this Indo-Pacific 'hotpot' (e.g. Bouchet et al., 2002; Carpenter & Springer, 2005). With the issues discussed above in mind and with results from other expeditions, viz. New Caledonia (KOUMAC and TOUHO 1992), Loyalty Islands (LIFOU 2000) and Rapa, southernmost French Polynesia (2002), it was felt that a series of marine faunistic explorations to the Philippines would help us better understand this unique biological richness. As a result, a several marine exploratory activities were proposed to the government of the Philippines to conduct biodiversity field studies. This eventually led to the first of several of the first large-scale, international collaborative sampling and scientific efforts this century, officially named "Panglao Marine Biodiversity Project".

The island of Panglao in the Visayas region was chosen as the staging ground for the first of several Philippines expeditions. The expedition extended over the five municipalities of the first congressional district viz. Panglao, Dauis, Tagbilaran, Baclayon, and Cortes (Fig. 1A). Cortes was specifically included to incorporate the estuary of the Abatan River. Altogether, the study area includes some coastal area of 15,000 hectares (150 km^2) and a deep offshore basin reaching 2,000 m deep within 20 km from the coast. The major phase of this project took place 29 May 2004 to 8 July 2004. Some 74 scientists, students, support staff and volunteers, from 19 countries, were involved in this expedition. The average duration of individual stay was 30 days, and there about 55 persons working on-site at any given time during the duration of the expedition. Students and researchers from several countries (Indonesia, Viet Nam, Philippines, Nicaragua) were involved in the field and laboratory work, and after the expedition Filipino scientists have been involved in further taxonomic and curatorial activities in France and Singapore. This phase, commonly referrred to as the "PANGLAO 2004" expedition, is probably one of the the most comprehensive survey of coastal benthic molluscs and decapod crustaceans conducted anywhere in the tropics, and a benchmark expedition for tropical marine invertebrates.

This project proceeded under a permit granted by the Department of Agriculture, Bureau of Fisheries and Aquatic Resources (BFAR), Manila, Philippines. It was supported by grants from the Total Foundation, Total Philippines Corporatio, and the French Ministry of Foreign Affairs. Some funding came from two "Biodiversity Chairs" of the ASEAN Regional Center for Biodiversity Conservation (ARCBC). The whole project was co-ordinated by Philippe Bouchet (Muséum national d'Histore naturelle, MNHN) and Danilo Largo (University of San Carlos, USC). The field phase was coordinated by Philippe Bouchet (overall leader) and Peter K. L. Ng (National University of Singapore, crustacean group leader), as ARCBC (ASEAN Center for Biodiversity and Conservation) biodiversity chairs. Domestic logistics (pick up to/from Tagbilaran airport/ Tagbilaran pier, coordination with the accommodation management and staff, room allocation, and other related duties) was coordinated by Maria Lourdes Palomares. Implementation of scientific programme with boat operators and vehicles was supervised by Noel Saguil. Storage. Maintenance and distribution of laboratory supplies were the responsibility of Dave Valles. Supplies, equipment, shipping was co-ordinated by Philippe Maestrati.

OBJECTIVES

The purpose of the present project is to address the issue of the magnitude of species richness in coral reefs through an innovative approach that supposes three difficulties:

(1) by selecting a study site in the heart of the Indo-Pacific biodiversity gradient, i.e. the Philippines, where species richness is highest;

(2) by investigating a site at the spatial scale of landscapes, with a very high internal heterogeneity;

(3) by targeting two highly diversified taxa of benthic invertebrates: molluscs and decapod crustaceans.

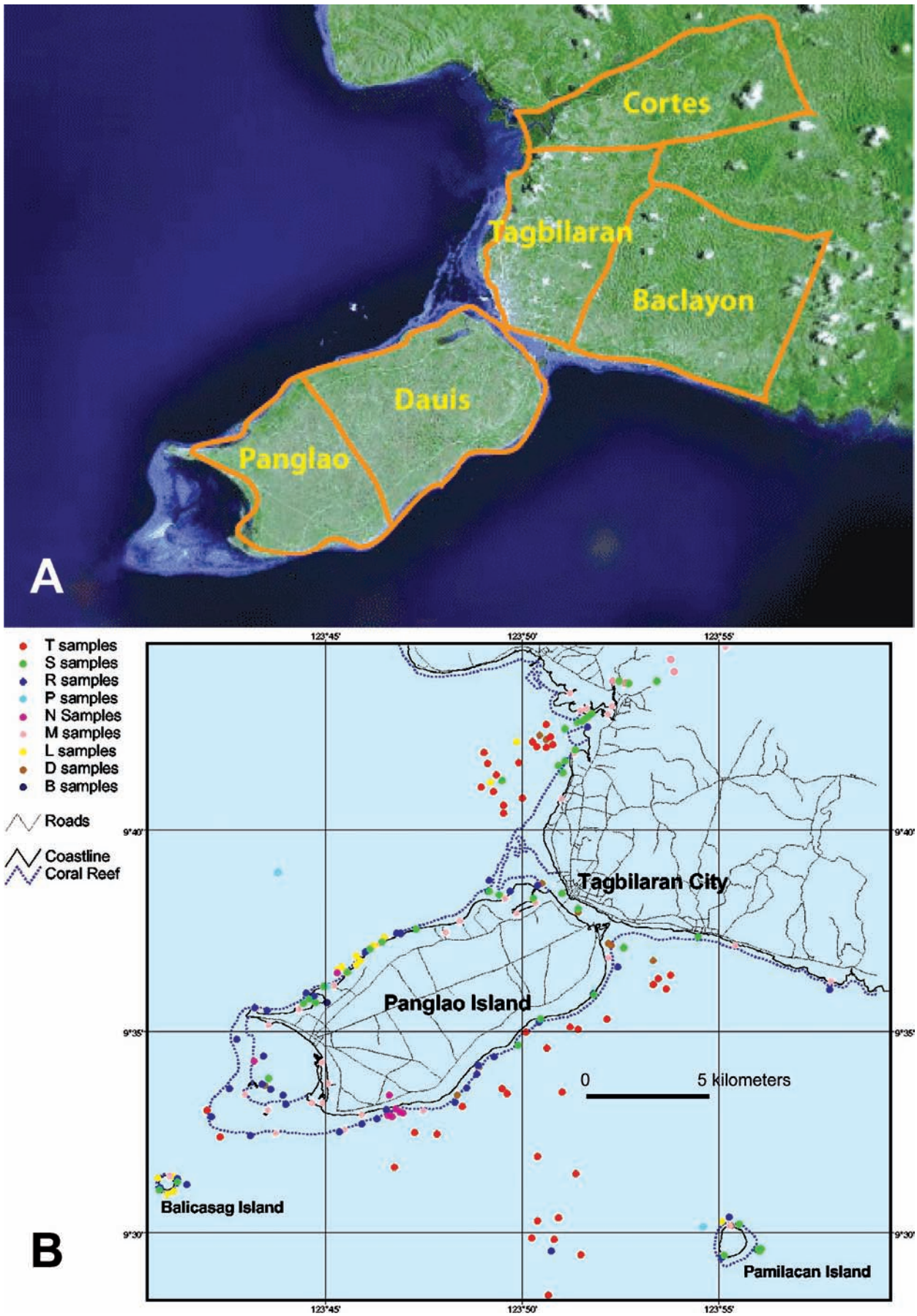

Fig. 1. A, The five municipalities of Panglao, Dauis, Tagbilaran, Baclayon, and Cortes; B, The sampling sites for PANGLAO 2004 expedition. The difference sampling techniques are indicated by single letters to represent the different collection methods, viz. B – brushing; D – dredge; L – lumum lumun; M – intertidal collection; N – traps; P – pamo (tangle) nets; R – SCUBA, hand-collecting; S – suction; T – trawl.

ORGANISATION OF FIELD OPERATIONS

Intertidal work

The best tides in Panglao occur during the night, and samples were taken during night tides on several occasions. Most of the intertidal samples were taken late in the afternoon or early in the morning. New moon and full moon periods were the best, but intertidal samples were actually taken nearly every day, as some habitats (high intertidal, estuarine, river/mangrove transition) do not require spring tides to be properly sampled. Intertidal samples typically consisted of specimens of large-/medium-sized species picked on the shore with the naked eye (on/under rocks, seagrasses) or hand dredge (in sand); pumping out burrows using "yabbie-pumps"; sifting through sand and algae; using baited traps; examination of residues of rock / algal wash; and echinoderms hosts specially examined for eulimid (parasitic) gastropods.

A total of 59 sites were sampled intertidally. Some sites were sampled repeatedly twice, thrice, or even four times. All available sites in the study area were sampled reasonably adequately, from broad intertidal mudflats between Tagbilaran and Cortes, to very narrow rocky platforms on the north coast of Panglao island, to mud banks and channels in the mangrove of the Abatan River. However, the intertidal zone around Balicasag and at the western tip of Panglao Island might have warranted additional sampling if time was available. Participants specially tasked to intertidal work were: Bruno Anseeuw, Henk Dekker, Peter Dworschak, Ludivina Labe, Marivene Manuel-Santos, Jean-Claude Plaziat, Dwi Listyo Rahayu, Emilio Rolan and Yves Terryn.

SCUBA

Subtidal sampling was central to the Panglao project and at least two chartered dive boats were assigned to sampling by SCUBA at any one time. Typically one boat would carry divers with special equipment (brushing baskets and suction samplers), while the other one would carry divers focusing on hand-picking specimens (especially nudibranchs and crustaceans in burrows) and hosts (echinoderms, octocorals and corals, etc.). The processing of the residue samples takes a long time and dives generating residue samples (by brushing or suction) were, as far as possible, taken in the morning. Only a few dives were made at night. A total of 1,150 dive-hours were made, and these generated 78 general samples, 53 suction samples and 42 brushings. Participants specially tasked to the SCUBA team were: Valeriano Borja, Yolanda Camacho, Jacques Dumas, Peter Dworschak, Terry Gosliner, Shigemitsu Kinjo, Manuel Malaquias, Machel Malay, Marco Oliverio, Patrice Petit de Voize, Marina Poddubetskaia, Gabriella Raybaudi, Patrick Scaps, Stefano Schiaparelli and Jose Templado.

Trawling and dredging

The research vessel of the USC, a 50-foot (ca. 15 m) research vessel named MB Heinrich Schoenighad, had been equipped in 2003 with an A-frame and a small winch for this expedition. Test dredgings and trawlings were carried out successfully in Oct.2003 down to depths of 100 meters. In Jun.2004, the main engine of the research vessel broke down less than a week into operations. Attempts to repair the engine were futlie and it was deemed to be beyond repair after four days. A new engine was purchased in Cebu, freighted to Tagbilaran and put in place in the vessel after six days.

Despite 10 days of down time, dredging and trawling gave remarkably good results, especially between 60–130 m depths, with catches remarkably different from the regular catches of tangle nets off the island of Balicasag (see Mendoza et al., 2009). A total of 42 trawl samples and 14 dredge samples were taken. Each sample corresponds to one to five hauls taken on the same bottom at the same depth and that were pooled together. Participants specially tasked to dredging and trawling were: Rudo von Cosel, Bertrand Richer de Forges and Hua Thai Tuyen.

Tangle nets

As a result of Phase 1 in Oct.2003, the services of local fishermen for deploying tangle nets ("pamo" nets) were engaged. Donato Lusterio deployed nets off Balicasag from Nov.2003 until Jul.2004; Jo Arbasto operated on the north coast of Panglao and in Maribohoc Bay from Jan.2004 until Jul.2004, while Terry Guibone deployed nets on Pamilacan from the beginning of Apr.2004 until Jul.2004. Crustaceans were fixed in alcohol and molluscs in formalin. Additionally, whenever possible, the fishermen brought specimens alive to our laboratory during the Expedition. Overall, the results were good, but irregular. Balicasag Island gave the largest amount of material, reflecting both the richness of the marine life around the island and the longer period of time the fishermen had been operating for us. However, many species that appear regularly or sporadically on the specimen seashell market were not present. Maribohoc Bay gave good results, but much fewer species, reflecting the lower species richness on deep soft bottoms. Returns from Pamilacan were very low and this might be due related to the collection efforts of the fishermen employed. Ng et al. (2009) discussed this method of trapping in some detail.

Lumun lumun

Lumun lumun is a trapping net made up of of tangle net material surrounded by a stronger net with large mesh size. This lumun lumun is usually left on the sea floor for about a month or more. The lumun lumun for the expedition could not be deployed until the first part of May 2004. We wanted to maximize the catch, so waited until late in the expedition to retrieve them, so that they would spend at least six weeks on the bottom. However, bad weather was encountered, and we were forced to retrieve most of our lumun lumun during

the last week. We also made deals with local fishermen to purchase the raw contents of their nets, to be sieved and processed according to our procedures. Again, the overall results were disappointing yet interesting. Disappointing because the contents were quantitatively very small; this may be due to the fact that our lumun lumun were too small and/or that old monofilament nets are in fact rather hostile environments that are not easily colonized by benthic fauna. Interesting, because lumun lumun are deployed on deep (60–140 m) drop-offs that cannot be reached by other collecting techniques and we got many species that were not obtained by other methods. Altogether, 35 units of lumun lumun were deployed by us [Pamilacan – 5, Balicasag – 12, mainland Panglao/Maribohoc – 18], eight were lost and 27 were retrieved [Pamilacan – 3, Balicasag – 11, mainland Panglao/Maribohoc – 16]. In addition, the contents of five large lumun lumun were purchased from a Balicasag fisherman.

Traps

Four sets of 10 traps were made locally by a fisherman from Looc, Panglao. These were modified from traps to catch chambered nautilus to narrower openings and finer mesh net to catch benthic molluscs and crustaceans. They were baited with chicken guts and deployed for periods of one to five nights at depths between 5 and 60 meters. We could not specifically dedicate a boat for deployment and retrieval, and the operators had to wait for the availability of boats dedicated to other tasks. This, in combination with problems with wind and currents, resulted in fewer deployments than anticipated. Deployments were restricted to the SW coast of Panglao in the vicinity of Alona Beach; in the shallow bays at the western end of the island; and off Lo-oc on the north coast; a total of 13 deployments were made. The results were again quantitatively disappointing, but qualitatively interesting: the traps got few specimens of few species, but the catch was unlike any other sampling method. Most remarkable was a specimen of an elbow crab (Parthenopidae) taken in 20 m off Alona Beach, which was described as *Pseudolambrus bato* Tan, 2008. Participants specially allocated to traps were: Patrice Bail, Roxie Diaz, Jacques Pelorce, Wenceslao Niones and Alain Robin.

LABORATORY AND OTHER SHORE-BASED WORK

Sieving and Sorting

Bulk samples and residues were sieved fresh in seawater and fractioned through a set of sieves from 0.5 to 10 mm, by which the light and heavy fractions were separated. The coarse fractions were sorted with the naked eye, fractions below three mm were sorted with dissecting microscopes. Participants more specially allocated to sieving and sorting were: Leonor Abad, Laurent Albenga, Delphine Brabant, Virginie Heros, Ida Kintanar, Joelle Lai, Philippe Maestrati, Rose Mary Omega, Reuben Pantanosas, Leah Saligumba, Tatiana Steyker, S. H. Tan and Anders Warén. Beside bulk samples, a number of catches received special treatment: notably eulimids on echinoderms (102 lots); epitoniids, ovulids and coralliophilids on Anthozoa (290 lots); opisthobranchs (1,192 lots) and thalassinids (210 lots).

Databasing and GIS

With such a large amount of samples and specimens taken, and their associated photographs and documentation, we built a database with three different files: (a) sample identifier; (b) specimen identifier; (c) photo identifier. Sample identifiers have a one-letter code corresponding to the type of gear/collect, followed by a sequential number; the database contains location (latitude, longitude and depth), brief description of site and information such as the boat used, name of group leader, date, etc. For example, T26 [trawl 26], S42 [suction sampling 42], etc. Specimen/photo identifiers consist of a two-letter code corresponding to the initials of the observer/operator, followed by a sequential number; in addition, specimen/photo identifiers carry a sample identification tag that connects them to the sample identifiers. For example, S42_BC2456 [suction sampling 42 bar code sample 2456], T26_ST247 [trawl 26 Sheila Tagaro photo 247]. Samples were also localized on a digitized map of the study area using ArcView. Participants specially allocated to photography were: Celine Chauvin, Emma Alima, Mike Cusi, Tin-Yam Chan, Chia-Wei Lin and Joelle Lai.

Photography

Books on molluscs often deal only with their shells and museum collections mostly consist of empty shells. Even spirit collections of live-collected specimens consist of discoloured animals retracted deep inside their shells. All the characters of the living animals are lost in the process. In Panglao, we documented as many species as possible of living, crawling molluscs, mostly taken in the laboratory, but some taken in situ. All digitals photographs have an identifier that connects them to the exact specimen that was photographed. Participants more specially allocated to photography were: Sheila Tagaro, Pierre Lozouet, Marina Poddubetskaia, Terry Gosliner,and Chia-Wei Lin. In addition, Serge Gofas made camera lucida drawings of selected small molluscs.

Barcoding and Fixations for Anatomical Work

The capacity to identify all living organisms from a specific sequence of their gene coding for cytochrome oxidase 1 (CO1) is known as the “Barcode Initiative” and is spearheaded by the Smithsonian Institution. The Panglao Expedition was a unique occasion to preserve a vast collection of tropical marine gastropods and decapod crustaceans in analytical-grade ethanol. A special difficulty for snails is that for a proper fixation, the animal must not be retracted deep inside the shell, especially if it closes with an operculum; species-level taxonomy requires examination of the intact shell. In Panglao, we used a combination of approaches to ensure proper fixation and preservation of shell characters. This required either breaking the shell of

one specimen and conserving it side by side with an intact specimen of the same species from the same sample; or relaxing and extending the animal in with magnesium chloride. A total of 2,911 barcode mollusc samples have been preserved for this exercise.

For crustaceans, the problems are fewer but still require that interesting species be specially preserved in 95% alcohol. Some 500 crustacean samples were specially treated, although some 40% of the remaining material has good potential for future barcoding work as they were preserved fresh in alcohol (some of the material was contaminated or had been preserved in formalin).

Taking into account redundancy (either accidental or intentional) between samples, we believe that this represents a set of 2,000–2,200 species of molluscs and 700–1,000 decapod crustaceans. This is probably the largest such systematic collection ever made. In parallel, further specimens were relaxed and fixed for anatomical or microscopy work, in different fixatives for different purposes (glutaraldehyde for electron microscopy; Bouin's, formalin or alcohol for dissecting), totalling 739 such samples. Participants more specially allocated to barcoding and fixing were: Frank Heralde, Yuri Kantor, Joelle Lai and Ellen Strong.

STATION CODING

A total of 306 localities were sampled and their details are listed in Table 1. Single letters are used to represent the method of collection, viz. B – brushing; D – dredge; L – lumum lumun; M – intertidal collection; N – traps; P – pamo (tangle) nets; R – SCUBA, hand-collecting; S – suction; T – trawl. All sampling sites are indicated in Fig. 1B

COMMUNICATION AND MEDIA

Reception at the Residence of the French Ambassador

To celebrate the launch of the Panglao project, a lunch was hosted by French Ambassador to the Philippines, Her Excellency Renée Veyret at her residence on 21 May 2004, in presence of Speaker de Valencia. The lunch was attended by directors and staff from the various institutions (USC, BFAR, National Museum and Ateneo de Manila) and partners (Total Philippines and European Delegation). ARCBC was represented by Co-Director Gregorio Texon and Project Officer Lauro Punzalan.

Visits by Local Government Units and NGOs

On two occasions, representatives from the municipalities of Panglao, Dauis and Cortes, visited the laboratory and expedition facilities in presence of Renato Villaber (Deputy of the Bohol Environment Management Office), Lourdes Lumuthang (Municipal Agricultural Officer of Dauis) and Hyacinth Suarez (permanent representative of BEMO to the project).

Visit by local NGOs on 24 Jun.2004: FPE (Federation for the Philippine Environment) represented by John Diviva, Mary Ann Tercero, Ramie Debuayan and Doris Caayan; FTC (Feed the Children Foundation)) represented by Marieta Fudolin; BANGON (Bohol Alliance of Non-Governmental Organizations) represented by Maita Palo; ELAC (Environmental Legal Assistance Center) represented by Doni Piquero; PROCESS (Participatory Research Organization of Communities and Education towards Struggle for Self-Reliance) represented by Antonio Cabo. The visit was also attended by Elvin Sansona and Ellen Gallares from FCB (First Consolidated Bank).

Visits by VIPs

USC officials: Ramon del Fierro (Dean, College of Arts and Sciences), Victoria Zosa (Vice-chair of the University Research Council) and Luz Paca (member, University Research Council).

BFAR officials: Malcolm Sarmiento (National Director), Noel Barut (Deputy Director of the National Fisheries and Research Development Institute), Edwyn Alesna (Senior Fisheries Inspector), Corazon Corrales (Regional Director of BFAR 7) and Crescencio Pahamutang (Provincial BFAR Officer).

French Embassy: Ambassador Renée Veyret, Frank Hebert (Counsellor for Cooperation and Culture), Emmanuel Gorin (science attaché) and M. Fourteau (Honorary Consul in Cebu).

TOTAL Philippines: Rona Quejada (former Manager for Corporate Affairs), Malou Espina (current Manager for Corporate Affairs), Christophe Dupeyron (Head of Finance and Administration) and Alexine Parreno (Public Affairs Executive).

Film and Television

GMA-7 at the invitation of Ms. Rona Quejada. Broadcast for three consecutive days in the morning show Unang Hirit (First Salvo) featuring the project from the laboratory to the actual field work.

Greg Miller, of Film Projects Pte. Ltd., had been shooting in the lab for a couple of weeks, initially for a film in conotoxins featuring Dr. Olivera, but expanding to a story on the expedition to be aired on Australian TV.

Jorge Sinclair, independent film maker working for the Total Foundation, has been shooting in Panglao both underwater and in the lab for three weeks. The resulting film will be used by Total for internal communication and outside promotion.

Newspapers and Magazines

The Philippine Daily Inquirer featured an article "New, rare species/Bohol waters yield diverse marine life" by Charles

Table 1. Station listing of sampling points at PANGLAO 2004

Station	Date	Locality	Coordinates	Depth	Description
Stn B1	30 May 2004	Panglao Island, Alona Reef	9°33.0'N 123°46.5'E	8–14 m	slope between reef patches
Stn B2	31 May 2004	Panglao Island, Alona reef	9°33.0'N 123°46.5'E	5 m	reef slope
Stn B3	31 May 2004	Panglao Island, Arco Point	9°33.5'N 123°48.6'E	8 m	base of reef slope
Stn B4	1 Jun.2004	Panglao Island, BBC Point	9°33.2'N 123°48.3'E	24 m	reef slope with overhangs
Stn B5	2 Jun.2004	Panglao Island, Biking	9°35.2'N 123°50.4'E	4 m	reef slope with overhangs
Stn B6	4 Jun.2004	Balicasag Island, Black Forest	9°31.1'N 123°41.3'E	12–14 m	coral patches
Stn B7	5 Jun.2004	Panglao Island, Catarman	9°35.9'N 123°51.8'E	4–30 m	reef slope with caves
Stn B8	7 Jun.2004	Panglao Island, Napaling	9°37.1'N 123°46.1'E	3 m	subtidal reef platform
Stn B9	8 Jun.2004	Panglao Island, Napaling	9°33.1'N 123°44.0'E	8–10 m	caves in the reef wall
Stn B10	10 Jun.2004	Panglao Island, Momo Beach	9°36.5'N 123°45.6'E	3–14 m	reef wall with small caves
Stn B11	11 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	2–4 m	coral rubble
Stn B12	14 Jun.2004	Panglao Island, Doljo point	9°35.6'N 123°43.2'E	24–27 m	reef slope
Stn B13	15 Jun.2004	Bohol Island, Baclayon Takot	9°37.1'N 123°52.6'E	3–5 m	coral rubble
Stn B14	16 Jun.2004	Panglao Island, Sungcolan Bay	9°38.5'N 123°49.2'E	2–4 m	coral rubble
Stn B15	16 Jun.2004	Panglao Island, Sungcolan	9°38.8'N 123°49.2'E	2–4 m	reef wall with dead coral
Stn B16	17 Jun.2004	Panglao Island, Bingag	9°37.6'N 123°47.3'E	20 m	coral rubble on sand and gravel
Stn B17	19 Jun.2004	Panglao Island, Bingag	9°37.5'N 123°46.9'E	3–21 m	reef wall with small caves
Stn B18	20 Jun.2004	Panglao Island, Sungcolan Bay	9°38.5'N 123°49.7'E	3–5 m	blocks dispersed among seagrass
Stn B19	21 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	17 m	reef slope with cave
Stn B20	23 Jun.2004	Bohol Island, Ubajan	9°41.5'N 123°51.0'E	2–8 m	rocks and corals with sand and mud
Stn B21	24 Jun.2004	Panglao Island, Napaling	9°37.2'N 123°46.4'E	20–21 m	reef wall with small caves
Stn B22	24 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	15–20 m	rubble on mixed bottom
Stn B23	25 Jun.2004	Balicasag Island, Black Forest	9°31.1'N 123°41.3'E	20–25 m	rubble on sand
Stn B24	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	38 m	floor of cave
Stn B25	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.1'E	16 m	reef slope
Stn B26	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	35 m	ceiling of small cavern
Stn B28	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.1'E	25 m	sediment from deep part of cave
Stn B29	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.1'E	26 m	sediment from cave entrance
Stn B30	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.1'E	25 m	ceiling and wall of cave
Stn B31	26 Jun.2004	Panglao Island, Dauis	9°38.7'N 123°50.4'E	1–2 m	rubble on sandy bottom ans sea grass
Stn B32	26 Jun.2004	Panglao Island, Looc	9°35.8'N 123°44.6'E	20 m	reef wall
Stn B33	26 Jun.2004	Panglao Island, Looc Cave	9°35.7'N 123°45.0'E	0–1 m	anchialine cave
Stn B34	28 Jun.2004	Panglao Island, Sungcolan inlet	9°38.3'N 123°50.3'E	1–2 m	channel between inlet and the open sea
Stn B35	1 Jul.2004	Panglao Island, North of Doljo	9°35.9'N 123°44.5'E	31 m	reef wall
Stn B36	1 Jul.2004	Panglao Island, North of Doljo	9°35.9'N 123°44.5'E	24 m	reef wall
Stn B37	2 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	19–20 m	floor of cave A, corals, sponges
Stn B38	2 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	17–18 m	bioclastic sand at entrance of cave C
Stn B39	2 Jul.2004	Panglao Island, Pontod Lagoon 1	9°32.8'N 123°42.1'E	17–25 m	reef wall with small caves
Stn B40	3 Jul.2004	Panglao Island, San Isidro	9°34.6'N 123°49.9'E	22 m	inside cave: bioclastic sand and brushing of cave wall
Stn B41	4 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	17–19 m	floor of large cave
Stn B42	6 Jul.2004	Panglao Island, between Momo and Napaling	9°37.0'N 123°46.0'E	30–33 m	ledge on reef wall
Stn D1	3 Jun.2004	Panglao Island, southeast of Dauis	9°37.2'N 123°52.2'E	2 m	muddy coarse sand with rubble
Stn D2	3 Jun.2004	Bohol Island, west of Baclayon	9°36.8'N 123°53.3'E	41–46 m	muddy fine sand, encrusting red algae
Stn D3	3 Jun.2004	Panglao Island, southeast of Dauis	9°37.1'N 123°52.3'E	4–5 m	white coral sand with coral slabs
Stn D4	5 Jun.2004	Panglao Island, Pontod Islet	9°33.1'N 123°44.0'E	0–2 m	soft bottom with seagrass
Stn D5	6 Jun.2004	Panglao Island, Pontod Islet	9°33.6'N 123°43.5'E	0–3 m	soft bottom with seagrass
Stn D6	7 Jun.2004	Panglao Island, Bolod	9°33.4'N 123°48.4'E	3 m	mixed bottom
Stn D7	7 Jun.2004	Panglao Island, Pontod Islet	9°33.1'N 123°44.0'E	2–3 m	soft bottom with seagrass
Stn D8	9 Jun.2004	Panglao Island, Dao	9°34.0'N 123°48.9'E	1–4 m	sandy bottom, seagrass, rubble, coral slabs
Stn D9	11 Jun.2004	Pamilacan Island	9°30.0'N 123°55.3'E	2–4 m	coral and white sand

Table 1. Continued.

Station	Date	Locality	Coordinates	Depth	Description
Stn D10	20 Jun.2004	Bohol Island, Cortes	9°42.4'N 123°50.6'E	15–22 m	mud
Stn D11	20 Jun.2004	Bohol Island, Cortes	9°42.5'N 123°50.5'E	41–48 m	mud
Stn D12	28 Jun.2004	Tagbilaran, Panglao channel	9°38.5'N 123°51.0'E	2–4 m	mud
Stn D13	29 Jun.2004	Panglao Island, Tagbilaran channel	9°38.0'N 123°51.4'E	2–3 m	sand
Stn D14	29 Jun.2004	Panglao Island, West Tutoland	9°38.8'N 123°50.6'E	2–4 m	coral sand on hard bottom
Stn L35	21 Jun.2004	Panglao Island, Looc	9°36.4'N 123°45.5'E	90 m	
Stn L36	21 Jun.2004	Panglao Island, Looc	9°36.7'N 123°45.8'E	85–90 m	
Stn L37	21 Jun.2004	Panglao Island, Looc	9°36.8'N 123°45.9'E	110 m	
Stn L38-39	21 Jun.2004	Panglao Island, Looc	9°37.1'N 123°46.2'E	135 m	
Stn L40	24 Jun.2004	Panglao Island, Tangnan	9°37.3'N 123°46.5'E	100–120 m	
Stn L41	1 Jul.2004	Panglao Island, in front of PTA Compound	9°31.3'N 123°41.2'E	90–100 m	
Stn L42	2 Jul.2004	Balicasag Island	9°31.2'N 123°40.7'E	80–90 m	
Stn L43	2 Jul.2004	Pamilacan Island	9°30.1'N 123°55.1'E	60 m	
Stn L44	3 Jul.2004	Balicasag Island	9°30.8'N 123°41.0'E	85–100 m	
Stn L45	3 Jul.2004	Panglao Island, Bingag	9°36.6'N 123°45.4'E	80–90 m	
Stn L46	4 Jul.2004	Balicasag Island	9°30.9'N 123°41.2'E	90–110 m	
Stn L47	5 Jul.2004	Bohol Island, Cortes Takot	9°41.3'N 123°49.2'E	ca. 100 m	
Stn L48	5 Jul.2004	Bohol Island, Manga	9°42.3'N 123°49.9'E	ca. 100 m	
Stn L49	6 Jul.2004	Panglao Island, off Momo Beach	9°36.5'E, 123°45.3'E	90 m	
Stn L50	6 Jul.2004	Panglao Island, off Momo Beach	9°36.9'E, 123°45.8'E	120 m	
Stn M1	May–Jul.2004	Panglao Island, Alona Beach	9°32.9'N 123°46.6'E	0–1 m	intertidal to shallow subtidal
Stn M2	30 May 2004	Panglao Island, west end of Alona Beach	9°32.8'N 123°45.9'E	0–2 m	reef flat with seagrass bed
Stn M3	31 May 2004	Panglao Island, Danao	9°32.5/33.1'N 123°44.7/45.5'E	0–2.5 m	intertidal to shallow subtidal reef
Stn M4	31 May 2004	Panglao Island, south of Gak-Ang Islet	9°32.4'N 123°43.7'E	0.5–3 m	mixed reef with Sargassum
Stn M5	May–Jun.2004	Panglao Island, Doljo Point	9°35.5'N 123°43.3'E/44.3'E	0–2 m	mixed intertidal platform, fringe mangove, seagrass
Stn M6	31 May 2004	Bohol Island, Baclayon, Loay	9°36.2'N 123°57.9'E	? m	mangrove and intertidal seagrass bed
Stn M7	1 Jun.2004	Panglao Island, Momo Beach	9°36.1'N 123°45.2'E	0–3 m	reef platform with seagrass
Stn M9	4 Jun.2004	Panglao Island, inside lagoon near Doljo Point	9°35.1'N 123°43.6'E	0,5 m	muddy sand flat with seagrass, fringe mangrove
Stn M10	5 Jun.2004	Panglao Island, Bingag/Tabalong	9°37.8'N 123°48.4'E	0–3 m	rocky intertidal with seagrass
Stn M11	6 Jun.2004	Panglao Island, Sungcolan Bay	9°38.3'N 123°49.6'E	0–3 m	rocky intertidal, fringe mangrove and seagrass
Stn M12	8 Jun.2004	Panglao Island, Dao	9°33.9'N 123°48.9'E	0–3 m	coral platform with seagrass
Stn M13	8 Jun.2004	Panglao Island, Bolod	9°32.9'N 123°47.5'E	0–3 m	coral platform with seagrass
Stn M14	8 Jun.2004	Panglao Island, Bolod	9°32.9'N 123°46.9'E	0–3 m	coral platform with seagrass
Stn M15	9 Jun.2004	Bohol Island, Baclayon	9°37.2'N 123°55.4'E	0–1 m	intertidal platform with seagrass
Stn M16	9 Jun.2004	Panglao Island, Sungcolan inlet	9°38.2'N 123°50.3'E	0–1 m	mixed bottoms
Stn M17	9 Jun.2004	Panglao Island, Pontod Islet	9°33.4'N 123°43.0'E	0–1 m	sandy bottom and seagrass
Stn M18	10, 12 Jun.2004	Panglao Island, Gak-Ang Islet	9°33.0'N 123°43.5'E	0–1 m	sandy bottom and seagrass
Stn M19	11 Jun.2004	Pamilacan Island	9°30.0'N 123°55.3'E	0–2 m	sand beach, seagrass and rocks
Stn M20	13 Jun.2004	Pamilacan Island	9°29.3'N 123°55.1'E	0–2 m	gently sloping platform protected by rock bar
Stn M21	13 Jun.2004	Balicasag Island	9°31.3'N 123°41.0'E	0–1 m	rocky intertidal
Stn M22	15 Jun.2004	Panglao Island, Napaling	9°37.2'N 123°46.4'E	0–3 m	coral platform
Stn M23	16 Jun.2004	Panglao Island, Bingag/Tabalong	9°37.8'N 123°48.4'E	0–1 m	white sand and seagrass
Stn M24	17 Jun.2004	Bohol Island, Manga Point	9°42.1'N 123°51.3'E	0–1 m	mangrove and mixed intertidal
Stn M26	19 Jun.2004	Bohol Island, Taloto	9°40.9'N 123°51.1'E	0–2 m	mixed intertidal with fringe mangrove
Stn M27	23 Jun.2004	Bohol Island, north of Abatan River	9°43.6'N 123°51.2'E	0–1 m	mangrove; salinity 35%
Stn M28	23 Jun.2004	Bohol Island, Abatan River	9°44.5'N 123°53.8'E	0–1 m	intertidal in nipa palms; salinity 7.5%

Table 1. Continued.

Station	Date	Locality	Coordinates	Depth	Description
Stn M29	23 Jun.2004	Bohol Island, Abatan River	9°44.7'N 123°55.2'E	0–1 m	intertidal in nipa palms; salinity 4%
Stn M30	24 Jun.2004	Bohol Island, mouth of Abatan River	9°43.1'N 123°51.5'E	0–1 m	mangrove; salinity 29%
Stn M31	24 Jun.2004	Bohol Island, Abatan River	9°43.0'N 123°52.2'E	0–1 m	intertidal in nipa palms; salinity 16%
Stn M32	24 Jun.2004	Bohol Island, Abatan River	9°43.8'N 123°52.7'E	0–1 m	intertidal in nipa palms; 16%°
Stn M33	25 Jun.2004	Bohol Island, south of Abatan River	9°42.8'N 123°51.7'E	0–1 m	seafront from mangrove to nipa; salinity 30%
Stn M34	25 Jun.2004	Bohol Island, Abatan River	9°43.8'N 123°52.7'E	0–1 m	nipa palms and sanbar; salinity 10%
Stn M35	25 Jun.2004	Bohol Island, Abatan River	9°44.8'N 123°54.7'E	0–2 m	sand, consolidated cliff and rocks; salinity 4%
Stn M37	26 Jun.2004	Bohol Island, Abatan River, north of Cortes bridge	9°44.8'N 123°55.5'E	0–2 m	sand, consolidated cliff, subtidal rocks; salinity 2%
Stn M38	26 Jun.2004	Bohol Island, Abatan River	9°45.0'N 123°55.9'E	0–1 m	gravel, sand and mud; salinity 4%
Stn M39	26 Jun.2004	Bohol Island, Abatan River	9°45.2'N 123°56.0'E	0–2 m	sand, consolidated cliff, subtidal rocks; salinity 2%
Stn M40	22, 28 Jun.2004	Panglao Island, Looc (lagoon inside)	9°35.7'N 123°44.7'E	0–3 m	fringe mangrove, subtidal, seagrass and hard bottom
Stn M41	28 Jun.2004	Bohol Island, Abatan River	9°43.9'N 123°52.3'E	0 m	nipa palms; salinity 10%
Stn M42	28 Jun.2004	Bohol Island, Abatan River	9°43.9'N 123°53.4'E	0–1 m	nipa palms, river bed and shore cliff, mud, rocks; 4%
Stn M43	28 Jun.2004	Bohol Island, Abatan River	9°44.1'N 123°53.9'E	0–1.5 m	muddy sand and consolidated cliff; salinity 4%
Stn M44	29 Jun.2004	Panglao Island, inner part of Danao embayment	9°33.1'N 123°44.9'E	0 m	fringe mangrove
Stn M45	29 Jun.2004	Bohol Island, Abatan River	9°43.9'N 123°53.4'E	0–1 m	nipa palms, fresh water spring on bank; salinity 8%
Stn M46	29 Jun.2004	Bohol Island, Abatan River	9°44.8'N 123°55.5'E	0–1 m	nipa palms
Stn M47	29 Jun.2004	Panglao Island, middle part of Danao embayment	9°33.6'N 123°45.1'E	0–0.5 m	fringe mangrove
Stn M48	30 Jun.2004	Bohol Island, Abatan River	9°44.8'N 123°55.5'E	0–2 m	gravels and plants upstream of nipa palms; salinity 1%
Stn M49	30 Jun.2004	Bohol Island, Abatan River	9°43.8'N 123°52.6'E	0 m	nipa palms; salinity 10%
Stn M50	30 Jun.2004	Bohol Island, Abatan River	9°43.2'N 123°52.3'E	0 m	nipa palms; salinity 14%
Stn M51	30 Jun.2004	Panglao Island, Mayacabac	9°36.8'N 123°52.2'E	0 m	sand and seagrass
Stn M52	30 Jun.2004	Panglao Island, mouth of Danao embayment	9°34.2'N 123°44.9'E	0–1 m	fringe mangrove, seagrass on sand
Stn M53	2 Jul.2004	Panglao Island, Mayacabac	9°36.8'N 123°52.2'E	0 m	artificial mangrove; residual water at 40%
Stn M54	2 Jul.2004	Bohol Island, Abatan River	9°43.2'N 123°51.6'E	0 m	mangrove with dominant nipa palms; salinity 27%
Stn M55	2 Jul.2004	Bohol Island, north of mouth of Abatan River	9°43.0'N 123°51.7'E	0 m	mangrove; salinity 17–31%
Stn M56	2 Jul.2004	Panglao Island, Momo Beach	9°36.1'N 123°45.2'E	0 m	upper intertidal rocky cliff at night
Stn M57	4 Jul.2004	Panglao Island, Sungcolan inlet	9°38.0'N 123°49.9'E	0 m	fringe mangrove; salinity 28–31%
Stn M58	4 Jul.2004	Balicasag Island	9°31.3'N 123°41.0'E	? m	intertidal
Stn M59	5 Jul.2004	Panglao Island, Cambagat Cave	9°37.5'N 123°48.1'E	0 m	night collect
Stn N1	4 Jun.2004	Panglao Island, Alona Beach	9°32.9'N 123°46.6'E	3 m	baited traps
Stn N2	7 Jun.2004	Panglao Island, Alona reef	9°32.9'N 123°46.6'E	12 m	baited traps
Stn N3	7 Jun.2004	Panglao Island, Alona reef	9°32.9'N 123°46.6'E	25–30 m	baited traps
Stn N4	10 Jun.2004	Panglao Island, Alona reef	9°32.9'N 123°46.9'E	15–20 m	baited traps
Stn N5	10 Jun.2004	Panglao Island, Alona reef	9°32.9'N 123°46.9'E	20–35 m	baited traps
Stn N6	11 Jun.2004	Panglao Island, Tawala	9°32.9'N 123°47.0'E	40–45 m	baited traps
Stn N7	12 Jun.2004	Panglao Island, Tawala	9°32.9'N 123°46.9'E	16–17 m	baited traps
Stn N8	14 Jun.2004	Panglao Island, Tawala	9°32.8'N 123°46.6'E	32–55 m	baited traps
Stn N9	17 Jun.2004	Panglao Island, Tawala	9°32.8'N 123°46.7'E	50–65 m	baited traps
Stn N10	21 Jun.2004	Panglao Island, Tawala	9°33.0'N 123°46.8'E	35–60 m	baited traps

Table 1. Continued.

Station	Date	Locality	Coordinates	Depth	Description
Stn N11	24 Jun.2004	Panglao Island, Tawala	9°33.3'N 123°46.6'E	? m	baited traps in anchialine cave, salinity 4%
Stn N12	24 Jun.2004	Panglao Island, lagoon off Poblacion	9°34.2'N 123°43.2'E	1–2 m	baited traps
Stn N13	7 Jul.2004	Panglao Island, Momo Beach	9°36.4'E, 123°45.3'E	100 m	baited traps
Stn P1	30 May 2004	Bohol Island, Maribohoc Bay	9°36.1'N 123°45.0'E	90–200 m	tangle nets from local fishermen
Stn P2	30 May 2004	Bohol Island, Maribohoc Bay	9°39.0'N 123°43.8'E	400 m	tangle nets from local fishermen
Stn P3	31 May 2004	Balicasag Island	9°31.1'N 123°41.5'E	ca. 100 m	tangle nets from local fishermen
Stn P5	3 Jun.2004	Pamilacan Island	9°30.0'N 123°54.6'E	ca. 100 m	tangle nets from local fishermen
Stn PN1	anyday	Balicasag Island	9°31.2'N 123°41.3'E	50–500m	purchase from local fishermen
Stn R1	30 May-2004	Balicasag Island	9°31.2'N 123°41.3'E	5–7 m	sand with degraded coral patches
Stn R2	30 May-2004	Panglao Island, Sea Quest Wreck	9°32.6'N 123°45.9'E	3–18 m	reef slope
Stn R3	May–Jul.2004	Panglao Island, Alona reef	9°33.0'N 123°46.5'E	5–24 m	base of reef slope
Stn R4	May–Jul.2004	Panglao Island, Arco Point	9°33.5/34.1'N 123°48.6/48.9'E	2–30 m	base of reef slope
Stn R5	31 May 2004	Panglao Island, Catarman	9°36.6'N 123°52.4'E	5–16 m	coral heads
Stn R6	31 May 2004	Bohol Island, Baclayon, Loay	9°36.0'N 123°57.8'E	5–12 m	very muddy sand with coral boulders
Stn R7	1 Jun.2004	Panglao Island, BBC Point	9°33.2'N 123°48.3'E	5–22 m	reef slope with soft/hard corals, small caves
Stn R8	any days	Panglao Island, House Reef	9°32.7'N 123°46.3'E	4–24 m	reef slope, small caves, mixed bottoms
Stn R9	1 Jun.2004	Panglao Island, BBC Point	9°33.2'N 123°48.3'E	5–22 m	reef slope with soft/hard corals, small caves
Stn R10	1 Jun.2004	Panglao Island, Biking	9°35.3'N 123°50.5'E	2–10 m	reef platform with seagrass bed
Stn R11	2 Jun.2004	Panglao Island, Biking	9°35.2'N 123°50.5'E	4 m	reef platform with seagrass bed
Stn R12	2 Jun.2004	Panglao Island, Danao	9°32.4'N 123°45.4'E	2–20 m	sandy reef slope
Stn R14	3 Jun.2004	Bohol Island, Baclayon	9°37.4'N 123°54.5E	6–8 m	sand and coral patches
Stn R16	4 Jun.2004	Balicasag Island, Black Forest	9°31.1'N 123°41.3'E	6–22 m	edge of reef platform and slope
Stn R17	4 Jun.2004	Balicasag Island, Black Forest	9°31.1'N 123°41.3'E	3–15 m	edge of reef platform and slope
Stn R18	4 Jun.2004	Panglao Island, Catarman	9°35.9'N 123°51.8'E	2–46 m	coral heads
Stn R19	5, 7, 24 Jun. 2004	Panglao Island, Napaling	9°37.1/2'N 123°46.1/46.4'E	2–54 m	reef slope with gorgonians and black coral
Stn R20	5 Jun.2004	Balicasag Island, Cathedral	9°31.1'N 123°41.5'E	7–48 m	sand ledge with coral patches, reef wall
Stn R21	5 Jun.2004	Balicasag Island, Rico's Wall	9°31.0'N 123°40.8'N	2–50 m	reef wall
Stn R22	5 Jun.2004	Panglao Island, Catarman	9°35.9'N 123°51.8'N	4–30 m	reef slope with caves
Stn R23	5, 6, 21 Jun. 2004	Panglao Island, lagoon off Poblacion	9°33.5/34.8'N 123°42.7/43.6'E	1–5 m	sand with extensive seagrass, few coral heads
Stn R24	6 Jun.2004	Panglao Island, Bingag	9°37.5'N 123°46.8'N	0–2 m	coral platform
Stn R25	6 Jun.2004	Panglao Island, Bingag	9°37.5'N 123°46.8'N	2–32 m	steep reef wall
Stn R26	6, 20, 30 Jun. 2004	Panglao Island, Sungcolan Bay	9°38.4/38.5'N 123°49.1/49.4/49.7'E	1–5 m	fringe mangrove, sand and seagrass
Stn R29	7 Jun.2004	Panglao Island, Pontod Islet	9°33.5'N 123°42.6'E	3–35 m	reef wall with caves, large gorgonians
Stn R30	8 Jun.2004	Panglao Island, Napaling	9°37.1'N 123°46.1'E	15–37 m	reef slope with black coral, gorg/alcyo.
Stn R31	8 Jun.2004	Pamilacan Island, south-southwest slope	9°29.4'N 123°56.0'E	10–41 m	reef slope with caves, anthipa/gorg.
Stn R32	8 Jun.2004	Panglao Island, Pontod Islet lagoon	9°33.1'N 123°44.0'E	4 m	sand with extensive seagrass, few coral heads
Stn R33	9 Jun.2004	Panglao Island, Dao	9°33.9'N 123°48.8'E	1–4 m	coral platform with seagrass
Stn R34	9 Jun.2004	Panglao Island, Looc	9°35.9'N 123°44.7'E	1–12 m	coral platform, sand patches, seagrass
Stn R35	9 Jun.2004	Pamilacan Island	9°30.2'N 123°55.3'E	2–32 m	
Stn R36	9 Jun.2004	Pamilacan Island	9°30.2'N 123°55.3'E	3–32 m	
Stn R37	10 Jun.2004	Panglao Island, Momo Beach	9°36.5'N 123°45.6'E	28–32 m	caves in the reef wall
Stn R38	11 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	6–37 m	reef slope
Stn R39	11 Jun.2004	Panglao Island, lagoon 1	9°33.6'N 123°43.4'E	3 m	sand with extensive seagrass, few coral heads
Stn R40	12 Jun.2004	Pamilacan Island	9°29.2'N 123°55.1'E	8–33 m	damaged coral slope

Table 1. Continued.

Station	Date	Locality	Coordinates	Depth	Description
Stn R41	13 Jun.2004	West Pamilacan Island, Cervera shoal	9°29.4'N 123°50.7'E	11–40 m	damaged coral reef
Stn R42	12 Jun.2004	Bohol Island, Baclayon Takot	9°37.1'N 123°52.6'E	8–22 m	damaged coral reef
Stn R43	13 Jun.2004	Bohol Island, Cortes Takot	9°41.3'N 123°49.5'E	3–41 m	isolated coral plateau
Stn R44	14 Jun.2004	Panglao Island, lagoon near Doljo Point	9°33.3/34.6'N 123°43.9/43.4'E	2 m	fine sand with seagrass
Stn R45	15 Jun.2004	Pamilacan Island	9°29.3'N 123°55.1'E	3–7 m	fringing reef with patches of sand
Stn R46	15 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	11–38 m	coral plateau with fine sand covering rock
Stn R47	16 Jun.2004	Panglao Island, Sungcolan	9°38.8'N 123°49.2'E	4–25 m	reef wall with dead coral
Stn R48	17 Jun.2004	Panglao Island, Bingag	9°37.6'N 123°47.3'E	4–20 m	reef wall with small caves
Stn R49	17 Jun.2004	Panglao Island, San Isidro	9°34.6'N 123°49.9'E	1–32 m	reef flat and slope
Stn R50	18 Jun.2004	Panglao Island, Looc	9°35.7'N 123°44.4'E	3–7 m	sand and seagrass with coral patches
Stn R51	Jun–Jul.2004	Panglao Island, Doljo point	9°35.5/35.9'N 123°43.2/44.5'E	2–52 m	reef platform and wall; giant seafans in 40-60 m
Stn R52	19 Jun.2004	Panglao Island, Bingag	9°37.4'N 123°46.9'E	3–20 m	coral and sand platform
Stn R54	20 Jun.2004	Bohol Island, Manga	9°41.8'N 123°51.1'E	8–10 m	mud
Stn R55	20 Jun.2004	Bohol Island, Manga	9°41.7'N 123°50.9'E	8–15 m	mud
Stn R56	21 Jun.2004	Panglao Island, western tip of island	9°32.3'N 123°43.1'E	1–10 m	lagoon and upper reef slope
Stn R59	22 Jun.2004	Panglao Island, Momo Beach	9°36.1'N 123°44.9'E	2–20 m	coral patches, platform with thin layer of sand
Stn R60	22 Jun.2004	Panglao Island, Looc	9°35.7'N 123°44.7'E	2–8 m	rocks, seagrass, sand and coral patches
Stn R61	23 Jun.2004	Panglao Island, between Dao and San Isidro	9°34.3'N 123°49.3'E	4–22 m	sand slope with fine sediment near fringe mangrove
Stn R62	23 Jun.2004	Bohol Island, Ubajan	9°41.5'N 123°51.0'E	2–15 m	hard bottom with sediment patches
Stn R63	24 Jun.2004	Panglao Island, Napaling	9°37.2'N 123°46.4'E	3–40 m	reef slope with gorgonians and black coral
Stn R64	26 Jun.2004	Panglao Island, Looc	9°35.8'N 123°44.6'E	1–6 m	hard plateau, fine sediment near fringe mangrove
Stn R65	26 Jun.2004	Panglao Island, Dauis	9°38.7'N 123°50.4'E	1–2 m	sand and seagrass
Stn R66	28 Jun.2004	Panglao Island, Sungcolan inlet	9°38.3'N 123°50.3'E	1–3 m	channel between lagoon and the sea
Stn R67	30 Jun.2004	Panglao Island, Tagbilaran-Panglao channel	9°38.1'N 123°51.4'E	3–3.5 m	sand with little mud
Stn R68	30 Jun.2004	Panglao Island, Tagbilaran-Panglao channel	9°38.1'N 123°51.4'E	3–3.5 m	Mussel bed on silty sand
Stn R70	1 Jul.2004	Pamilacan Island	9°30.1'N 123°55.5'E	20 m	corals and sand
Stn R73	2 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	2–30 m	coral platform and reef wall
Stn R74	2 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	? m	reef platform
Stn R75	3 Jul.2004	Panglao Island, west of Pontod	9°32.8'N 123°42.1'E	3–35 m	reef slope and wall
Stn R77	6 Jul.2004	Panglao Island, between Momo and Napaling	9°37.0'N 123°46.0'E	2–10 m	platform with sand, seagrass and coral patches
Stn R78	7 Jul.2004	Bohol Island, Manga-Taloto	9°42.7'N 123°51.7'E	2–4 m	subtidal mudflat
Stn S1	2 Jun.2004	Panglao Island, Biking	9°35.3'N 123°50.5'E	5 m	reef slope with overhangs
Stn S2	3 Jun.2004	Bohol Island, Baclayon	9°37.4'N 123°54.5'E	4–5 m	hard bottom with small pockets of sediment
Stn S3	4 Jun.2004	Balicasag Island, Black Forest	9°31.1'N 123°41.3'E	6 m	edge of reef platform
Stn S4	5 Jun.2004	Panglao Island, Catarman	9°35.9'N 123°51.8'E	4–30 m	reef slope with caves
Stn S5	8 Jun.2004	Panglao Island, Napaling	9°37.1'N 123°46.1'E	2–4 m	rock and coral patches, brown algae
Stn S6	9 Jun.2004	Panglao Island, Sungcolan Bay	9°38.5'N 123°49.2'E	1–4 m	sand with seagrass
Stn S7	9 Jun.2004	Panglao Island, Sungcolan Bay	9°38.5'N 123°49.2'E	1–4 m	sand with seagrass
Stn S8	10 Jun.2004	Panglao Island, Momo Beach	9°36.5'N 123°45.6'E	28–32 m	caves in the reef wall
Stn S9	10 Jun.2004	Panglao Island, lagoon off Poblacion	9°33.8'N 123°43.6'E	3 m	fine sand and seagrass
Stn S10	11 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	6–14 m	coral plateau with fine sand covering rocks
Stn S11	11 Jun.2004	Panglao Island, lagoon off Poblacion	9°33.6'N 123°43.6'E	2 m	fine sand and seagrass

Table 1. Continued.

Station	Date	Locality	Coordinates	Depth	Description
Stn S12	14 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	6–8 m	coral plateau with fine sand
Stn S13	15 Jun.2004	Bohol Island, Baclayon Takot	9°37.1'N 123°52.6'E	8–15 m	reef wall with dead coral sand and mud
Stn S14	15 Jun.2004	Pamilacan Island	9°29.3'N 123°55.1'E	5–12 m	fringing reef
Stn S15	16 Jun.2004	Bohol Island, Cortes Takot	9°41.3'N 123°49.5'E	4–6 m	coral plateau
Stn S16	17 Jun.2004	Panglao Island, Bingag	9°37.6'N 123°47.3'E	15–18 m	reef wall with small caves
Stn S17	17 Jun.2004	Panglao Island, San Isidro	9°34.6'N 123°49.9'E	6 m	reef flat, mixed bottoms
Stn S18	18 Jun.2004	Panglao Island, Looc	9°35.7'N 123°44.4'E	0–2 m	subtidal platform, mixed bottoms
Stn S19	20 Jun.2004	Bohol island, Manga	9°42.1'N 123°51.4'E	3–4 m	mud
Stn S20	20 Jun.2004	Bohol island, Manga	9°41.8'N 123°51.1'E	10 m	mud
Stn S21	20 Jun.2004	Bohol island, Manga	9°41.7'N 123°50.9'E	4–12 m	reef slope with silt
Stn S22	21 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	15–20 m	hard ground covered with sand
Stn S23	22 Jun.2004	Panglao Island, Looc	9°35.7'N 123°44.7'E	2 m	sand and seagrass
Stn S24	22 Jun.2004	Panglao Island, Momo Beach	9°36.1'N 123°45.0'E	2–4 m	subtidal platform
Stn S25	23 Jun.2004	Bohol Island, Ubajan	9°41.5'N 123°51.0'E	21 m	mud
Stn S26	23 Jun.2004	Bohol Island, Ubajan	9°41.5'N 123°51.0'E	21 m	mud
Stn S27	23 Jun.2004	Bohol Island, Ubajan	9°41.5'N 123°51.0'E	12 m	mud
Stn S28	24 Jun.2004	Panglao Island, Napaling	9°37.2'N 123°46.4'E	28–32 m	reef wall with small caves
Stn S29	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.0'E	32 m	wall and floor of small cavern
Stn S30	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.1'E	25 m	floor of cave (same cave as S31)
Stn S31	25 Jun.2004	Pamilacan Island	9°29.4'N 123°56.1'E	24 m	wall of cave (same cave as S30)
Stn S32	28 Jun.2004	Panglao Island, Looc	9°35.8'N 123°44.6'E	2–3 m	hard plateau with sand covering rocks
Stn S33	28 Jun.2004	Bohol Island, Abatan River Estuary	9°43.8'N 123°52.7'E	1–3 m	mud sand
Stn S34	29 Jun.2004	Panglao Island, Sungcolan inlet	9°38.3'N 123°50.3'E	2 m	mixed bottom
Stn S35	29 Jun.2004	Bohol Island, Abatan River	9°43.9'N 123°53.4'E	3–5 m	sandy mud; salinity 28%
Stn S36	29 Jun.2004	Bohol Island, Abatan River	9°45.2'N 123°56.0'E	2–3 m	hard ground, thin layer of mud, patches of sand; salinity 1%
Stn S37	29 Jun.2004	Bohol Island, Abatan River	9°44.8'N 123°55.5'E	2–4 m	hard ground covered by mud; salinity 24%
Stn S38	30 Jun.2004	Panglao Island, Tagbilaran-Panglao channel	9°38.1'N 123°51.4'E	3–4 m	grey sand with a little mud
Stn S39	30 Jun.2004	Panglao Island, Tagbilaran-Panglao channel	9°38.1'N 123°51.4'E	3–4 m	muddy sand, beds of *Modiolus*
Stn S40	30 Jun.2004	Panglao Island, Sungcolan Bay	9°38.4'N 123°49.4'E	2–4 m	very fine sand
Stn S41	30 Jun.2004	Panglao Island, Sungcolan Bay	9°38.4'N 123°49.4'E	2–4 m	coarse Amphioxus sand
Stn S42	1 Jul.2004	Pamilacan Island	9°30.1'N 123°55.5'E	15–20 m	sand on hardground
Stn S43	1 Jul.2004	Pamilacan Island	9°30.1'N 123°55.5'E	2–3 m	sand and coral debris
Stn S44	2 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	40 m	wall and floor of cave A
Stn S45	2 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	17 m	bioclastic sand on the floor of cave B
Stn S46	2 Jul.2004	Balicasag Island	9°30.9'N 123°40.8'E	14 m	wall and floor of cave B
Stn S47	3 Jul.2004	Bohol Island, Abatan River	9°43.9'N 123°52.5'E	2–8 m	sandy bottom; salinity 31%
Stn S48	3 Jul.2004	Bohol Island, Abatan River	9°43.0'N 123°51.7'E	2–3 m	river mouth btwn mangroves; salinity 31%
Stn S49	3 Jul.2004	Bohol Island, Abatan River	9°43.0'N 123°51.8'E	2–6 m	river mouth, mangrove with nipa palms; salinity 33%
Stn S50	5 Jul.2004	Bohol Island, off Abatan River mouth	9°42.8'N 123°51.5'E	2 m	mud
Stn S51	5 Jul.2004	Bohol Island, off Abatan River mouth	9°42.9'N 123°51.6'E	2 m	mud
Stn S52	5 Jul.2004	Bohol Island, off Abatan River mouth	9°42.7'N 123°51.1'E	2 m	shell accumulations
Stn S53	5 Jul.2004	Bohol Island, off Abatan River mouth	9°42.7'N 123°51.1'E	2 m	muddy sand
Stn T1	30 May 2004	Panglao Island, Bolod	9°32.4'N 123°47.3'E	83–102 m	mud and many sponges
Stn T2	31 May 2004	Panglao Island, Bolod	9°32.4'N 123°47.8'E	152 m	coarse sand
Stn T3	31 May 2004	Panglao Island, Bolod	9°31.5'N 123°46.8'E	ca. 150 m	fine and muddy sand
Stn T4	1 Jun.2004	Panglao Island, Bolod	9°33.0'N 123°48.5'E	82 m	many large sponges
Stn T5	2 Jun.2004	Bohol Island, west of Baclayon	9°35.3'N 123°52.2'E	84–87 m	coarse muddy sand

Table 1. Continued.

Station	Date	Locality	Coordinates	Depth	Description
Stn T6	2 Jun.2004	Bohol Island, west of Baclayon	9°35.1'N 123°51.2'E	34–82 m	coarse muddy sand with large sponges
Stn T7	3 Jun.2004	Bohol Island, west of Baclayon	9°36.1'N 123°53.3'E	61–62 m	muddy fine sand
Stn T8	8 Jun.2004	Panglao Island, San Isidro	9°34.9'N 123°50.1'E	1–3 m	
Stn T9	14 Jun.2004	Panglao Island, off San Isidro	9°33.5/33.9'N 123°49.5/50.5'E	97–120 m	fine sand with seagrass
Stn T10	15 Jun.2004	Panglao Island, off San Isidro	9°33.4/33.8'N 123°49.6/51.5'E	117–124 m	mud and fine sand
Stn T11	16 Jun.2004	Bohol Island, Maribohoc Bay	9°40.9'N 123°50.0'E	78–95 m	sponges and muddy sand
Stn T12	17 Jun.2004	Bohol Island, Maribohoc Bay	9°42.1'N 123°49.0'E	180 m	mud
Stn T13	17 Jun.2004	Bohol Island, Maribohoc Bay	9°40.5'N 123°49.5'E	90–100 m	sponges
Stn T14	17 Jun.2004	Bohol Island, Maribohoc Bay	9°41.5'N 123°49.3'E	101–110 m	mud with shells
Stn T15	18 Jun.2004	Bohol Island, Cortes	9°41.2'N 123°49.0'E	180 m	muddy bottom
Stn T16	19 Jun.2004	Bohol Island, Cortes	9°40.7'N 123°49.5'E	88–116 m	muddy bottom with sponges
Stn T17	19 Jun.2004	Bohol Island, Cortes	9°41.8'N 123°49.1'E	132–137 m	muddy bottom with sponges
Stn T18	19 Jun.2004	Bohol Island, Cortes	9°41.8'N 123°49.9'E	80–100 m	muddy bottom with sponges
Stn T19	20 Jun.2004	Bohol Island, Cortes	9°42.2'N 123°50.8'E	10–26 m	mud
Stn T20	20 Jun.2004	Bohol Island, Cortes	9°42.2'N 123°50.4'E	44–59 m	mud
Stn T21	21 Jun.2004	Bohol Island, Cortes	9°42.8'N 123°50.6'E	12 m	dead corals
Stn T22	21 Jun.2004	Bohol Island, Cortes	9°42.5'N 123°50.7'E	11–20 m	mud
Stn T23	21 Jun.2004	Bohol Island, Cortes	9°42.2'N 123°50.6'E	35–45 m	
Stn T24	23 Jun.2004	Bohol Island, Cortes	9°42.3'N 123°50.3'E	35–57 m	mud and wood
Stn T25	24 Jun.2004	Bohol Island, Cortes	9°41.1'N 123°49.3'E	160–210 m	fine sand and mud
Stn T26	24 Jun.2004	Bohol Island, Cortes	9°43.3'N 123°48.8'E	123–135 m	mud
Stn T27	25 Jun.2004	Between Panglao and Pamilacan islands	9°33.4'N 123°51.0'E	106–137 m	fine sand and mud with Echinoderms
Stn T28	1 Jul.2004	Panglao Island, Biking-Catarman	9°35.0'N 123°51.4'E	80 m	muddy sand
Stn T29	1 Jul.2004	Panglao Island, Biking	9°34.5'N 123°50.6'E	77–84 m	mud
Stn T30	1 Jul.2004	Bohol Island, Baclayon	9°36.3'N 123°53.5'E	59–65 m	muddy sand
Stn T31	2 Jul.2004	Between Panglao and Balicasag islands	9°33.0'N 123°42.0'E	100–140 m	sand and hard bottom
Stn T32	3 Jul.2004	Bohol Island, Baclayon	9°36.4'N 123°53.8'E	60–62 m	muddy sand
Stn T33	3 Jul.2004	Bohol Island, Baclayon	9°36.0'N 123°53.7'E	67–74 m	sand with sponges
Stn T34	3 Jul.2004	Between Libaong and Pamilacan	9°31.3'N 123°51.4'E	145–163 m	sand with Echinoderms
Stn T35	3 Jul.2004	Between Libaong and Pamilacan	9°31.8'N 123°50.4'E	172–182 m	-
Stn T36	4 Jul.2004	West Pamilacan island, Cervera shoal	9°29.3'N 123°51.5'E	95–128 m	sand on Echinoderms bed
Stn T37	4 Jul.2004	West Pamilacan island, Cervera shoal	9°28.2'N 123°50.7'E	134–190 m	sand on Echinoderms bed
Stn T38	4 Jul.2004	Balicasag Island	9°32.3'N 123°42.3'E	80–140 m	sponges bed
Stn T39	6 Jul.2004	West Pamilacan Island, Cervera shoal	9°30.1'N 123°50.4'E	100–138 m	muddy sand
Stn T40	6 Jul.2004	West Pamilacan Island, Cervera shoal	9°29.7'N 123°50.8'E	80–98 m	sponges bed
Stn T41	6 Jul.2004	West Pamilacan Island, Cervera shoal	9°29.7'N 123°50.2'E	110–112 m	-
Stn T42	6 Jul.2004	West Pamilacan Island, Cervera shoal	9°30.2'N 123°51.0'E	120–135 m	sand with Echinoderms

Legend:
B, brushing; D, dredge; L, lumum lumun; M, intertidal collection; N, traps; P, pamo (tangle) nets; R, SCUBA, hand-collecting; S, suction; T, trawl.

Buban in its 10–11 Jul.2004 edition (this is a two-part series, Saturday and Sunday). This article acknowledges the support of ARCBC.

"Bastille Day 2004", published as a supplement to the Philippine Star, has an article by Dong Magsajo "The Panglao Project: Science as a source of cooperation".

Agence France-Presse issued a release on 9 Jul.2004 entitled "Panglao marine study finds 'dozens' of new species".

Two journalists, Marie Lescroart (story) and Claude Rives (photographs), working for the French magazine Terre Sauvage were present in Panglao for a couple of weeks.

The Straits Times of Singapore picked up the story from the Philippine Daily Inquirer via Reuters and presented a special story about the Singapore delegates and the overall expedition mission in Sep.2004.

Web Site

A web site dedicated to the Panglao Marine Biodiversity project has been set up (www.panglao-hotspot.org) and updated during the expedition by Ryard-Jerard Paig. It contains a description of the project (in English, Tagalog and Cebuano); sampling techniques used; list of the participants, their institutional affiliation and work assignment(s) during the project; an in situ and ex situ gallery of the most significant catches found in the field. A link has been established to the ARCBC site, and other sites of sponsors and funding participants.

RESULTS

Preliminary estimates suggest that some 1,200 species of decapod crustaceans and between 5,000–6,000 species of molluscs were sampled (Bouchet, 2006). This reflects the diversity of the collecting techniques used, as well as the variety of skills of all the participants involved for collecting, sieving and fractioning, and sorting. The large amount of material obtained is currently still being sorted and worked upon by specialists in their respective fields.

Crustacea

Three alpheid species belonging in two new genera have been reported (*Jengalpheops rufus* Anker & Dworschak, 2007; *Richalpheus palmeri* Anker & Jeng, 2006; *Athanas anatidactylus* Anker & Marin, 2007; *Acanthanas pusillus* Anker, Poddoubtchenko & Jeng, 2006). Marin & Chan (2006) reported two new genera (*Brucecaris* and *Unguicaris*) and a new species of crinoid-associated pontoniine shrimps, *Unguicaris panglaonis*. Dworschak, Marin & Anker (2006) described *Naushonia carinata* (Thalassinidea: Laomediidae) from this expedition. Dworschak (2006a) described *Eucalliax panglaoensis*, followed by the first record of *Lepidophthalmus tridentatus* from the Philippines (Dworschak, 2006b). For the Crangonidae, Komai & Chan (2007) described *Philocheras magnioculus*. Han et al. (2007) reported on the other crangonids obtained from PANGLAO 2004 and the subsequent deep-sea expedition to the Bohol Sea [see PANGLAO 2005 report in this Supplement (Richer de Forges et al., 2009)]. Mitsuhashi & Chan (2007) described a new genus and species, *Blepharocaris panglao*, from the expedition. For pontoniine shrimps, Mitsuhashi & Chan (2008) described a new species, *Apopontonia dentimanus*, from north of Doljo (Stn. B36). A beautiful new species of reef lobster of the family Enoplometopidae has also been found (Chan & Ng, 2008).

For anomurans, McLaughlin & Rahayu (2007) reported *Pseudopagurodes piliferus* (Henderson, 1888) from this expedition. For brachyurans, Richer de Forges & Ng (2007a) reported *Homola orientalis* Henderson, 1888, *Latreillopsis bispinosa* Henderson, 1888, *Latreillopsis tetraspinosa* Dai & Chen, 1980, *Lamoha murotoensis* (Sakai, 1979), *Homolomannia sibogae* Ihle, 1912, and *Homolomannia occlusa* Guinot & Richer de Forges, 1981. In the same paper, they described two new species, viz. *Latreillopsis mariveneae* and *Yaldwynopsis saguili*. Richer de Forges & Ng (2007b) reported *Cyrtomaia murrayi* Miers, 1886, and *Cyrtomain horrida* Rathbun, 1916. Ng & Castro (2007) described *Xenocrate peculiaris* (Goneplacidae) from three specimens obtained during the expedition. Ng & Manuel-Santos (2007) reported on a new family, Vultocinidae, a new genus and species, *Vultocinus anfractus*, from PANGLAO 2004, which was followed by a subsequent report on female characters of *Vultocinus anfractus* by Ng & Richer de Forges (2009). Galil & Ng (2007) recorded 38 species of leucosiid crabs from Panglao. Amongst these, three were new: *Alox bothros, Alox chaunos* and *Urnalana cristata*. Five species were also recorded from the Philippines for the first time: *Leucosia rubripalma* Galil, 2003, *Myra tumidospina* Galil, 2001, *Urnalana elata* (A. Milne-Edwards, 1874), *Urnalana pulchella* (Bell, 1855), and *Urnalana whitei* (Bell, 1855). Mendoza & Ng (2007) described *Macrophthalmus* (*Euplax*) *dagohoyi* from the subtidal regions of Bohol. Tan (2008) described a bizarre parthenopid, *Pseudolambrus bato*, that was surprisingly caught just outside the expedition camp site. Mendoza & Ng (2008a) described two new xanthid genera, *Visayax* and *Rizalthus*, along with the new species *Hepatoporus pumex*, *Visayax estampadori*, *Visayax osteodictyon* and *Rizalthus anconis*. Mendoza & Ng (2008b) described *Alainodaeus filipinus* (Xanthidae) from Balicasag. McLay & Tan (2009) used *Garthambrus* Ng, 1996, material from this expedition in their revision of that genus. Several species of hymenosomatids were also described from the subtidal and intertidal areas by Naruse et al. (2008). Ahyong & Ng (2007) described *Visayeres acron*, a new genus and new species of pinnotherid, from the mantle cavity of a *Lithophaga* sp. specimen. In this supplement, more new species of cymonomids, leucosiids and pinnotherids collected from the PANGLAO 2004 expedition are described by Ahyong & Ng (2009), Galil & Ng (2009) and Ng & Naruse (2009). Material from this expedition has also contributed to some key revisions, for example by Castro (2007) on the Goneplacidae; Tan & Ng (2007a, b) on the Parthenopidae; and Manuel-Santos & Ng (2007) on the xanthid genus *Ladomedaeus*.

Ahyong et al. (2007) utilised some of the material obtained from this expedition in their paper on brachyuran phylogeny. Other material were also used in an analysis of Gnathophyllidae phylogeny using nuclear 18S and 28S rDNA sequences (Mitsuhashi et al., 2007), and in a cladistic analysis of *Metanephrops* (Tshudy et al., 2007).

Mollusca

Material from the PANGLAO 2004 Expedition has contributed in part or in whole to at least nine publications. Dollin (2007) published a work on the *Ransoniella*. Kantor (2007) analysed the feeding ability of *Conus*. Malaquias & Reid (2008) revised the Bullidae. Poppe et al. (2006) dealt with the Sequenziidae, Chilodontidae, Trochidae, Calliostomatidae, Trochidae, Calliostomatidae and Solariellidae from the Philippines. Puillandre et al. (2008) published a work on untangling the complex phylogeny of molluscs known as "turrids". Reid et al. (2008) dealt with the relationship between mudwhelks and mangroves. Simone & Cunha (2008) published additional information to the recent revision of the genus *Spinosipella*. Verhecken (2008) treated the Cancellariidae from the Philippines. Vidal & Kirkendale (2007) described 10 new species of Cardiidae from New Caledonia and the tropical Western Pacific. And finally, Williams & Ozawa (2006) published a molecular phylogenetic study which suggests the polyphyly of the Turbinidae and the Trochoidea.

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APPENDIX

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