Marine biodiversity of the coastal area of the Berau region, East Kalimantan, Indonesia

Progress report

East Kalimantan Program - Pilot phase (October 2003)

Preliminary results of a field survey performed by an Indonesian - Dutch biodiversity research team sponsored by

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Contents

Abstract. The coastal waters of East Kalimantan are part of the western boundary of the Indo-West Pacific centre of maximum marine biodiversity. During the pilot phase of the East Kalimantan Program (EKP) this has been tested by various specialists who used model taxa to test this hypothesis. Emphasis has been put on the species-rich coral reefs and islands that show reef communities in association with mangroves, seagrass, and algae. A range of habitats has been surveyed, varying in distance offshore (with decreasing salinity, turbidity, sedimentation and nutrient load): fringing reefs along the mainland shore, offshore patch reefs, delta-front barrier reefs, and uplifted atolls. The atolls consist of limestone rock and contain shallow enclosed marine lakes with a unique marine biota. The various marine environments at NE Kalimantan have enabled the selection of taxa and sites that can be used for future research on climate change records (e.g. corals, sponges and molluscs), molecular (genetic) divergence within species between separated populations, and environmental effects on species diversity. The biodiversity data will be important for the design of Marine Protected Areas (MPAs) and as an instrument in raising public awareness regarding the sustainable use of the natural resources, such as through fisheries and diving tourism.

Scientific significance. The coastal waters of East Kalimantan form part of the western boundary of the Indo-West Pacific centre of maximum marine biodiversity. Historical and ecological explanations support this hypothesis. During the last glacial maximum (17,000 yrs ago), sea levels and river mouths were situated 120 m lower than now (Voris 2000). Shelf seas (e.g. the Java Sea) had disappeared and Kalimantan was part of the SE Asian continental mainland. In that time, the Indonesian throughflow (Gordon & Fine 1996) also passed east off Kalimantan, through the Sulu-Sulawesi Seas and the Makassar Strait, carrying larvae and plankton from the Pacific to the Indian Ocean.

Surface seawater salinity near most of the Kalimantan coastline is low and sediment load is high due to river runoff (Wyrtki 1961, Eisma et al. 1989). The Berau River discharge, however, is low enough to enable the development of extensive reefs in addition to mangroves and seagrass beds. Nevertheless, it still causes low salinity, high nutrient loads, turbidity and sedimentation that may affect these ecosystems, especially at the fringing reef along the mainland shore. The delta-front barrier reef system may block the river discharge to more offshore reefs (Tomascik et al. 1997). The 3m-tidal range causes a distinct depth zonation over the reef slopes. Sedimentation may be related to the velocity of the currents in between the reefs. Uplifted atolls are located just outside the 200-m isobath (Kuenen 1933). Enclosed atoll lakes (one at Kakaban, two at Maratua) form a rare environmental feature in SE Asia, comparable with those of the Palau Islands (Hamner & Hamner 1998).

Marine biodiversity has been assessed by collecting species presence / absence data of selected genera and families from habitats along an onshore-offshore gradient. DNA-samples will be used for the study of intra-specific genetic relationships between populations. With the help of these baseline data from Kalimantan, taxa and sites have been selected in proposals for the main phase transect studies on species richness and habitat deterioration. Some taxa will be selected for climatic change records (corals, molluscs, sponges) and for future DNA studies (sponges, molluscs) in relation to isolation processes.

Hypothesis and research question. The Berau Archipelago contains a wide spectrum of coastal habitats. The area offers ecological conditions for a potentially high number of marine species and is most suitable for representing E Kalimantan in biodiversity studies. Although some new and rare species have been described from here (Ng & Tomascik 1994, Tomascik & Mah 1994, Kott 1995, Fransen & Tomascik 1996, Massin & Tomascik 1996), and preliminary fieldwork has been carried out by PPO-LIPI (1995 and 1999), no comparative fauna and flora inventories were made before the EKP pilot phase. The EKP pilot phase was aimed at testing whether East Kalimantan is part of the centre of marine biodiversity, and whether this would be predominantly related to ecological and/or historical-biogeographical factors.

Research methodology. Target taxa were used in a rapid bio-diversity assessment in which biogeographic data were gathered from the Berau area (see maps on page 4). By the restriction to these model taxa, not only relevant occurrence records were collected for biogeographic comparisons but also reasonably reliable absence data could be gathered (see Hoeksema & Putra 2002, Wallace et al. 2002). In one month time, habitats were studied varying in distance offshore (salinity, turbidity, nutrient load, sedimentation), land- and seaward position, depth, current velocity, substratum type, and isolation (marine lakes). Monitoring of symbiotic associations represented the biotic habitat component in the biodiversity studies, e.g. shrimps and gastropods living in association with invertebrate hosts (sponges, corals, ascidians). Reference collections have been or will be deposited at Ancol PPO-LIPI), Cibinong (PPB-LIPI), Leiden (Naturalis), and Amsterdam (Zoological Museum, Univeristy of Amsterdam).

History of the project. This project is a follow-up of the Snellius-II Expedition (1984-1985), during which Naturalis, KUN, NHN and ZMA worked with LIPI. These institutes have also been involved in the Buginesia Programme at Makassar with UNHAS (1980-present). Naturalis and LIPI have cooperated in marine research at Jakarta (1983), Ambon (1992, 1996), N Sulawesi (1994), and Bali (2001). LIPI has organised at least two short large-scale expeditions of the Berau area (1995, 1999). Dra. Anna Manuputty and Ir Yosphine Tuti of LIPI have visited Naturalis 2 months in 2001 and 2 months in 2002.

LIPI, Naturalis, KUN, NHN, and ZMA cooperate in four coastal biodiversity sub-themes: flora, reef fishes, benthic fauna and pelagic fauna. LIPI and Naturalis will sign an MOU regarding cooperation in the fields of marine biology and geology (November 2002). Molecular studies will be performed with the Coral Reef Research Foundation (Palau) for comparisons of jellyfish DNA from marine lakes (East Kalimantan, Palau). Cooperation with the VU and NIOZ concerns the selection of animals for climatic records. Because of the importance of the project for nature conservation, cooperation has been established with Indonesian NGO's (TNC Indonesia Program, KEHATI, TERANGI, WWF Indonesia, RASI Foundation).

Map. Kalimantan and Sulawesi separated by Sulawesi Sea and Makassar Strait. The research area is indicated. Source: http://www.reefbase.org/ReefGIS/mapper.asp.

Map of the research area made with http://www.reefbase.org/ReefGIS/mapper.asp. Green cross-hatched = mangroves, orange lines = coral reefs. Updated Indonesian topographical data from charts 57and 58 of the Indonesian Navy.

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Stony corals

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Due to limited time, we concentrated our research efforts on the distribution of mushroom corals (Fungiidae) as a pilot group. In total 40 species were encountered in the Berau area in 43 samples (Fig. 1). Two of these species were not found at our survey sites (Table 1): *Lithophyllon undulatum* and *L. ranjithi*. The latter was previously only know from Darvel Bay, Sabah, 300 km to the north of the Berau area (Ditlev 2003). The species accumulation curve (Fig. 13) shows that the sampling effort has been sufficient. Hence, additional samples would not have resulted in more species. Species diversity was generally highest at stations in or at the outside of the barrier with gentle slopes, especially around Sangalaki I. and Derawan I. (Fig. 1). Some offshore sites showed low species records due to wave exposure and /or steep slopes. Comparison of the species composition of Berau with other areas shows that East Kalimantan can be considered part of the center of maximum marine diversity (Figs. 13-14).

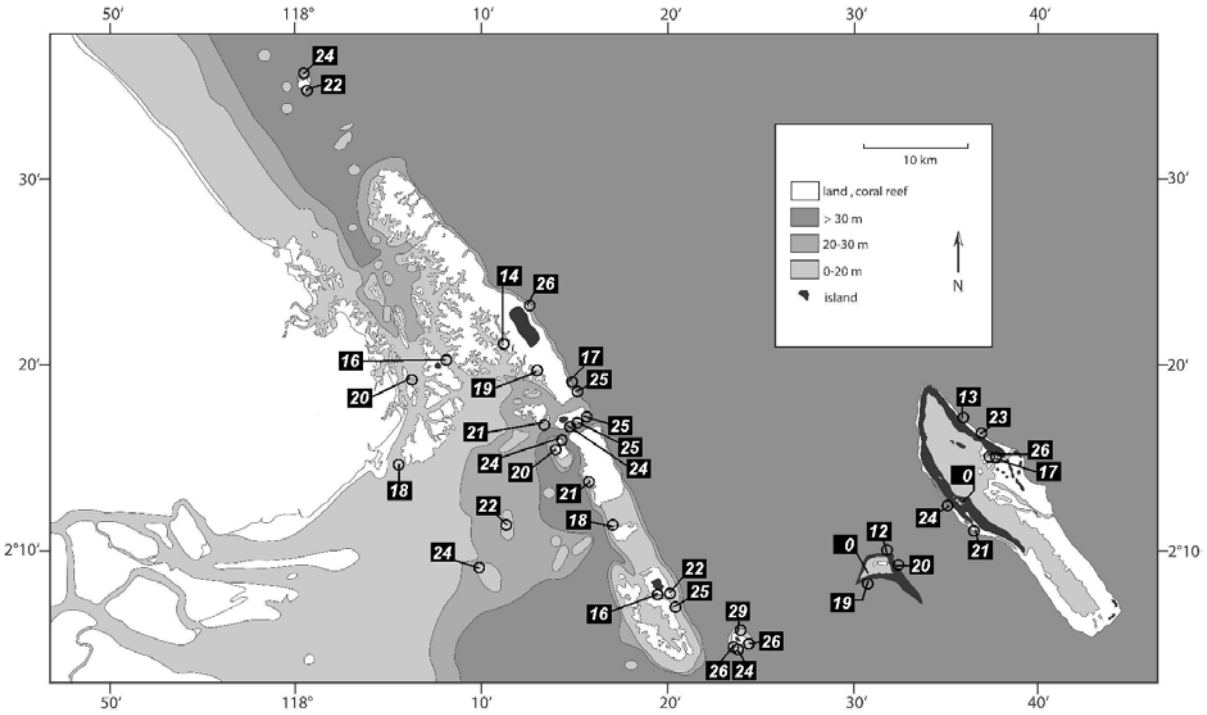


Fig. 1. Berau: Numbers of coral species (Fungiidae) per station.

Some species have widespread distributions in the area (Fig. 2), whereas other ones can be considered rare (Table 1, Fig. 3). Such widespread and rare species cannot be used as indicator species. On the other hand, some species show a distinct relation with nearshore conditions, related to river discharge (Fig. 4), or to offshore conditions, remote from river impact (Figs. 5-7, 10).

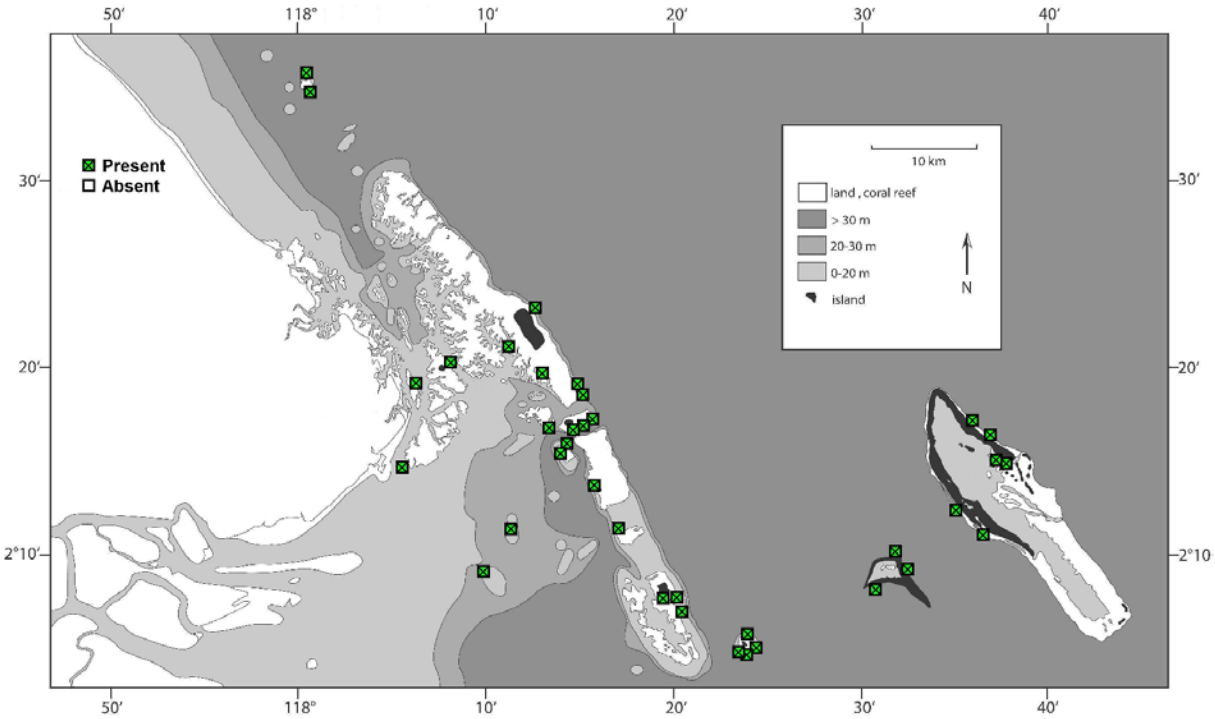


Fig. 2. Distribution (presence/absence) found in the most common species (occurence at all stations): *Fungia fungites*, *F. granulosa*, *F. horrida*, *F. paumotensis*, *F. repanda*, *Herpolitha limax*.

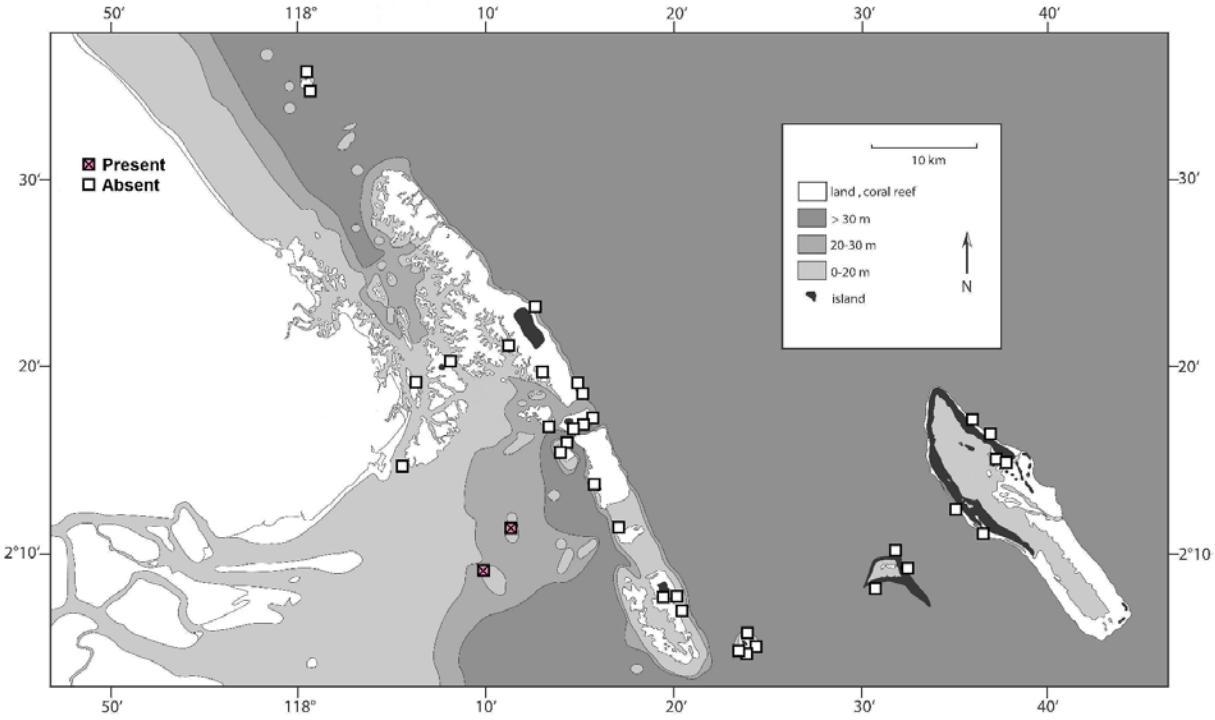


Fig. 3. Distribution (presence/absence) of a rare species: *Fungia spinifer*.

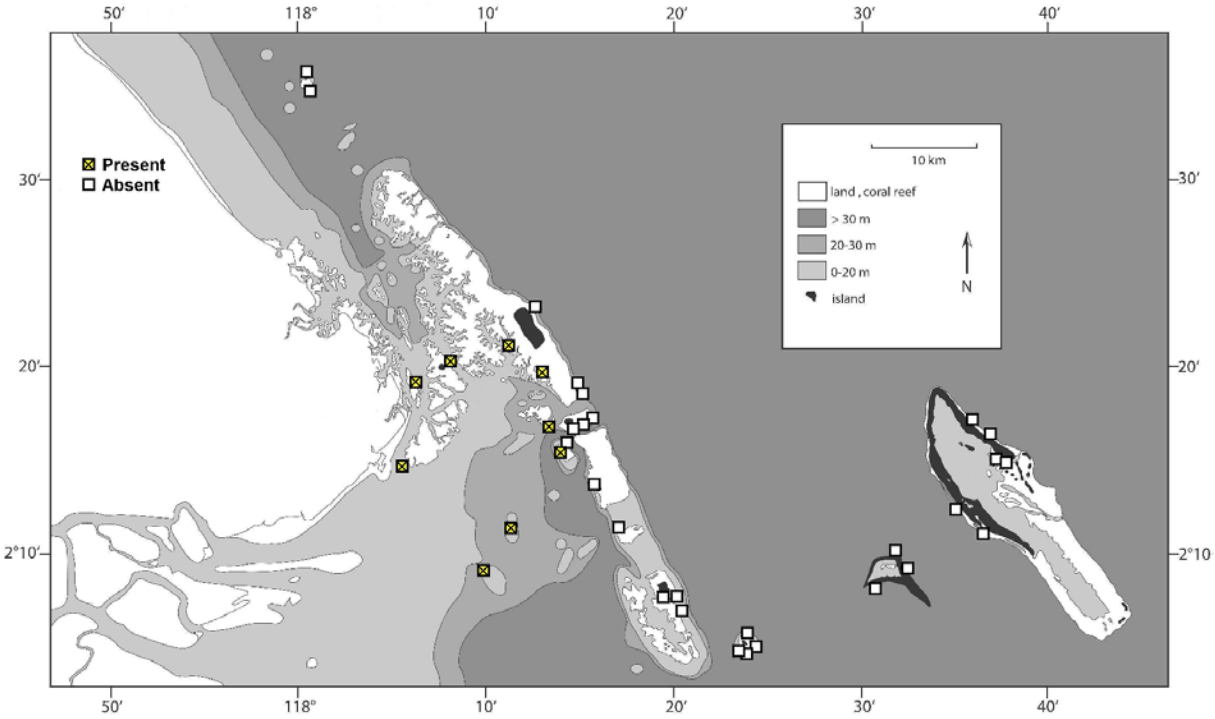


Fig. 4. Distribution (presence / absence) of an indicator species for nearshore conditions: *Fungia scabra*.

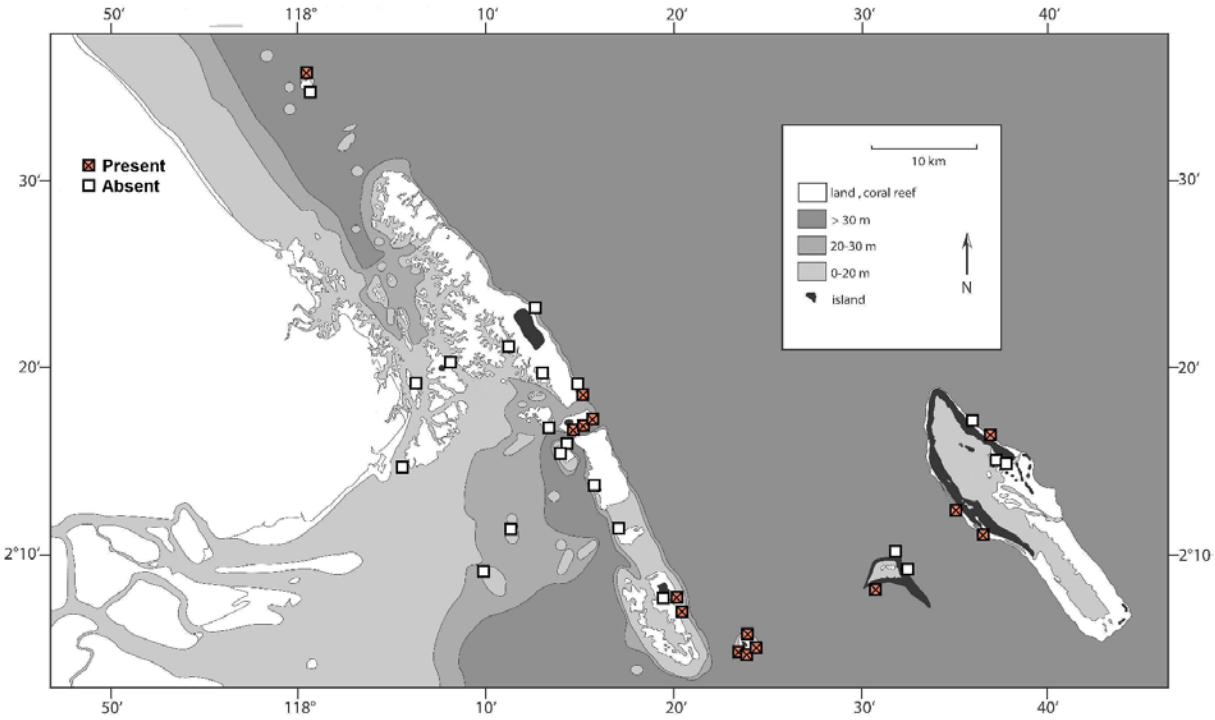


Fig. 5. Distribution (presence/absence) of an indicator species for offshore conditions: *Zoopilus echinatus*.

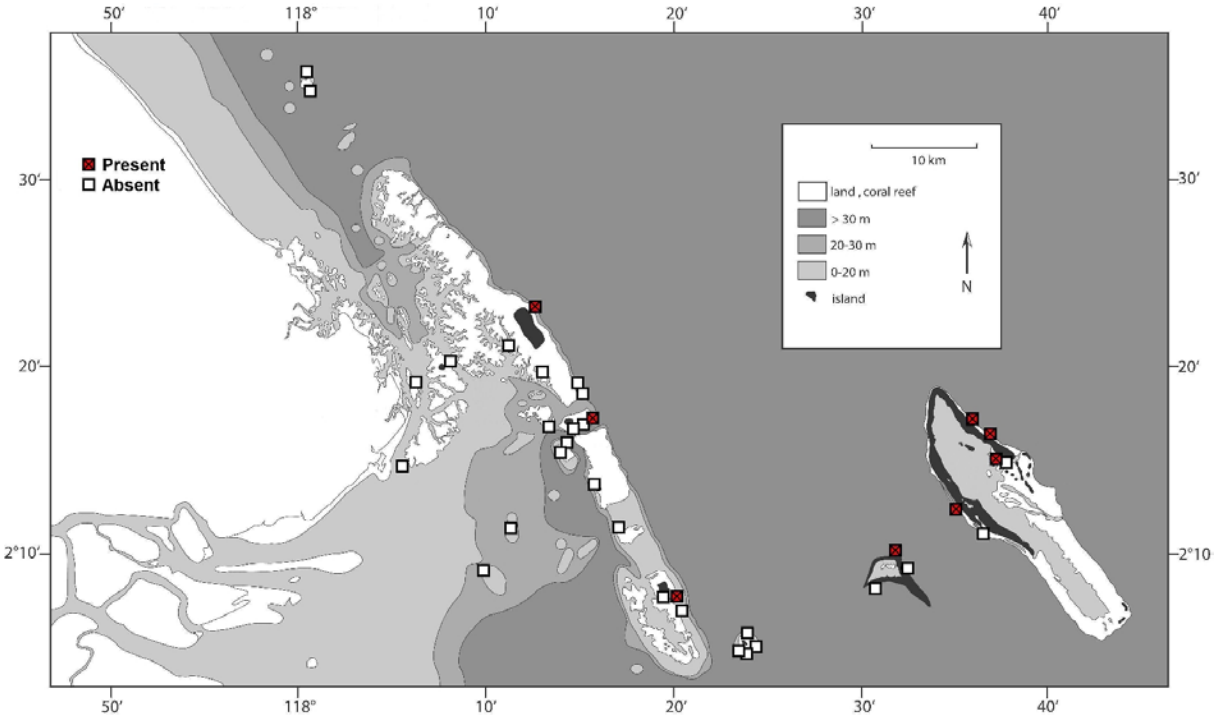


Fig. 6. Distribution (presence/absence) of an indicator species for offshore conditions: *Fungia scutaria*.

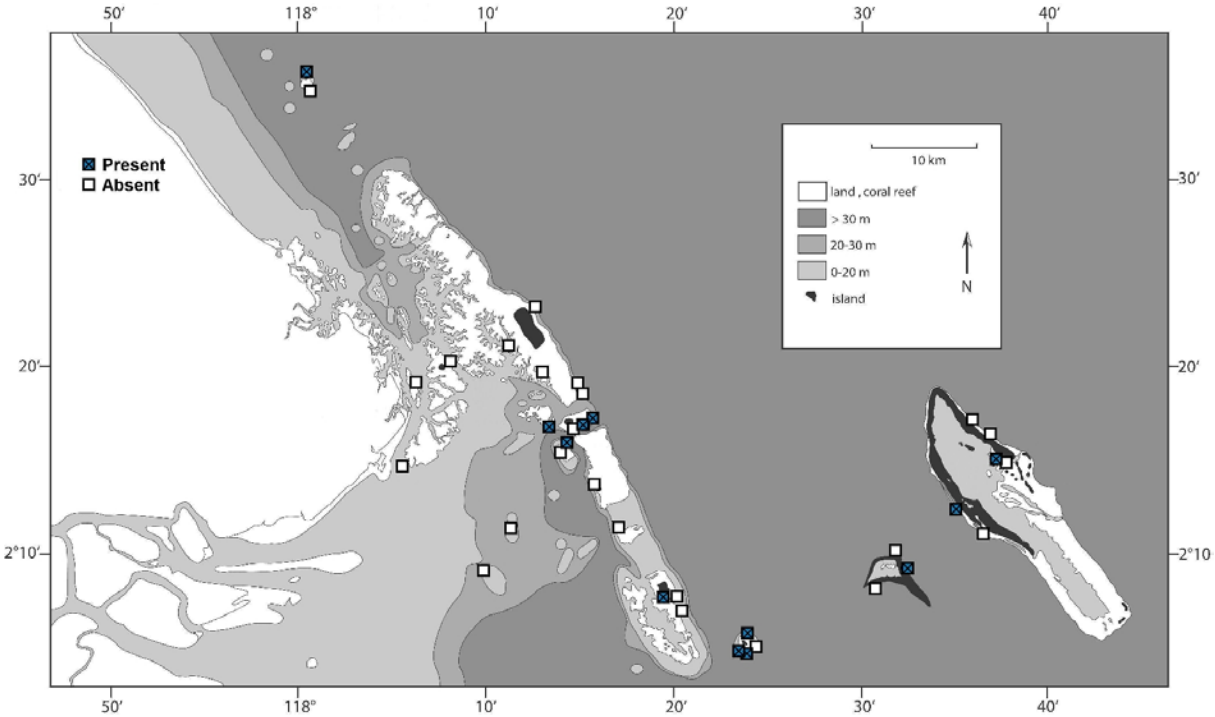


Fig. 7. Distribution (presence/absence) of an indicator species for offshore conditions: *Fungia fralinae*.

Fungia fralinae shows a predominantly offshore distribution (Fig. 7). At the sites where this species has been observed it shows large aggregations of individuals thanks to its extreme capacity of budding (Figs. 8-9). At one locality, south of Derawan island, one population coveres an area of 1.500 m^2 (Hoeksema 2004).

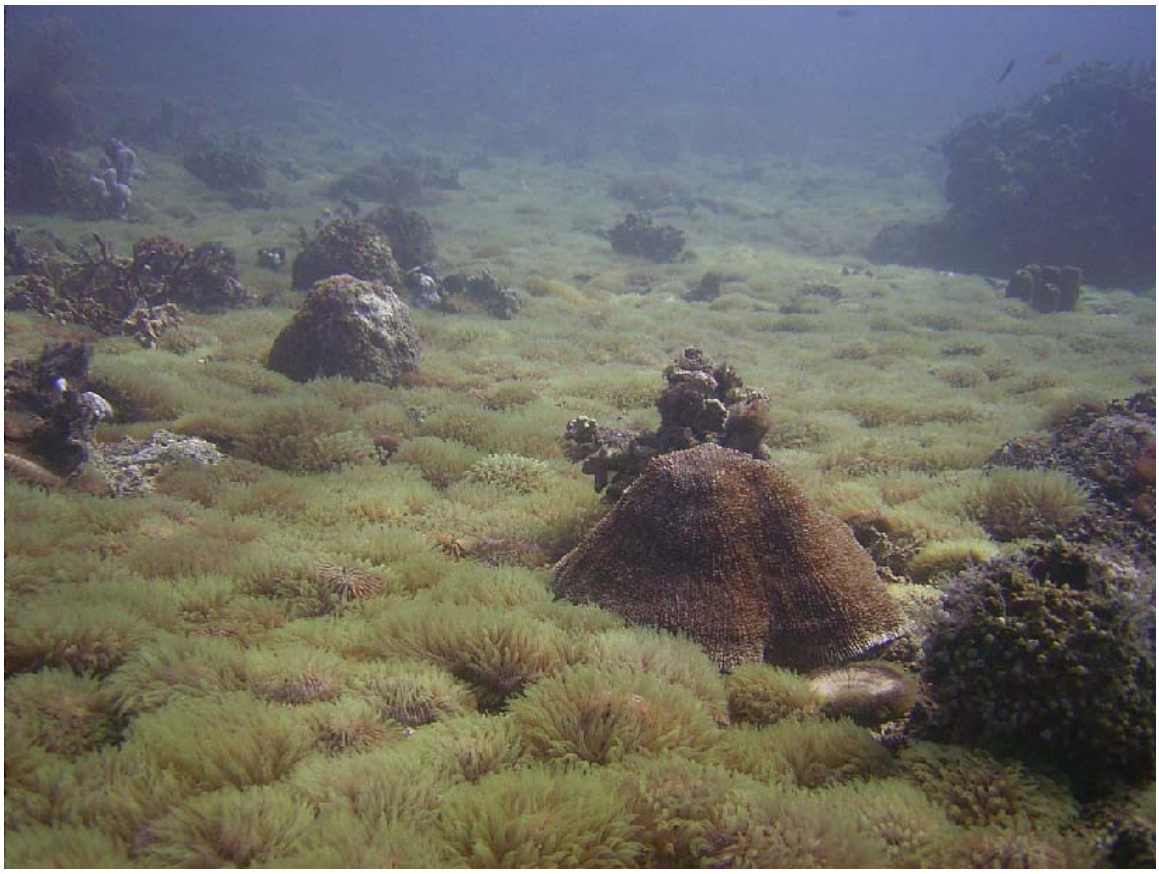


Fig. 8. Mushroom coral garden at Derawan island (Sta. BER.43) consisting of *Fungia fralinae* specimens propagating by budding as asexual reproduction mechanism.

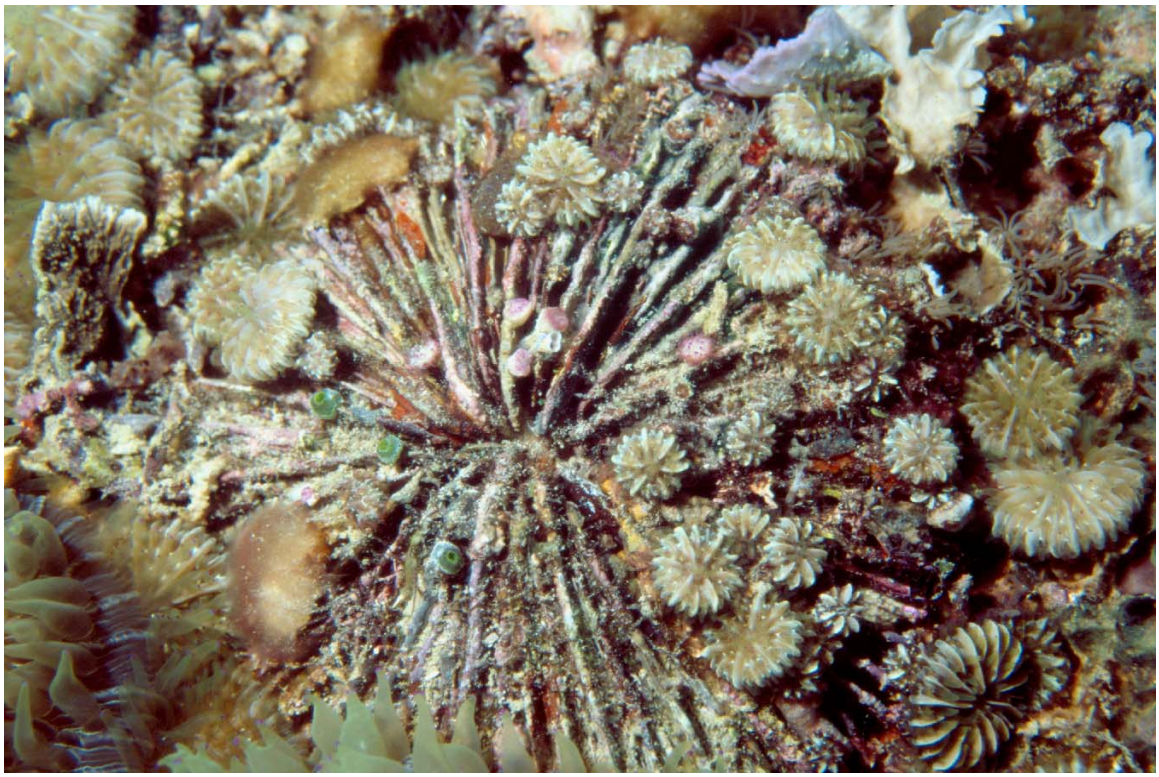


Fig. 9. Dead parent coral of *Fungia fralinae* at Derawan island (Sta. BER.43) covered and surrounded by attached and detached buds as juvenile individuals.

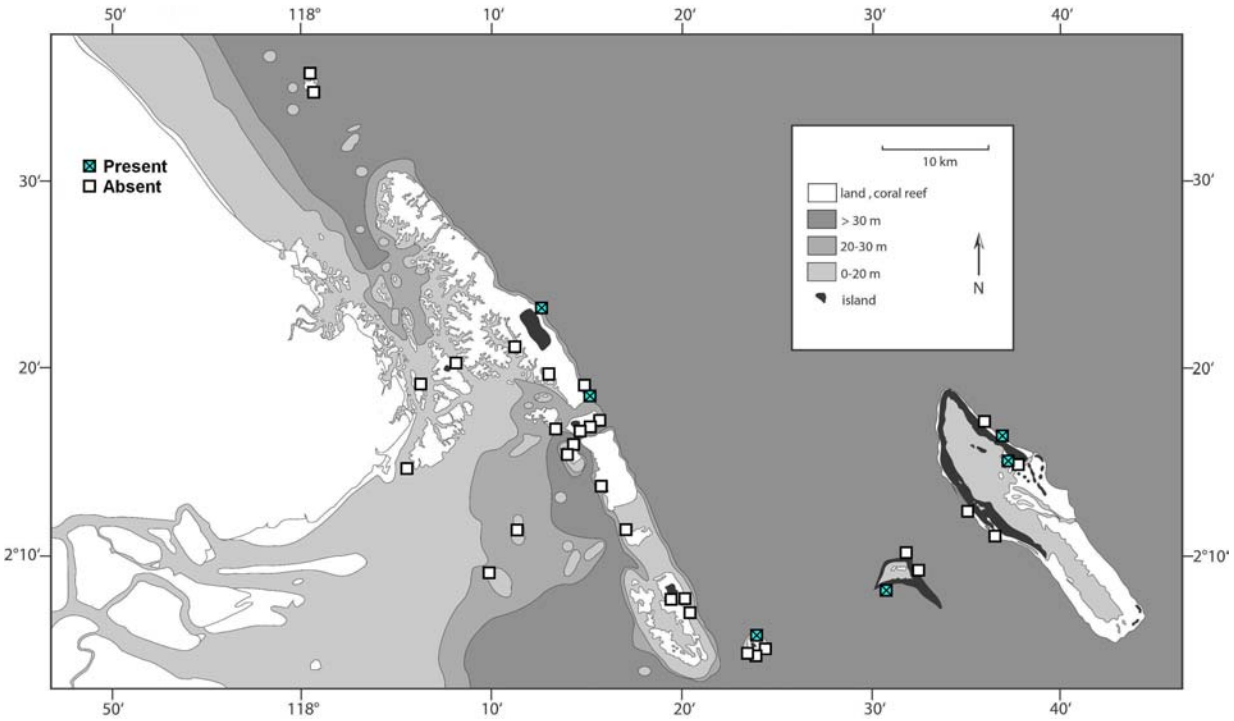


Fig. 10. Distribution (presence/absence) of an indicator species for offshore conditions: *Fungia taiwanesis*.

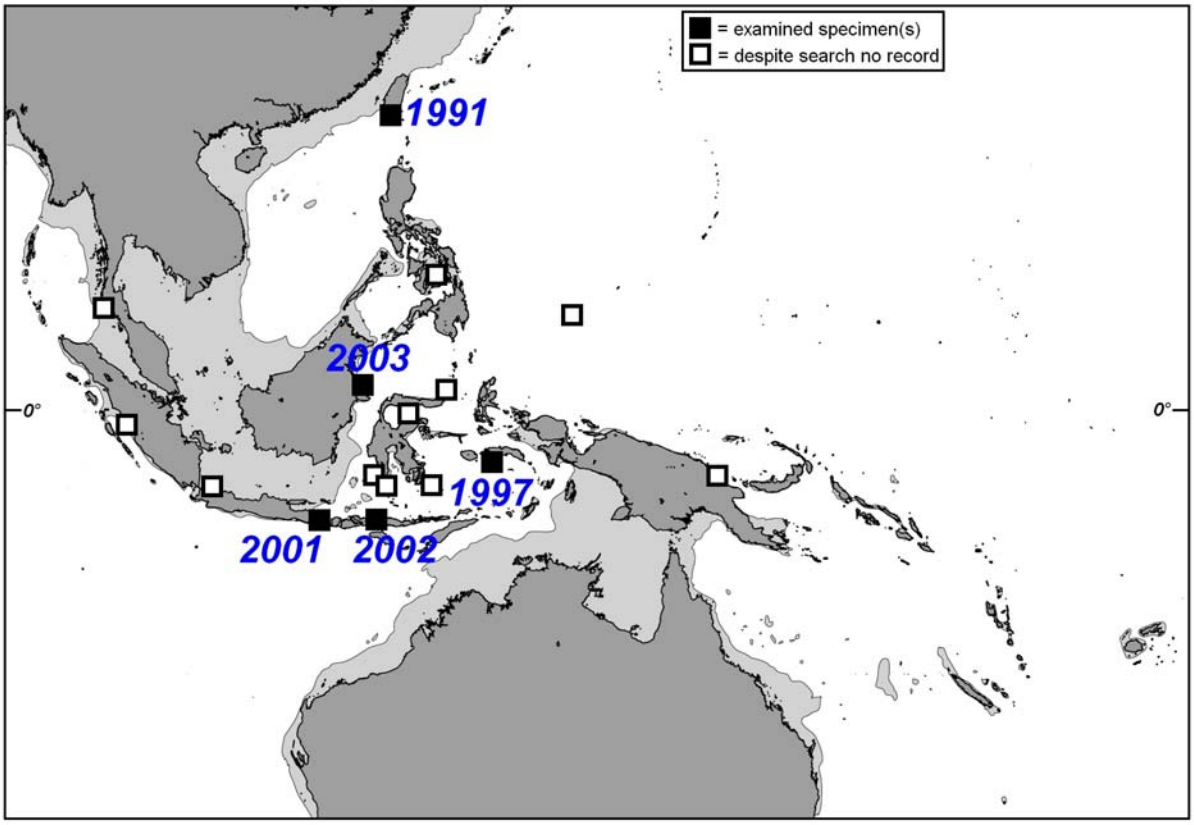
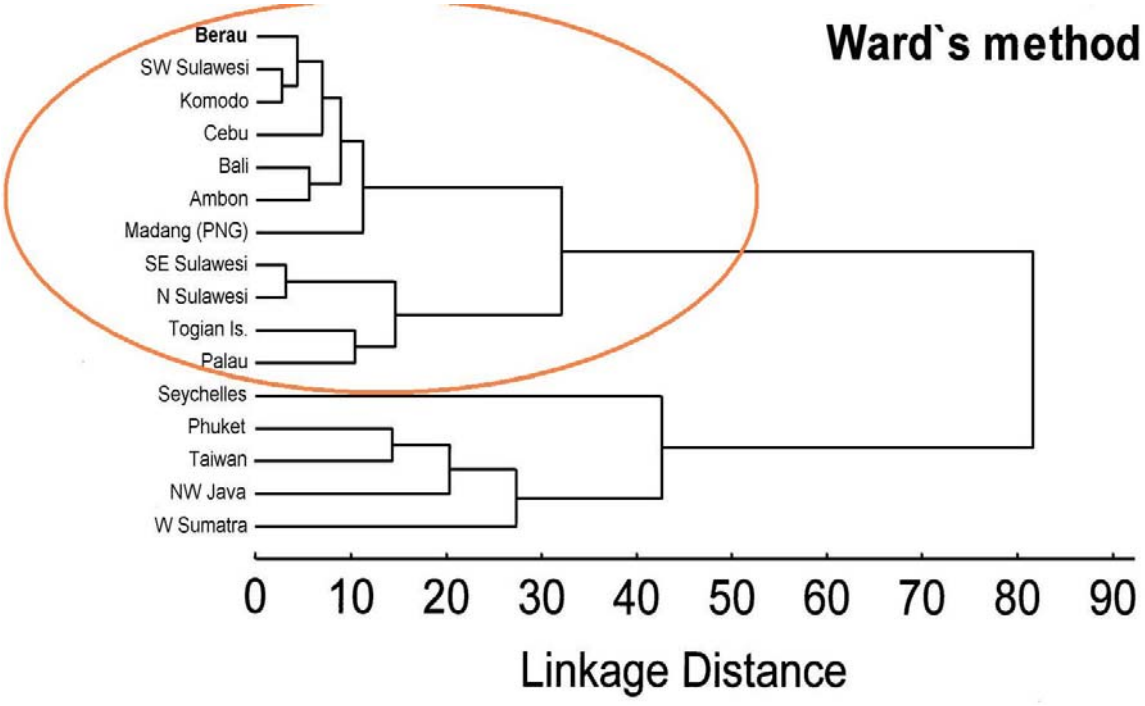


Fig. 11. Increased sampling effort and additional records result in range extension of *Fungia taiwanensis* Hoeksema & Dai, 1991.

Fungia taiwanensis was considered a rare species since 1991, but has been recorded from various places in Indonesia, including East Kalimantan during the present survey.



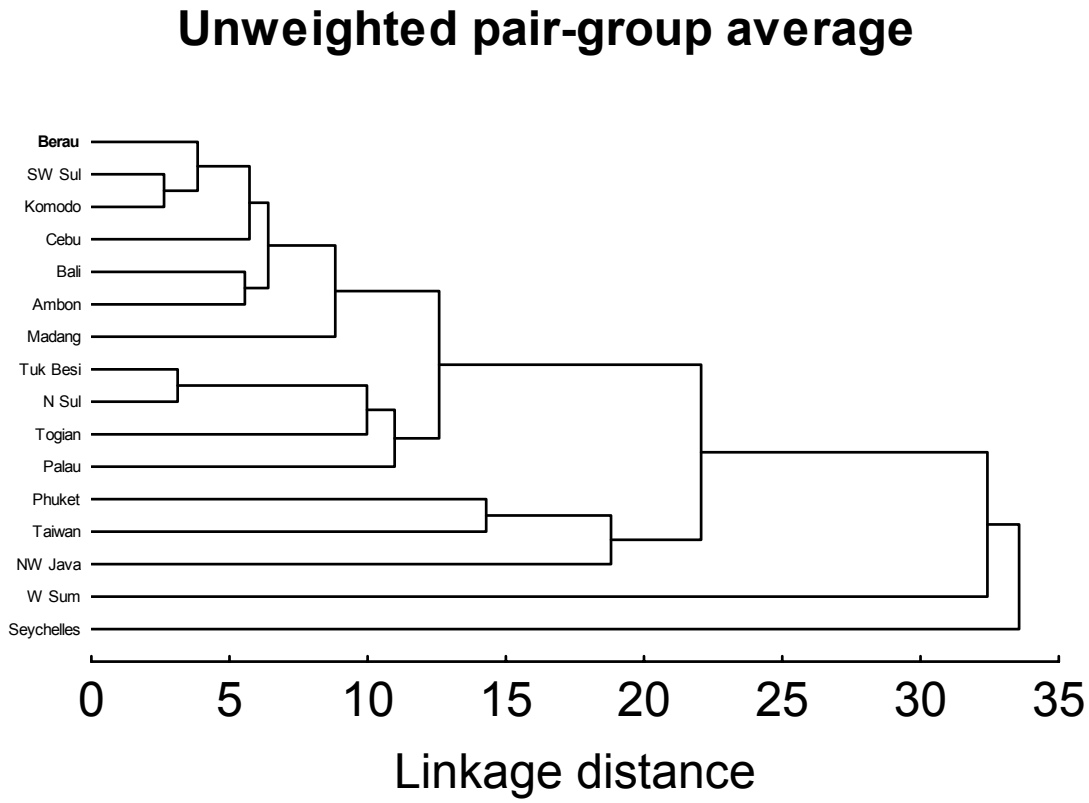


Fig. 12. Cluster analysis of 16 surveyed mushroom coral faunas. Berau (East Kalimantan) is situated within the cluster representing the centre of maximum benthic diversity.

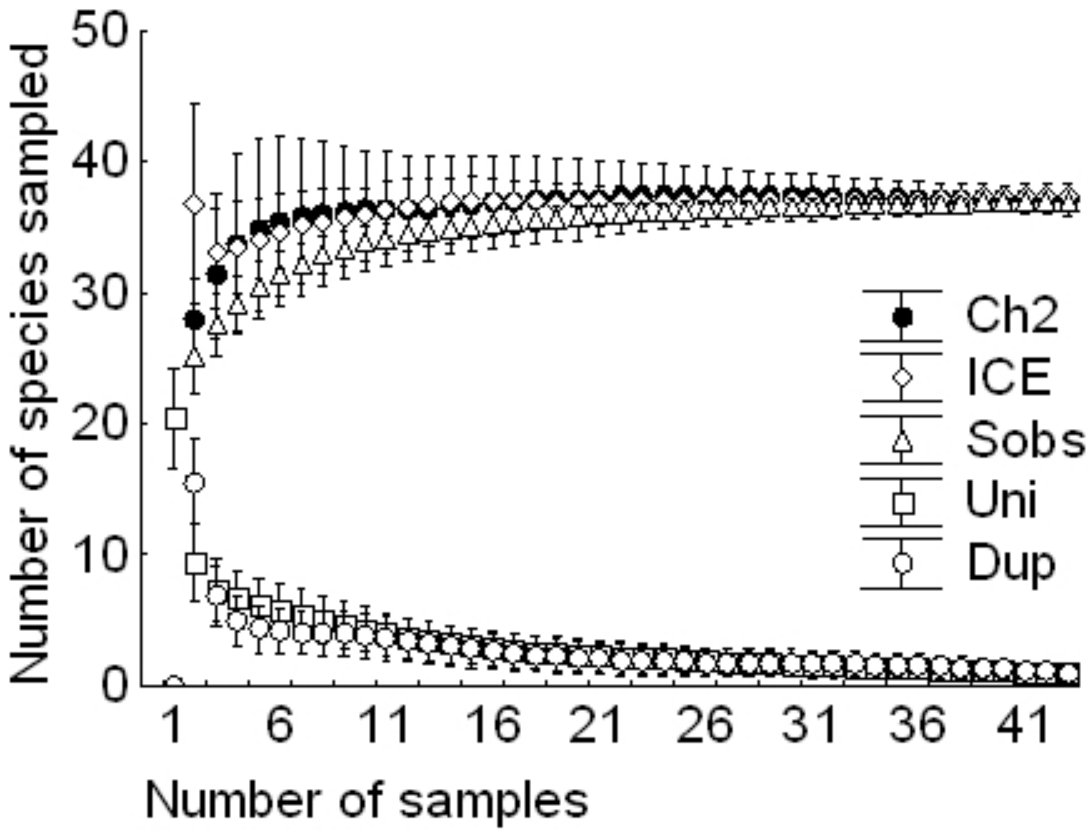


Fig. 13. Sampling efficiency East Kalimantan: Species accumulation curves of mushroom coral species over 43 samples: 38 species in survey area, 12-29 species per sample.

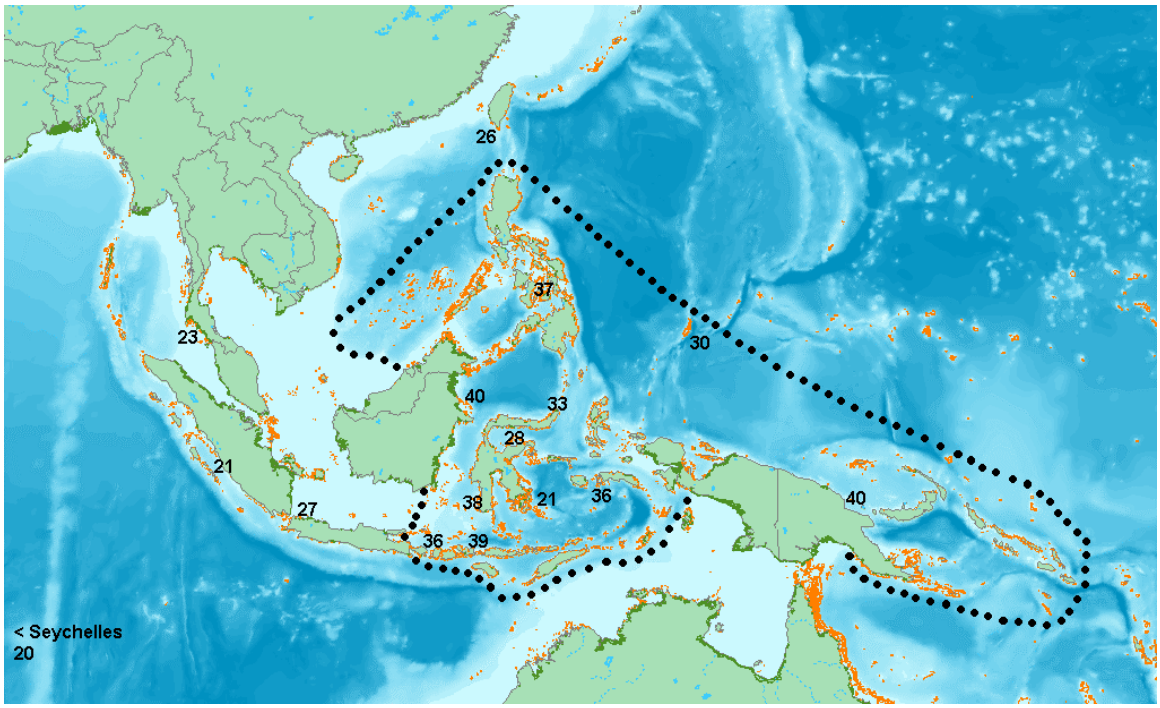


Fig. 14. Areas sampled for presence / absence data of mushroom coral species. Berau (40 species) is situated in the hypothetical centre of maximum marine benthic diversity.

Table. 1. Berau Stations with mushroom coral species encountered. The first time a species was observed is indicated by bold print.

Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Berau Station	1	2	5	6	7	9	10	11	12	13	14	15	16	17	3	1	9	19	20	22	23	24	26	3	3
Fungiidae total	19	21	24	22	12	12	16	18	29	26	26	19	13	23	20	17	19	18	20	26	24	22	25	17	19
Fungia (Cycloseris) sinensis	0	**1**	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0
F. (C.) cyclolites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F. (C.) fragilis	0	0	**1**	1	0	0	0	0	1	1	1	0	0	0	0	1	0	1	1	1	1	0	1	0	0
F. (C.) distorta	**1**	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1
F. (C.) somervillei	0	0	0	0	0	0	0	0	**1**	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
F. (C.) vaughani	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F. (C.) costulata	0	**1**	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1
F. (C.) tenuis	**1**	1	1	1	1	1	0	0	1	1	0	0	1	1	1	1	1	0	0	1	0	1	1	1	1
F. (C.) spec.	0	**1**	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
F. (Verrillofungia) scabra	0	**1**	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
F. (V.) spinifer	0	0	**1**	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F. (V.) concinna	**1**	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
F. (V.) repanda	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
F. (Danafungia) fralinae	**1**	1	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
F. (D.) horrida	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
F. (D.) scruposa	**1**	1	1	1	0	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1
F. (Fungia) fungites	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
F. (Wellsofungia) granulosa	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
F. (Lobactis) scutaria	0	0	0	0	**1**	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
F. (Pleuractis) moluccensis	**1**	0	1	1	0	0	0	0	1	0	1	1	0	1	1	0	0	1	1	1	1	1	1	0	0
F. (P.) gravis	**1**	1	0	0	0	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
F. (P.) paumotensis	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
F. (P.) taiwanensis	0	0	0	0	0	0	0	0	**1**	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Heliofungia actiniformis	**1**	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
Ctenactis albitentaculata	**1**	1	0	1	0	0	1	1	1	1	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1
C. echinata	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
C. crassa	**1**	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Herpolitha limax	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Polyphyllia talpina	**1**	1	1	1	0	0	1	1	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	0	0
Sandalolitha dentata	0	0	**1**	0	0	0	0	1	1	1	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0
S. robusta	0	0	**1**	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	1	0
Zoopilus echinatus	**1**	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	1	0	0	1	1	1	1	0	1
Halomitra pileus	0	0	**1**	0	0	0	0	1	1	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1
Lithophyllon undulatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L. mokai	0	0	**1**	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
L. ranjithi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Podabacia crustacea	0	**1**	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	0	0
P. motuporensis	0	0	0	0	0	0	0	0	0	**1**	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1
P. spec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1. Continued.

Sample #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
Berau Station	28	29	4	30	30	37	38	38	39	40	42	41	1	43	46	47	48	49	
Fungiidae total	17	20	21	20	22	20	21	23	22	24	25	17	22	25	16	14	21	20	total
Fungia (Cycloseris) sinensis	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	11
F. (C.) cyclolites	**1**	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
F. (C.) fragilis	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	14
F. (C.) distorta	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	8
F. (C.) somervillei	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	4
F. (C.) vaughani	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3
F. (C.) costulata	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	36
F. (C.) tenuis	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	1	1	33
F. (C.) spec.	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	13
F. (Verrillofungia) scabra	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	9
F. (V.) spinifer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
F. (V.) concinna	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	40
F. (V.) repanda	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	43
F. (Danafungia) fralinae	0	1	0	1	0	0	1	1	0	1	0	0	0	1	0	0	0	1	14
F. (D.) horrida	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	43
F. (D.) scruposa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	39
F. (Fungia) fungites	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	43
F. (Wellsofungia) granulosa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	43
F. (Lobactis) scutaria	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	8
F. (Pleuractis) moluccensis	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	27
F. (P.) gravis	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	34
F. (P.) paumotensis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	43
F. (P.) taiwanensis	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	6
Heliofungia actiniformis	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	37
Ctenactis albitentaculata	1	0	1	1	1	1	1	1	0	1	1	0	1	1	0	0	1	1	30
C. echinata	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	41
C. crassa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	38
Herpolitha limax	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	43
Polyphyllia talpina	0	1	1	1	1	1	0	0	1	1	1	0	0	1	1	0	1	0	28
Sandalolitha dentata	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	11
S. robusta	1	0	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	29
Zoopilus echinatus	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	0	0	1	17
Halomitra pileus	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	28
Lithophyllon undulatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L. mokai	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0	8
L. ranjithi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Podabacia crustacea	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	36
P. motuporensis	0	0	0	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	11
P. spec	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Soft corals

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During the EKP pilot phase, Octocorallia and Antipatharia were collected and photographed. The specimens were preserved in alcohol 75% for further examination in PPO-LIPI and Naturalis. The number of octocoral genera found during the present survey was unexpectedly high and nearly the same as numbers found during expeditions of LIPI and Naturalis to Sulawesi, Bali, and Ambon.

Altogether 52 genera of Octocorallia were found (Table 1), based on underwater observations and photographs. Identification of several genera and most species is only possible after microscopic examination of the skeleton sclerites. Hence, the number of genera will increase after this examination. Most gorgonian octocorals were found on reefs close to the Berau river outlet, in very shallow water (- 15 m), instead of the usual greater depths (30 m) in clear water. Especially species of the family Ellisellidae and antipatharians dominated these reefs. Apparently the turbid waters on these reefs enable the gorgonians and antipatharians to grow in shallow water.

The soft coral *Paraminabea aldersladei*, normally found in caves and under overhangs ,was also found in this very shallow water, probably also due to its high turbidity. The same applies to several rare species of *Sinularia* with leafy growth forms, which were observed occasionally. One particular reef (Sta. BER.06) was completely dominated by *Sinularia brassica*. Although this is a common species in Indonesian waters, a density and abundance like at this locality was never reported before from any other area. The only known species of the genus *Asterospicularia*, so far only reported from Taiwan, Guam, Palau, Papua New Guinea, the Great Barrier Reef, and Bali, was not present in the Berau delta. It seems that this easily recognised species does not occur in central Indonesia.

Although the boundaries of the centre of maximum marine benthic biodiversity in the Indo-Pacific are not yet exactly known, it is clear that the Berau delta should be included with regard to Octocorallia. Among this centre the Berau delta represents the most western boundary.

Table 1. Indo-Pacific genera of reef-dwelling Octocorallia recorded in the Berau delta.

Family Heliporidae
- *Heliopora* de Blainville, 1830

Family Tubiporidae
- *Tubipora* Linnaeus, 1758

Family Clavularidae
- *Carijoa* Müller, 1867
- *Clavularia* Blainville, 1830
- *Paratelesto* Utinomi, 1958

Family Paralcyoniidae
- *Studeriotes* Thomson & Simpson, 1909

Family Alcyoniidae
- *Cladiella* Gray, 1869
- *Klyxum* Alderslade, 2000
- *Lobophytum* von Marenzeller, 1886
- *Paraminabea* Williams & Alderslade, 1999
- *Sarcophyton* Lesson, 1834
- *Sinularia* May, 1898

Family Nephtheidae
- *Capnella* Gray, 1869
- *Dendronephthya* Kükenthal, 1905
- *Lemnalia* Gray, 1868
- *Litophyton* Forskål, 1775
- *Nephthea* Andouin, 1828
- *Paralemnalia* Kükenthal, 1913
- *Scleronephthya* Wright & Studer, 1889
- *Stereonephthya* Kükenthal, 1905
- *Umbellulifera* Thomson & Dean, 1931

Family Nidalidae
- *Chironephthya* Studer, 1887
- *Siphonogorgia* von Kölliker, 1874
- *Nephthyigorgia* Kükenthal, 1910

Family Xeniidae
- *Anthelia* Lamarck, 1816
- *Cespitularia* Milne Edwards & Haime, 1850
- *Sympodium* Ehrenberg, 1834
- *Heteroxenia* Kölliker, 1874
- *Xenia* Lamarck, 1816

Family Briareidae
- *Briareum* Blainville, 1830

Family Anthothelidae
- *Alertigorgia* Kükenthal, 1908
- *Iciligorgia* Duchassaing, 1870
- *Solenocaulon* Gray, 1862

Family Subergorgiidae
- *Subergorgia* Gray, 1857
- *Annella* Gray, 1858

Family Melithaeidae
- *Melithaea* Milne Edwards & Haime, 1857

Family Acanthogorgiidae
- *Acanthogorgia* Gray, 1857
- *Anthogorgia* Verrill, 1868
- *Muricella* Verrill, 1869

Family Plexauridae
- *Astrogorgia* Verrill, 1868
- *Bebryce* Philippi, 1841
- *Echinogorgia* Kölliker, 1865
- *Echinomuricea* Verrill, 1869
- *Menella* Gray, 1870

Family Ellisellidae
- *Ctenocella* Valenciennes, 1855
- *Dichotella* Gray, 1870
- *Ellisella*, Gray, 1858
- *Junceella* Valenciennes, 1855

Family Gorgoniidae
- *Pinnigorgia* Grasshoff & Alderslade, 1997
- *Hicksonella* Nutting, 1910
- *Rumphella* Bayer, 1955

Family Isididae
- *Isis* Linnaeus, 1758

Octocorals are abundant and rich in species at the reef flat of Derawan Island. Photo B.W. Hoeksema.

Pontoniine shrimps

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Pontoniine shrimps (Decapoda, Caridea, Palaemonidae) comprise around 450 species, ca 350 of which have been recorded from the Indo-Pacific. Most species are living in association with other organisms. This subfamily forms the the most dominant group within the Palaemonoidea, which has been selected as target taxon. Only few records of these shrimps from East Kalimantan are known in the scientific literature. Most of the shrimps in this report are now recorded from East Kalimantan for the first time.

Shrimps were photographed on the host before collecting. In total more than 1000 underwater photographs were made of shrimps and their hosts. Ca. 600 samples collected. Preliminary identification of the material resulted in ca. 90 species (Table 2). This number will increase slightly when the endofauna of sponges will be sorted by Drs. N.J. de Voogd. This number resembles the diversity measured in other localities within the area of maximal marine diversity (Table 1): Cebu (1999: ca. 87 species), Sulawesi (1994: ca. 80 species), Ambon (1996: ca. 90 species) and Bali (ca. 90 species). This number is much higher than at the Seychelles (1992: 57 species).

Several species were not recorded. This seems related to the low density of their hosts, or even their absence. Although the number of *Tridacna* shells was high, only few were searched for shrimps, which explains the absence of several shrimp species belonging to the genera *Anchistus* and *Conchodytes*. Within the genera *Urocaridella*, *Climeniperaeus*, *Conchodytes*, *Periclimenaeus*, *Periclimenes, Pontonides,* and *Vir*, undescribed species have been found.

Table 1. Number of Palaemonoid species per hostgroup encountered in different areas.

	E Kalimantan 2003	Bali 2001	Cebu 1999	Sulawesi 1994	Ambon 1996	Seychelles 1992/93
Free-living	8	4	6	4	6	6
Porifera	6	22	10	10	6	4
Hydrozoa	1	2	2	2	2	2
Actiniaria	8	2	6	8	8	2
Corallimorpharia	1	1	1	1	1	1
Scleractinia	23	18	25	20	22	20
Alcyonaria	7	3	2	5	8	5
Gorgonaria	8	3	4	4	5	11
Antipatharia	6	8	9	6	5	5
Echinoidea	1	2	2	1	1	1
Asteroidea	1	1	2	1	1	1
Crinoidea	9	12	9	10	9	3
Holothuroidea	1	0	0	1	1	1
Bivalvia	8	6	8	7	7	9
Ascidiacea	10	9	3	4	8	3

Table 2. Palaemonoid species collected during the East Kalimantan Expedition.

PALAEMONOIDEA Rafinesque, 1815
PALAEMONIDAE Rafinesque, 1815
PALAEMONINAE Rafinesque, 1815
Urocaridella antonbrunii (Bruce, 1967)
Urocaridella vestigialis Chace & Bruce, 1993
Urocaridella spec. nov.
PONTONIINAE Kingsley, 1878
Anchiopontonia hurri (Holthuis, 1981)
Anchistus australis Bruce, 1977
Anchistus custoides Bruce, 1977
Anchistus demani Kemp, 1922
Anchistus miersi (De Man, 1888)
Araiopontonia odontorhyncha Fujino & Miyake, 1970
Climeniperaeus spec. nov. "*paradubia*"
Conchodytes meleagrinae Peters, 1852
Conchodytes spec. nov. 'in *Chama'*
Coralliocaris superba (Dana, 1852)
Dactylonia anachoreta (Kemp, 1922)
Dactylonia ascidicola (Borradaile, 1898)
Dactylonia holthuisi Fransen, 2002
Dasycaris ? zanzibarica Bruce, 1970
Hamodactylus aqabai Bruce & Svoboda, 1983
Hamodactylus noumeae Bruce, 1970
Hamodactylus boschmai Holthuis, 1952
Hamopontonia corallicola Bruce, 1970
Harpiliopsis depressa (Stimpson, 1860)
Ischnopontonia lophos (Barnard, 1962)
Miopontonia yongei Bruce, 1985
Odontonia katoi Kubo, 1940
Odontonia rufopunctata Fransen, 2002
Odontonia sibogae Bruce, 1972
Orthopontonia ornata (Bruce, 1970)
Palaemonella pottsi (Borradaile, 1915)
Palaemonella ? rotumana (Borradaile, 1898
Palaemonella spec.
Palaemonella/Periclimenes spec. 1
Palaemonella/Periclimenes spec. 2
Palaemonella/Periclimenes spec. 3
Palaemonella/Periclimenes spec. 4
Palaemonella/Periclimenes spec. 5
Paranchistus pycnodontae Bruce, 1978
Periclimenaeus spec. nov. 'orbitocarinatus'
Periclimenaeus pachydentatus Bruce, 1969
Periclimenaeus ? spongicola Holthuis, 1952
Periclimenaeus storchi Bruce, 1989
Periclimenella spinifera (De Man, 1902)
Periclimenes affinis (Zehntner, 1894)
Periclimenes amboinensis (De Man, 1888)
Periclimenes brevicarpalis (Schenkel, 1902)
Periclimenes ceratophthalmus Borradaile, 1915
Periclimenes cornutus Borradaile, 1915
Periclimenes cristimanus Bruce, 1965
Periclimenes darwiniensis Bruce, 1987
Periclimenes demani Kemp, 1915
Periclimenes ? elegans (Paulson, 1875)
Periclimenes galene Holthuis, 1952
Periclimenes gonioporae Bruce, 1989
Periclimenes grandis (Paulson, 1875)
Periclimenes holthuisi Bruce, 1969
Periclimenes imperator Bruce, 1967
Periclimenes incertus Borradaile, 1915
Periclimenes aff. *incertus*
Periclimenes inornatus Kemp, 1922
Periclimenes kororensis Bruce, 1977
Periclimenes lepidus Bruce, 1978
Periclimenes madreporae Bruce, 1969
Periclimenes magnificus Bruce, 1979
Periclimenes ornatus Bruce, 1969
Periclimenes pilipes Bruce & Zmarzly, 1983
Periclimenes psamathe (De Man, 1902)
Periclimenes sarasvati Okuno & Nomura, 2002
Periclimenes sinensis Bruce, 1969
Periclimenes soror Nobili, 1904
Periclimens tenuipes Borradaile, 1898
Periclimenes tenuis Bruce, 1969
Periclimenes aff. toloensis Bruce, 1969
Periclimenes venustus Bruce, 1989
Periclimenes watamuae Bruce, 1976
Periclimenes spec. nov. "orange"
Periclimenes spec. nov. aff. *perlucidus* Bruce, 1969
Periclimenes spec. 1 aff. *perturbans* Bruce, 1978
Platycaris latirostris Holthuis, 1952
Pliopontonia furtiva Bruce, 1973
Pontonides maldivensis Borradaile, 1915
Pontonides unciger Calman, 1939
Pontonides spec. nov.
Pontoniopsis comanthi Borradaile, 1915
Thaumastocaris streptopus Kemp, 1922
Vir sp. '*Euphyllia ancora*" spec. nov.
Vir sp. '*Euphyllia divisa'* spec. nov.
Vir sp. '*Euphyllia glaberescens'* spec. nov.
Vir sp. '*Physogyra lichtensteini'* ?= *V. orientalis* (Dana, 1852)
Vir '*Euphyllia paradivisa*" ? spec. nov.
Vir philippinensis Bruce & Svoboda, 1884

This commensal shrimp belongs to a new species (*Periclimenes* sp.) that lives in association with various actiniarian host species (sea anemones). It was observed at two sites in the Berau area. Photo C.H.J.M. Fransen.

Algae

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The primary objective of the phycological team was a gross investigation on the marine macroalgae in the research area to test the feasibility of a number of suggestions for future research. Our program contained the following themes:

1) Interactions between Foraminifera and macroalgae (= seaweeds).
2) Studies on megacellular green macroalgae (*Caulerpa, Halimeda* and *Ventricaria).*
3) Survey of the seaweeds in the Berau delta area (including the Berau archipelago).
4) Survey of the seaweed vegetation of anchialine lakes on the islands Kakaban and Maratua.
5) Support of other EKP projects.

Preliminary results:

Ad 1) Several species of larger Foraminifera occur mainly on seaweeds, especially on calcareous algae (*Halimeda, Galaxaura),* on smaller calcareous turf-forming algae (*Jania)* and on rigid turf-forming algae (*Gelidiopsis*).

Ad 2) Collected material:

Herbarium samples: *Caulerpa*: 61 samples (22 different taxon names), *Halimeda*: 54 samples (20 different taxon names), *Ventricaria*: 19 samples (one species). Samples in silicagel: In total 61 (53 samples of *Caulerpa).* Samples in ethanol: In total 65 (24 samples of *Halimeda*).

Ad 3) We collected 470 herbarium samples, each of which contained one taxon. In total we observed 233 taxa of macroalgae, of which 189 taxa were conserved. This number is comparable to the total number of species collected by dr. E. Verheij (233 species) during his two years research period in the Spermonde Archipelago off Makassar (South Sulawesi).

Ad 4) We studied the algal vegetation of three anchialine lakes: the large (5 km^2) *Halimeda* lagoon on Kakaban Island (Sta. BER.08) and two smaller anchialine lakes on Maratua Island (respectively designated by us as Maratua south and Maratua north, Sta. BER18 and Sta. BER.44, respectively).

Our preliminary results are:

Locality	Kakaban	Maratua south	Maratua north
Number of species	29	20	12
Kakaban species	29	5 or 6	4
Maratua south	5 or 6	20	7
Maratua north	4-Jan	7	12
Halimeda	Dominant	Absent	Some
Caulerpa	Sub-dominant	Dominant	sub-dominant
			Filterfeeders dominant

We only found the species *Caulerpa verticillata* and *Caulerpa fastigiata* in all three lakes. The genus *Cladophoropsis* was also recorded in all three lakes, but we are not sure yet whether this concerns the same species in all three lakes.

Ad 5) See reports of other EKP projects.

We thank the grant-giving organizations (KNAW, NWO, WOTRO, LUF and Nationaal Herbarium Nederland) for giving us the opportunity to join and execute intensive phycological fieldwork in the Berau area. We thank the participants in the island cluster for their pleasant company and cooperation and especially Dr. B.W. Hoeksema for being the motor and coordinator of this trip. The staff of the Derawan Diving Resort was very helpful. Their experise and their facilities were very adequate and of a high standard, which enabled us to carry out the research in a remote area for a long period of time.

A mixed vegetation of *Halimeda* and *Caulerpa* in Kakaban Lake. Photo B.W. Hoeksema.

Plankton

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Research goal one: To asses the zooplankton biodiversity of the coastal waters of East Kalimantan which are part of the westernmost boundary of the Indo-West Pacific centre of maximum marine biodiversity. Target groups are chaetognaths, pteropods, and euphausiids. The target groups will be identified to species level. Besides comparison with older samples regarding relative abundancies of species, also samples will be used for morphological and molecular studies of different species to establish biodiversity at different levels e.g. from species assemblages to infra-specific variation. The studies can only be undertaken for the surface plankton because of the restraints in sampling capabilities e.g. small nets, which are operated by hand. It was usually impossible to sample at night and to sample deeper layers because this requires larger nets and a big ship. At present, identification is not completed yet. Chaetognatha and Copepoda were the dominant groups at all stations except at those from the saltwater lakes of Kakaban and Maratua, where (pelagic) Chaetognatha are absent.

Research goal two: To test whether selected zooplankton taxa can be used as model taxa for hypothesis testing by comparison of the marine biota of NE Kalimantan with those of neighbouring areas. A range of habitats will be surveyed, varying in distance offshore (with decreasing salinity, turbidity, and nutrient load): water along the mainland shore and around reefs and atolls. At the moment the species identification in not yet complete, first results of chaetognaths indicate no species differences with what is known from neighbouring areas but identification did not yet include very small neritic specimens. This last area is where one might expect endemism.

a) Study area and stations. During the fieldwork period, 33 stations were occupied in the coastal waters of the Berau area from 6 till 28 October 2004. In total 70 zooplankton samples were made. The northernmost station was in the vicinity of Panjang Island (about 10 km N of Derawan Island), the southernmost station was near Tanjung Mankalihat, ca. 120 km SE of Derawan Island. In the West, samples were taken close to the mouth of the Berau River, whereas the easternmost stations were off P. Maratua. Also, zooplankton samples were taken in the so-called saltwater lakes of Kakaban Island (1 lake) and P. Maratua (2 lakes). The study area was thus stretching over ca. 130 km NW-SE and ca. 80 km W-E. The depth of the waters where sampling was performed, ranged from about 10 m in the Berau River mouth, to about 700 m off Tanjung Mankalihat — measured by echosoundings or according to the chart. The maximum measured depths of the saltwater lakes ranged from 5 to 14 m (by echosounding and not corrected for the tide). Stations and haul data are listed in a separate table [Table 1].

b) Sampling methods. In most cases sampling was done with a 500 µm mesh ringnet (100 cm ø), lesser frequently a 2000 µm mesh net (100 cm ø) was used. Additionally, samling was done with 55 µm and 80 µm mesh nets. Plankton was also collected by hand or with a dipnet (e.g. jellyfishes). Nets were towed either horizontally or vertically, in the latter case the maximum attained depth was an estimated 110 m. In horizontal or oblique sampling the net was always towed against the current. Samples were made during daytime mainly, and only in a few cases sampling could be carried out by night. The collected zooplankton samples were preserved in 4% buffered formalin/seawater solution and/or in 70% ethanol. Especially chaetognaths (arrow worms) were preserved also in DNA-fixing buffer.

c) Measurements. Water depth was mesured with echosounding or taken from the chart. Vertical sampling depth was according to the rope length, with an estimated correction for tilt of the rope. Temperature, salinity and turbidty were not measured. During horizontal sampling, the netflow could not be measured, nor could tow speed, distance run or current speed. Therefore it is not possible to give reliable figures for biovolume of those samples that were made horizontally. Yet many samples had to be made horizontally at shallow stations. Because the sampling was done each time in athe same way, a prudent comparison of sample biomass is still possible.

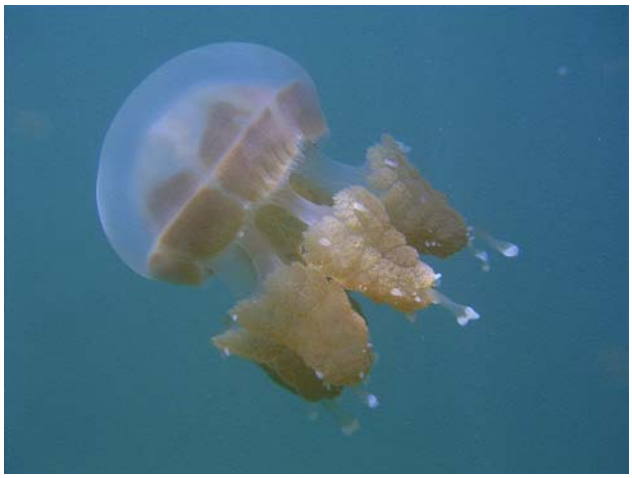
Analysis. In the home laboratory samples were sorted out according to major groups of interest, e.g. Chaetognatha, Gastropoda (Pteropoda and Heteropoda), gastropod veligers, bivalve veligers, Cephalopoda, larger Crustacea (mostly decapod larvae) and various unsorted rest groups, often consisting of the Copepoda. Occasionally Siphonophora, Appendicularia and Ostracoda were separated as well. At present, the sorting of samples is still in progress. Identification of species has begun on chaetognaths. Pteropoda will be the next targeted group.

Preliminary results. Samples can be divided roughly in four categories according to location: coming from stations located at a) sea, b) near shore or over a reef, c) in the vicinity of the Berau River, or d) coming from the Kakaban and Maratua “saltwater lakes”. With respect to species and numbers, it is expected to find different outcome of the analysis of samples from these categories.

Biomass. Already observed in the field, and confirmed with measurements of the samples’ biovolume in the lab, the zooplankton biomass off Sangalaki Island was the highest of all stations, in terms of standardised biovolume. The large group of manta rays seems to be associated with this high biomass of zooplankton. Biomass was also rather high near the Berau River mouth. High biovolumes were due to abundant chaetognaths, siphoniphores and copepods. Biovolumes were relatively low in the open sea samples. The samples from the saltwater lakes are rather hard to compare with the other samples due to considerable different zooplankton assemblages in the lakes, which consisted only of copepods and veligers (larvae) of gastropods and bivalves. If jellyfishes are taken into account, again the samples from the lakes are remarkable because they contain large amounts of medusae of *Mastigias* and *Aurelia*, which were not encountered outside the lakes during the present fieldwork where their densities are much lower.

b) *Taxonomy.* At present, identification is not completed yet. An overview is given at an only high systematic level with some preliminar results for chaetognath species. Chaetognatha and Copepoda were the dominant groups at all stations except at those from the saltwater lakes of Kakaban and Maratua, where (pelagic) Chaetognatha are absent. At most stations also Siphonophora, Appendicularia, Gastropoda (Pteropoda mainly) and Ostracoda were found, but variation in numbers was considerable. In very low numbers, but almost always, also Polychaeta, fish larvae and Hydromedusae were found. Less frequently, Thaliacea (belonging to the pelagic tunicates), Amphipoda, and bivalve veligers were found in the samples. Larvae of Crustacea, especially those of Decapoda, were found regularly, but due to the rather small mouth opening of the net, numbers are low. For the same reason, it is assumed that Euphausiacea (adults, as well as larvae) are remarkable rare in the samples. If present at all, it concerned rather small specimens of *Euphausia* and *Stylocheiron*.

With respect to the planktonic animals found in the saltwater lakes of Kakaban and Maratua, so far the following can be said. The jellyfishes *Mastigias* and *Aurelia* are present in all three lakes, the cubomeduse and the upside-down jellyfish *Cassiopeia* (not a true pelagic animal) were found only in Kakaban and the southern lake of Maratua and were absent from the northern lake of that island. Regarding *Mastigias*, according to the lake where they were found the animals showed differences in the length and shape of the tentacle club and in the colour pattern of the umbrella. It is not yet clear whether this is indicating different species. The copepods from the Kakaban lake appear to belong to two species, one from the order Calanoida, the other from the order Cyclopoida; the latter species was present with many ovigerous females. The samples from the two Maratua lakes are just superficially analysed, but seem to be poor in Copepoda — if not absent. All saltwater lake samples show polychaete larvae. The samples from Kakaban Lake hold large amounts of dinoflagellates (*Cerastium*), which were not found (yet) in the other two lakes. There are 9 chaetognath species found thus far e.g. *Sagitta enflata, S. pacifica, S. robusta, S. hexaptera, S. pulchra, S. tenuis, S. neglecta, Krohnitta pacifica,* and *Pterosagitta draco.* Practically all are oceanic species except for *Sagitta tenuis* which is a neritic species. The samples from the shelf area are poor in specimens, the samples from over deep water (700 m) or near P. Sangalaki are richer.



One of the many jellyfish, *Mastigias* sp., in Kakaban Lake. Photo B.W. Hoeksema.

Table 1. List of all identified taxa so far.

- Chaetognatha
  - *Sagitta*
    - *enflata*
    - *pacifica*
    - *robusta*
    - *hexaptera*
    - *tenuis*
    - *neglecta*
    - *pulchra*
  - *Krohnitta*
    - *pacifica*
  - *Pterosagitta*
    - *draco*
- Cnidaria
  - Hydrozoa
    - Hydroida
    - Siphonophora
  - Scyphozoa
    - Cubomedusae
    - Saemostomae
      - *Aurelia*
    - Rhizostomae
      - *Mastigias*
      - *Cassiopeia*
- Ctenophora
- Polychaeta
- Mollusca
  - Cephalopda
  - Bivalvia
  - Gastropoda
    - Pteropoda
    - Heteropoda
- Arthropoda
  - Insecta
    - Gerridae
      - *Halobates*
  - Crustacea
    - Copepoda
      - Calanoidea
      - Cyclopoida
      - Harpacticoida
    - Ostracoda
    - Cladocera
    - Amphipoda
      - Hyperiidea
    - Stomatopoda (larvae)
    - Euphausiacea
      - *Stylocheiron*
      - *Euphausia*
    - Decapoda
      - Sergestoidea
      - Caridea
      - Brachyura (larvae)
- Hemichordata
  - Tunicata
    - Appendicularia
    - Thaliacea
      - Doliolida
      - Salpida
- Chordata
  - Vertebrata
    - Pisces (eggs, larvae)

One of the many manta rays are foraging in the plankton assemblage off Sangalaki Island. Photo B.W. Hoeksema.

Cetacea and manta rays

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Long-snouted spinner dolphins. *Photograph by Budiono*.

Introduction. The coastal waters of East Kalimantan probably form part of the western part of the Indo-West Pacific centre of maximum marine biodiversity. Historical and ecological explanations support this working hypothesis. During the last ice age (17,000 yrs ago) sea levels and river mouths were situated 120 m lower than now (Voris 2000). Shelf seas (e.g. the Java Sea) had disappeared and Kalimantan was part of the SE Asian continental mainland. East off Kalimantan, the Indonesian throughflow (Gordon & Fine 1996), continued to pass east off Kalimantan, through the Sulu-Sulawesi Seas and the Makassar Strait, carrying larvae and plankton from the Pacific to the Indian Ocean. Similarly, these seas most likely represent a migratory pathway for oceanic whales and dolphins. East Kalimantan has a wide range of habitats, such as major river (deltas), mangroves, island / reefs and deepwater offshore habitat, which are all inhabited by cetaceans. It will be tested whether East Kalimantan is part of the centre of marine biodiversity, and whether this is predominantly related to ecological or historical-biogeographical factors. Cetaceans and mantas are the taxa used in this preliminary study.

The Indonesian Archipelago contains some 5 million km^2 of territory (including water and land), of which 62% consists of seas within the 12-mile limit (Polunin 1983). At least 29 species of cetaceans are reported to occur in the seas of the Indonesian Archipelago (Rudolph *et al.* 1997). However, only few dedicated studies have been conducted on the abundance, distribution and conservation of cetaceans in Indonesia, although very badly needed. Cetaceans are threatened with extinction in many parts of the world, but nowhere more obviously than in Asia. Growing human populations are putting an increasing pressure on natural resources, including the stocks of wild fish

and crustaceans, supplies of freshwater and even coastal landscapes themselves (e.g. through 'reclamation' projects, harbour constructions, mariculture and oil spills). Rivers, estuaries and coastal marine waters are becoming increasingly unhealthy ecosystems for wildlife stock. Modifications and degradations of the habitat of dolphins and porpoises have often resulted in dramatic declines in their abundance and range (Reeves *et al.* 1997).

The present survey involves a preliminary assessment of the cetacean diversity in the northeastern waters of East Kalimantan and provides the basis for future conservation-orientated research on cetaceans in this area.

Objectives. The objectives of the preliminary survey were to assess the diversity and occurrence of higher vertebrate organisms such as cetaceans and manta rays along the coast of East Kalimantan and relate this to ecological or historical-biogeographical factors. Diversity of these target species will be studied in different habitats varying in distance offshore (salinity, turbidity, nutrient load, sedimentation), land- and seaward position, depth and nearness to islands. A comparison of the species richness for cetaceans will be made with other areas, which have already been defined as center areas for cetacean diversity (in Indonesia: Komodo Islands). Finally, high density areas of biodiversity will be identified and related to geographical factors.

Survey area. The Berau Archipelago contains a wide spectrum of aquatic habitats; delta (mangrove); near shore; near reefs / islands; deepwater habitat (Figure 1). The area offers ecological conditions for a potentially high number of marine species and is most suitable for representing East Kalimantan in biodiversity studies. The southward peninsula Mangkalihat forms an interesting habitat as it narrows the passage that separates the Sulawesi Sea from the Makassar Strait, in between Kalimantan and Sulawesi. A shallow shelf is absent here and this area was confirmed to be a major deepwater habitat for oceanic dolphins and sperm whales (Budiono, *in verbis*).

Field methods. A two-weeks rapid diversity assessment was conducted (October 2003) for cetaceans and mantas in near shore, offshore and near-island habitats of the waters in the Berau district, Northeast Kalimantan. Pre-determined survey transects were designed to provide representative survey coverage of various habitats. Searches were conducted alternatively from two wooden boats of varying length, *i.e.* 16 m and 12 m and varying horsepower, *i.e*. 16 hp and 26 hp, respectively. The three-person observers team followed a routine survey protocol for observation and data recording, in which the first observer scanned the continuously with 7x50 binoculars, second observer searched for dolphins with naked eyes, and records all sighting effort data and environmental and geographical conditions using a GPS every 30 minutes. The third observer searched at the rear and occasionally used binoculars. Positions changed every 30 minutes. One transect was surveyed in one day and double sightings on the same transect avoided. Upon sighting the distance to the dolphins, compass bearing of the boat and of the dolphins, and coordinates of the sighting location were recorded. Species were identified and if more than one species was observed, it was recorded whether the species would mix, and if not what was the mean distance between the populations of those species.

Table 1. Number of sightings and cetacean species encountered in different habitats.

Habitat	Survey effort (km)	No. of independent sightings	No. of cetacean species	% of total no. species (*n* = 9)
Off-shore [1]	248	4	5	55%
Near shore [2]	246	0	0	0
Islands/ reefs [3]	221	7	7	88%
Total	715	11	8	

[1] = > 20 m depth coastal contour line, > 5 km distance off islands and reefs
[2] = < 20 m depth coastal contour line, > 5 km distance off islands and reefs
[3] = < 5 km distance of islands and reefs

Minimum, maximum and best estimates were made of group sizes and the number of calves and juveniles. Further, a general behaviour description was made and whether the groups avoided, approached or behaved neutral to the observation vessel. It was attempted to photograph each species and individuals with distinctive dorsal fins. Depth at sighting locations was traced back from an official sea map of the area with depths.

Results. Searches for cetaceans were conducted for a total of 715 km (49.8 h) during 12 survey days. Search effort was equally distributed over 3 different habitat types, i.e. near-shore, off-shore and near offshore islands (Table 1). A total number of 11 independent sightings consisted of one up to four different species. Most sightings (64%) were made near islands and reefs (within 5 km off the islands) and secondly (36%) in off-shore habitat, but still within 10 km off the islands). No sightings were made in near-shore habitat. Also most species were encountered near reefs and islands (88% of *n* = 9 species) compared to off shore sightings (55%). Minimum and maximum depths for all sighting locations were 30 m and 400 m.

Nine different cetacean species were encountered in both mixed species groups and groups consisting of a single species (Tables 2-3), which is 0.011 species/ km search effort. Sightings of mixed species composition involved 55% (*n* = 6) of all sightings. However, the percentage of sightings that existed of groups, which were actually mixed was 36% (*n* = 4). The remaining 19% (*n* = 2) involved dependent sightings of groups, which did not mix (minimum distance range 30 m and 100 m).

Most sightings were made of *Tursiops truncatus* and the genus *Stenella* including a dwarf form subspecies *Stenella l. roseiventris* (Plate 4). This last species represents the first official record of its occurrence in Indonesia. Although individual sightings for bottlenose dolphins, *Tursiops truncatus* are more numerous than for other species, highest total numbers of dolphins encountered in the study area are the long-snouted spinner dolphins, *Stenella longirostris* (Plate on title page) and a short beaked form of *Stenella longirostris* sp. These two species including the spotted dolphin, *Stenella attenuata*, occurred in the largest group sizes (Plate 1). The three whales species, false killer whale, *Pseudorca crassidens* (Plate 3); melon-headed whale, *Peponocephala electra* and short-finned pilot whale, *Globicephala macrorhynchus* were all recorded in low numbers and only during one sighting. All identified species were seen in mixed groups, except for the short-finned pilot whale. Only bottlenose dolphins and short-snouted spinner dolphins were also observed in monospecific groups.

Calves and juveniles were also observed for some species. Only one neonate spotted dolphin was observed. Also one ray species was encountered, i.e. the manta ray *Manta birostris*, in a large school (*n* = 65) near the offshore island Sangalaki (Plate 6).

The Berau islands are characterized by high species richness and the minimum area size within which all nine species and tentatively identified sub-specieswere found was 421 km^2. Eight species out of nine species ocurred in an area of only *ca.* 170 km^2, doubling the number of species per area size, i.e. 0.046 species/ km^2. Three species had a conservation dependent status. The status of the dwarf spinner dolphin has not been evaluated but it has the most restricted range of occurrence being confined to shallow inner waters of South East Asia (Rudolph & Smeenk 2002) although in this study the species also occured in deepwater habitat.

Table 2. Identified species and habitat characteristics per independent sighting location

No. independent sightings[1]	Species	Best estimates of group size	Habitat	Depth (m)	Mixed groups
1	*Tursiops truncates*	13	Island/ reefs [2]	200-300	-
2	*Tursiops aduncus* *Tursiops truncatus* *Stenella longirostris* *Stenella l. roseiventris*	7 40 55 8	Offshore (10 km off island)	300-400	All mixing
3	*Manta birostris*	65	Island/ reefs	30	-
4	*Tursiops truncates*	2	Island/ reefs	100-180	-
5	*Tursiops truncatus* *Stenella longirostris* sp.[3] *Stenella l. roseiventris*	18 45 15	Offshore (7 km off island)	50	Not mixing, > 100m dist.
6	*Tursiops truncates*	8	i.d. above	80	-
7	*Stenella longirostris* sp.	45	Island/ reefs	100-130	-
8	*Tursiops truncates*	1	Island/ reefs	30	-
9	*Stenella longirostris* sp. *Stenellal. roseiventris* *Stenella attenuate*	11 8 4	Island/ reefs	35	All mixing
10	*Pseudorca crassidens* *Peponocephala electra*	7 4	Island/ reefs	400	Mixing
11	*Globicephala macrorhynchus* *Stenella attenuate*	4 55	Island/ reefs	200-360	Not mixing, >30m dist.
12	*Stenella longirostris* *Stenella l. roseiventris*	35 9	Offshore (10 km off island)	360-400	Mixing

[1] = Numbers corresponding with numbers in Fig.1.
[2] = < 5 km off reefs and islands
[3] =Tentative identification of possible sub-species of *Stenella longirostris* with short beak.

Table 3. Cetacean species group sizes, encounter rates, sighting frequency and conservation status. They are sorted in decreasing sighting frequency order.

No. independent sightings[1]	Species	Best estimates of group size	Habitat	Depth (m)	Mixed groups
1	*Tursiops truncates*	13	Island/ reefs [2]	200-300	-
2	*Tursiops aduncus* *Tursiops truncatus* *Stenella longirostris* *Stenella l. roseiventris*	7 40 55 8	Offshore (10 km off island)	300-400	All mixing
3	*Manta birostris*	65	Island/ reefs	30	-
4	*Tursiops truncates*	2	Island/ reefs	100-180	-
5	*Tursiops truncatus* *Stenella clymene* *Stenella l. roseiventris*	18 45 15	Offshore (7 km off island)	50	Not mixing, > 100m dist.
6	*Tursiops truncates*	8	i.d. above	80	-
7	*Stenella clymene*	45	Island/ reefs	100-130	-
8	*Tursiops truncates*	1	Island/ reefs	30	-
9	*Stenella clymene* *Stenella l. roseiventris* *Stenella attenuate*	11 8 4	Island/ reefs	35	All mixing
10	*Pseudorca crassidens* *Peponocephala electra*	7 4	Island/ reefs	400	Mixing
11	*Globicephala macrorhynchus* *Stenella attenuata*	4 55	Island/ reefs	200-360	Not mixing, >30m dist.
12	*Stenella longirostris* *Stenella l. roseiventris*	35 9	Offshore (10 km off island)	360-400	Mixing

[1] = Red List designation: DD = Data Deficient; LR (cd) = Lower Risk (conservation dependent); LC = Least concern.

DISCUSSION

Methodological constraints. The month October was characterized by a transition of southern wind domination (July–September) to northern wind domination (November–January). This caused variable wheather conditions with occasional mirror-like sea surfaces, but also often high waves and changing winds. Due to the high waves, the eastern offshore habitats off the islands could not be surveyed, narrowing the originally planned survey area. Supposedly best months for surveying in this area are the months March until July.

Conservation. Based on the relatively high species richness and presence of species with a restricted range and a globally conservation dependent status, the waters near the Berau Islands have both a local and global biodiversity importance. For comparison, 14 species of cetaceans were identified in Komodo (identified as one of the richest marine diversity sites in the Indo-Pacific) National Park waters (1.214 km^2 surface waters) (Kahn *et al.* 2000), whereas in the Berau study area alone, 8 species were encountered in an area of only *ca.* 170 km^2. Although there are undoubtedly other areas of high cetacean diversity in Indonesia, such as reported for Solor and Lembata Island in eastern Indonesia

(Weber 1923, Barnes 1980, Hembree 1980), there are no comparative data on local species richness available. Most likely only a proportion of the actual species number which occur in the Berau Archipelago seasonally or year round were observed in this preliminary survey, so the species richness may be even higher. For example, sperm whales, *Physeter macrocephalus*; common dolphins, *Delphinus delphis*, killer whales, *Orcinus orca* and Irrawaddy dolphins, *Orcaella brevirostris* were also observed to occur in the study area during earlier visits to the area (Budiono, *in verbis*). The fact that one neonate spotted dolphin individual was detected indicates that this area may also be of significance in terms of breeding area.

Based on the preliminary sighting data, we found that most sightings and species occurred within 5 km distance off islands and reefs and all sightings were within 10 km distance, so a 10 km radius protection zone off islands and major reefs may be one of the conservation recommendations. Otherwise, the restricted range within which eight of the nine identified cetacean species and manta rays were observed has a good conservation potential to become a sanctuary for marine vertebrates. The area also included four islands, which are frequently visited by tourists, so the area also has a high eco-tourism potential. However, any possible dolphin / whale watching should be controlled and guided by instructed and responsible boats drivers.

Future planning. To continue investigating areas of high cetacean diversity but also to include other marine vertebrates, i.e. the dugong, *Dugong dugon*, and manta ray abundance; to prepare a species diversity index and compare with other areas that are defined as center areas of cetacean diversity; to investigate which areas have a year-round or seasonal importance for all target species and relate this to ecological and biogeographical factors; to investigate the presence of various cetacean species and dugongs in terms of active migration or historical/geographical factors; to asses the abundance status (occasional, common, very common, and abundant) of species and their habitats in terms of conservation; to prepare a conservation action plan for all threatened target species and their habitats if degraded, possibly through establishment of protected marine parks and local education/awareness campaigns.

Acknowledgements. This preliminary survey was conducted in close collaboration with the local NGO, RASI Conservation Foundation together with the Indonesian partner scientist, Ir. Budiono. The official collaboration was with the Indonesian Institute of Sciences (LIPI). Field surveys were conducted by Ir. Budiono, Ir. Bambang Yanupuspita, Ir. Syachraini and Dr. Matthijs Couwelaar. We would like to thank the field observers and boat drivers Pak Kasino and Pak Anto. We would like to thank the following persons for their hospitality: Pak Djamhari and villagers at Derawan Island; conservation staff of Turtle Foundation at Sangalaki Island; villagers at Kaniungan Island. Finally, we owe a great deal of gratitude to the teamleaders of the project, Dr. Bert W. Hoeksema and Dr. Annelies Pierrot-Bults for giving us the opportunity to conduct this survey and for their support.

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Plate 1. Spotted dolphin, *Stenella attenuata.* By Budiono/ YK-RASI

Plate 2. Belly-up swim by a long-snouted spinner dolphin, *Stenella longirostri*s. By Budiono/ YK-RASI

Plate 3. False killer whale. By Budiono/ YK-RASI

Plate 4. Dwarf spinner dolphins, *Stenella l. roseiventris.* By Budiono/ YK-RASI

Plate 5. Bottlenose dolphins' bubble-trailing. By Budiono/ YK-RASI

Plate 6. Manta Ray. *Manta birostris*. By Budiono/ YK-RASI

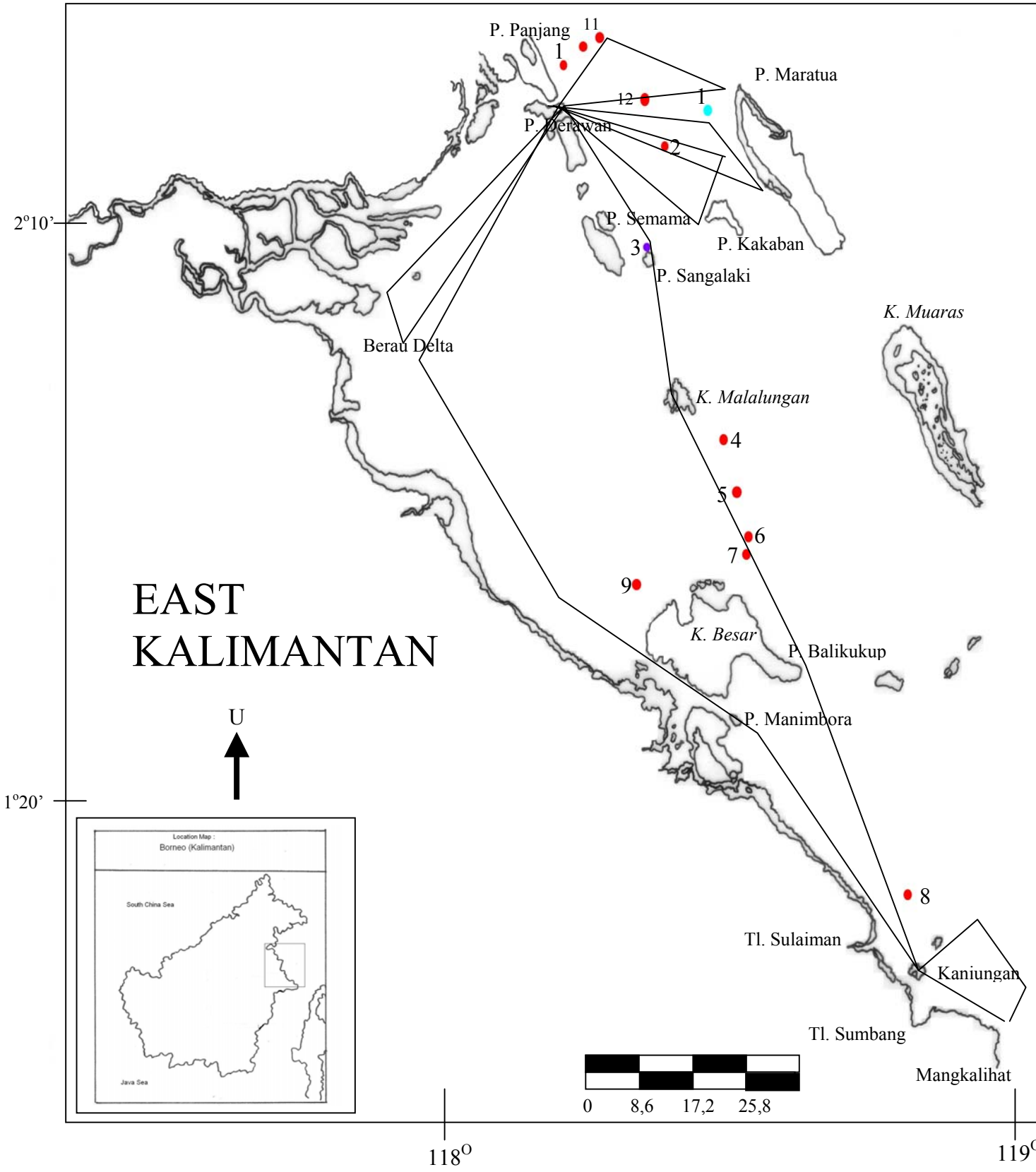

Figure 1. Map of cetacean and manta ray occurrence in the Berau archipelago, East Kalimantan. Numbers correspond with numbers of independent sightings in Table 2.

Reef fish

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Biodiversity was assessed by collecting species presence/absence data of selected genera/families of reef fishes from habitats along an onshore-offshore gradient, while data was also collected on their habitat utilisation. The original research goals were three-fold:

1. To unravel the food-web in relation to the species and genetic diversity of isolated marine lakes. East Kalimantan (Indonesia) contains some unique isolated marine lakes, which are located inside raised atolls. They have been isolated from the ocean for thousands to million years and are only connected to the sea by a network of underground fissures, caves and solution channels. The tidal flushing of the lakes is only a few percent of the total lake volume per tidal cycle. Because of their isolation, the lakes contain a distinct marine fauna and flora. The water layer contains very high densities of several jellyfish species of four different genera (*Mastigias*, *Cassiopeia, Aurelia* and *Tripedalia*). Other taxa which are well-presented with respect to abundances are *Halimeda* and *Caulerpa* algae, Anthozoa, Holothuria, Asteroidea, Tunicata, Porifera and Mollusca. A unique feature of some lakes is that they lack vertebrate herbivores, and that they only have a limited number of characteristic perhaps endemic species of herbivorous macroinvertebrates. Due to their geographic isolation, the atolls containing marine lakes have barely been studied. The fauna and flora is very different from open marine lagoons, and the lakes have little interaction with the ocean. This means that the inflow of plankton, particulate organic matter, sediment, and nutrient is very limited. The question can therefore be raised what the carbon source at the basis of the food web is. Likely contributors are those from terrestrial sources, such as detritus and plant material from the fringing mangroves, and inflow of rainwater from the shore. The input of carbon from these terrestrial sources is at least different, but perhaps also different than the input from other sources from the ocean input or autochthonous production. As a result, the fauna of these marine lakes may have specialised itself with respect to obtaining its carbon. A good example is that of the jellyfish-eating sea anemone in an environment with a high abundance of non-stinging jellyfish. The purpose of the present study was to analyse the contribution of terrestrial and autochthonous carbon sources to the food-web of isolated marine lakes, and to describe the food web by determining the trophic interactions between all functional groups. For that purpose stable isotope samples have been collected for ca. 50 taxa in two marine lakes (Kakaban, Maratua). Furthermore, DNA was collected for four jellyfish species to study genetic diversity in and outside the lakes. This year jellyfish lakes will be sampled at Palau for comparison with the Kalimantan jellyfish lakes. After collection at Palau all samples will be analysed for stable isotopes and genetic structure. The marine lakes show many rare species, several of which

are endemics. The uniqueness and vulnerability of the marine lakes biota will be studied with the help of molecular genetic methods.

2. To establish the diversity and food partitioning of butterflyfishes. During dives at various islands, butterflyfishes were identified and quantified using underwater visual census surveys. At least 36 species were observed (Table 1) of which one species never observed at Kalimantan. Species richness varied on a spatial scale, with lowest values near the Berau Delta (Fig. 1). A more detailed study was carried out at Derawan where for each species five specimens were sampled and analysed for stable isotopes, together with potential food items. The results show a clear differences in food partitioning between the various butterflyfish species (Fig. 2). However, stomach content analysis still needs to be done, as well as the length of the intestines measured.

Table 1. Occurrence of Chaetodontidae species at several off-shore islands near the Berau Delta.

		Lighthouse/Derawan	Lighthouse	Semama/Derawan	Semama	Maratua	Panjang	Sangalaki	Derawan	# locations found
#	# transects	1	1	1	2	2	2	4	6	
1	*Chaetodon adiergastos*							X	X	2
2	*Chaetodon auriga*			X	X	X	X	X	X	6
3	*Chaetodon baronessa*				X	X	X	X	X	5
4	*Chaetodon benetti*			X	X			X	X	4
5	*Chaetodon citrinellus*					X	X			2
6	*Chaetodon ephippium*								X	1
7	*Chaetodon kleinii*	X	X	X	X	X	X	X	X	8
8	*Chaetodon lineolatus*								X	1
9	*Chaetodon lunula*						X	X	X	3
10	*Chaetodon lunulatus*			X	X	X	X	X	X	6
11	*Chaetodon melannotus*					X	X	X	X	4
12	*Chaetodon meyeri*							X	X	2
13	*Chaetodon ocellicaudus*						X	X	X	3
14	*Chaetodon octofasciatus*	X	X		X		X	X		5
15	*Chaetodon ornatissimus*							X	X	2
16	*Chaetodon oxycephalus*							X		1
17	*Chaetodon punctatofasciatus*				X	X	X	X	X	5
18	*Chaetodon rafflesi*			X	X	X	X	X	X	6
19	*Chaetodon semeion*							X	X	2
20	*Chaetodon speculum*					X		X	X	3
21	*Chaetodon triangulum*			X				X		2
22	*Chaetodon trifascialis*							X		1
23	*Chaetodon ulietensis*			X	X	X	X	X	X	6
24	*Chaetodon unimaculatus*								X	1
25	*Chaetodon vagabundus*			X	X	X	X	X	X	6
26	*Chaetodon xanthurus*							X	X	2
27	*Chelmon rostratus*	X	X	X	X		X		X	6
28	*Coradion chrysozonus*	X						X	X	3
29/30	*Forcipiger spp.: flav./long.*			X	X	X	X	X	X	6
31	*Hemitaurichthys polylepis*					X		X	X	3
32	*Heniochus acuminatus*		X						X	2
33	*Heniochus chrysostomus*		X	X	X	X	X	X	X	7
34	*Heniochus diphreutes*								X	1
35	*Heniochus monoceros*								X	1
36	*Heniochus varius*			X	X	X	X	X	X	6

Diversity of Chaetodontidae: mean # species

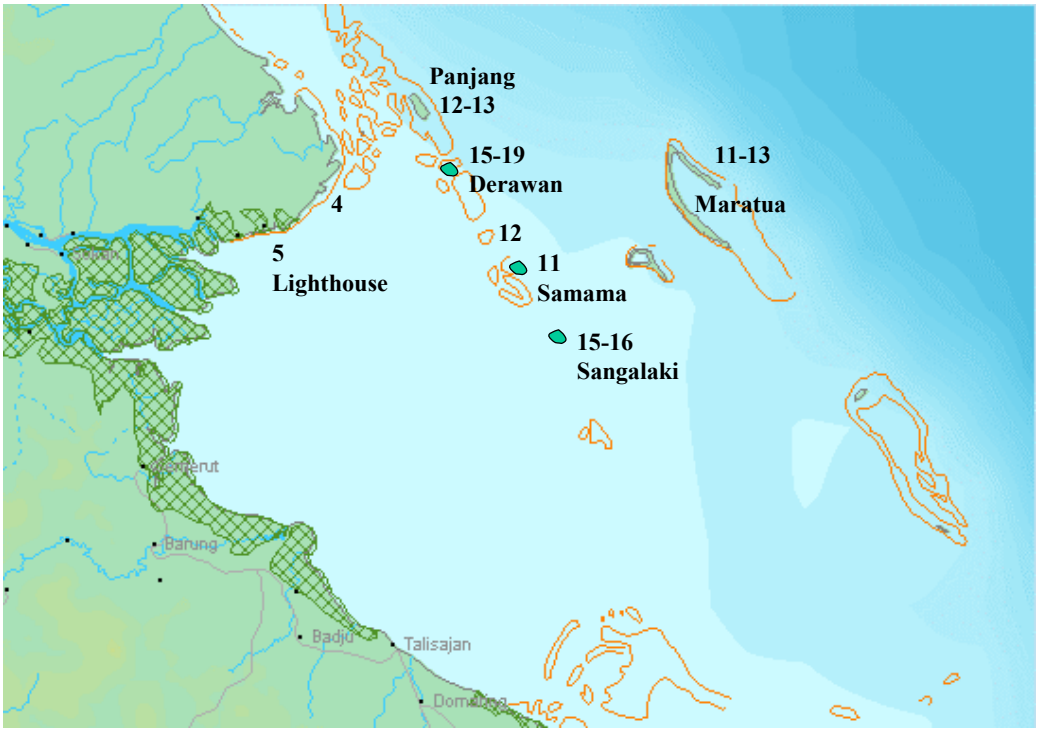

Figure 1. Species richness of Chaetodontidae at several islands near the Berau Delta.

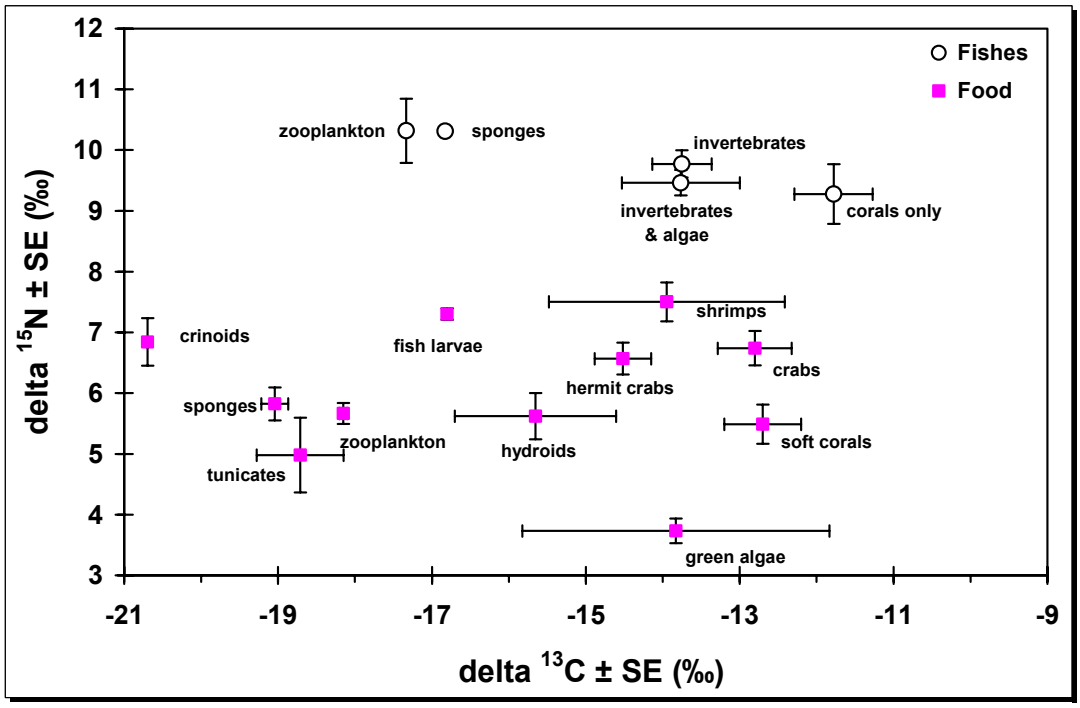

Figure 2. Stable carbon and nitrogen values for Chaetodontidae species, pooled according to their feeding guild, and potential food sources from Derawan Island.

3. To study the nursery function of mangroves and seagrass beds for coral reef fish. Utilisation of the mangrove habitat and adjacent seagrass habitat by reef fish species was determined in Panjang and Samama. The mangroves fall completely dry during low tide, suggesting that complete fish faunas undertake daily feeding migrations between reefs/seagrass beds/sand flats/mangrove forests. Samples of fishes and food items were collected to test this hypothesis, using stable isotope analysis. Furthermore, of a few dominant fish species DNA samples were taken for comparison with east Africa where the same species occur.

Butterfly fishes (Chaetodontidae) at Sangalaki Island. Photo B.W. Hoeksema.

The sea anemone *Entacmaea medusivora* attacking a jelly fish (*Mastigias* sp.) at Kakaban Lake. Photo B.W. Hoeksema.

Sponges

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Sponge samples were photographed and collected on the reefs in the Berau archipelago with the help of snorkel equipment and scuba and preserved in 75 % alcohol. The collectors were various expedition participants (Lori Colin, Matthijs van Couwelaar, Lisette De Senerpont Domis, Koos van Egmond, Bert Hoeksema, Ivan Nagelkerken, Leen van Ofwegen, Rob Moolenbeek, Willem Renema and Nicole de Voogd).. We also studied the sponges of three anchialine lakes of Kakaban Island, and Maratua Island. In total, 232 specimens were collected. Preliminary identification yielded approximately 150 species, 75 genera, 42 families, 14 orders and two classes (Table 2).

Most of the encountered reef sponges have been observed and collected in other regions in Indonesia, although approximately ten species were recorded for the first time. Approximately 100 specimens were collected from the anchialine lakes of Kakaban and Maratua. These lakes contain a unique flora and fauna. Sponges and seaweeds are the most abundant in species but also the main space acquisitors. Most species are growing on tree branches and mangrove roots, although some are burried in the sandy bottom. For instance, “golf ball” sponges (*Cinachyrella* spp.) are known to withstand high sedimentation areas unlike most sponges, and these species are abundant in all lakes. *Suberites* sp. is also known from other anchialine lakes, such as those from Palau and Lake Satonda (near Sumbawa). Other abundant species belonged to the genera *Tethya, Haliclona* and *Spongia*. Most species were found in the largest lake, at Kakaban Island, whereas the least species were found in the smallest lake of Maratua (North), which did not harbour unique species. Six species were encountered in all three lakes. Detailed spicule measurements have to be made in order to determine whether these species also occur outside the marine lakes and if the species prevalent in all lakes are the same species (table 1).

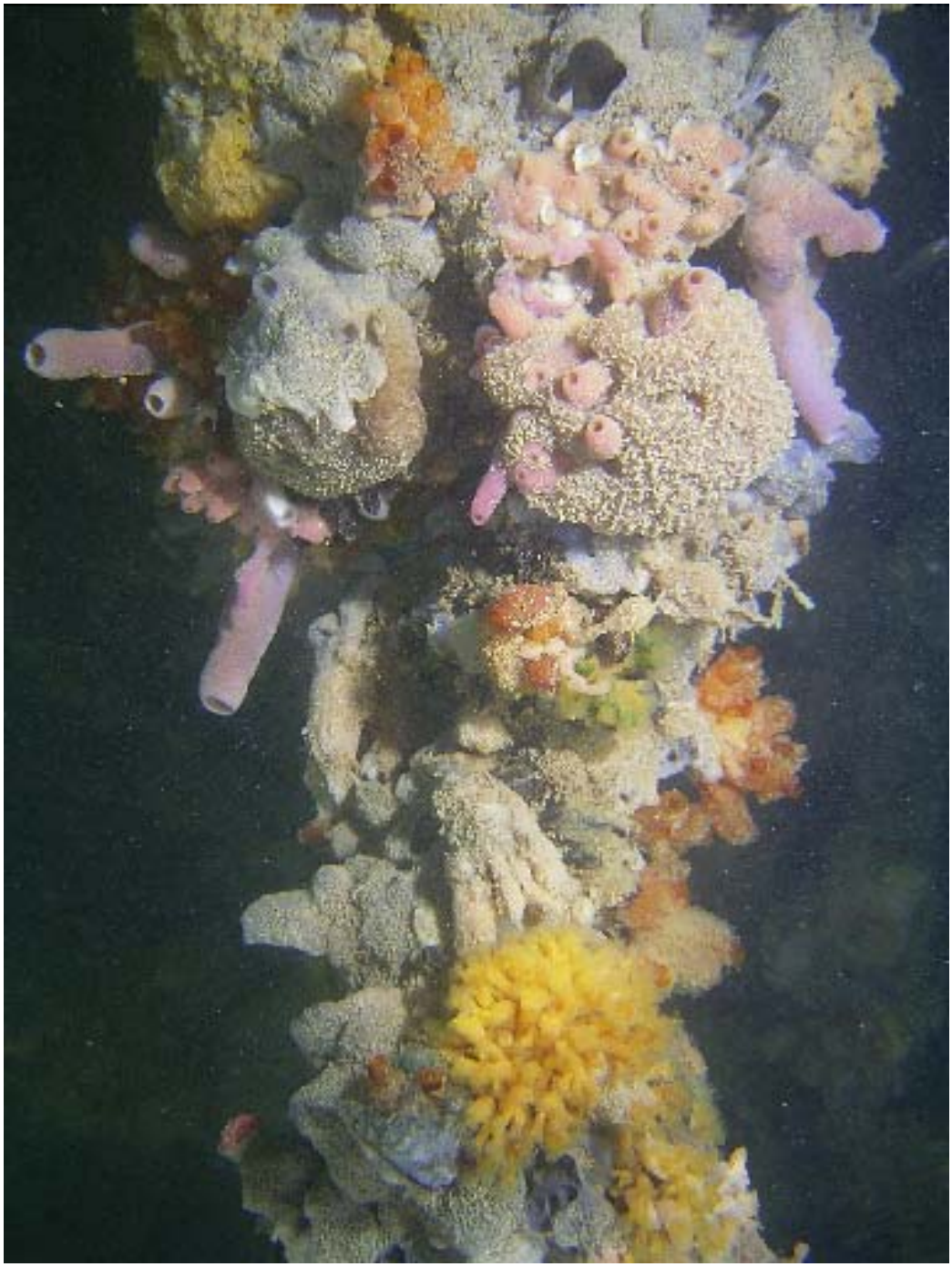
Table 1 Sponge species encountered in the anchialine lakes

	Kakaban	Maratua South	Maratua North
Total species	41	26	11
Unique species	24	4	0

Table 2. Sponge samples collected during the East Kalimantan Expedition

Demospongiae
Homosclerophorida Dendy, 1905
Plakinidae Schulze, 1880
Oscarella sp.
Plakortis lita de Laubenfels, 1954
Plakortis nigra Lévi, 1953
Spirophorida Bergquist & Hogg, 1969
Tetillidae Sollas, 1886
Cinachyrella australiensis Carter, 1886
Cinachyrella spp.
Astrophorida Sollas, 1888
Ancorinidae Schmidt, 1870
Jaspis splendens De Laubenfels, 1954
Melophlus sarassinorum Thiele, 1899
Penares sollasi Thiele, 1900
Rhadastrella globostellata Carter, 1883
Stelletta clavosa Ridley, 1884
Geodiidae Gray, 1867
Erylus lendenfeldi Sollas, 1888
Geodia spp.
Hadromerida Topsent, 1894
Clionaidae D'Orbigny, 1851
Spheciospongia congerena Ridley, 1884
Spheciospongia vagabunda Ridley, 1884
Spheciospongia sp.
Placospongiidae Gray 1867
Placospongia melobesioides Gray, 1867
Placospongia aff. *carinata* Bowerb., 1858
Polymastiidae Gray, 1867
Spinularia sp.
Spirastrellidae Ridley & Dendy, 1886
Spirastrella aff. *purpurea* Lamarck, 1814
Suberitidae Schmidt, 1870
Aaptos suberitioides Brønsted, 1934
Suberites spp.
Tethyidae Gray, 1848
Tethya cf. *seychellensis* Wright, 1841
Tethya spp.
Chondrosida Bourny-Esnault, 1985
Chondrilldae Gray, 1872
Chondrosia chucalla De Laubenfels, 1954
'Lithistid' Demospongiae
Theonellidae Lendenfeld, 1903
Theonella swinhoei Gray, 1868
Poecilosclerida Topsent 1928
Microcionina Hajdu, van Soest & Hooper, 1994
Microcionidae Carter, 1875
Antho (Acarnia) ridleyi Hentschel, 1913
Clathria (Thalysias) cervicornis Thiele, 1903
Clathria (Thalysias) reinwardti Vosmaer, 1880
Clathria (Thalysias) vulpina Lamarck, 1813
Raspailiidae Hentschel, 1923
Ceratopsion sp. Strand, 1928
Echinodictyum flabelliformis Keller, 1889
Thrinacophora cervicornis Ridley & Dendy, 1886
Myxillina Hajdu, van Soest & Hooper, 1994
Chondropsidae Carter, 1886
Strongylacidon zanzibarense Lendenfeld, 1879
Coelosphaeridae Dendy, 1922
Lissodendoryx (Acanthodoryx) fibrosa Lévi, 1961
Lissodendoryx (Waldoschmittia) sp. De Laubenfels, 1936
Crambeidae Lévi, 1963
Monanchora aff. *clathrata* Carter, 1883
Monanchora aff. *unguiculata* Dendy, 1922
Monanchora sp.
Iotrochotidae Dendy, 1922
Iotrochota baculifera Ridley, 1884
Iotrochota purpurea Bowerbank, 1875
Mycalina Hajdu, van Soest & Hooper, 1994
Desmacellidae
Biemna trirhaphis Topsent, 1897
Biemna spp.
Esperiopsidae Hentschel, 1923
Ulosa sp.
Mycalidae Lundbeck, 1905
Mycale aff. *flagelliferformis* Bergquist & Fromont, 1988
Mycale aff. *euplectelloides* Row, 1911
Podospongiidae De Laubenfels, 1936
Diacarnus megaspinorhabdosa Kelly-Borges & Vacelet, 1995
Isodictydidae Dendy, 1924
Coelocarteria singaporensis Carter, 1883
Halichondrida Gray, 1867
Desmoxyidae Hallmann, 1917
Higginsia mixta Hentschel, 1912
Myrmekioderma granulata Esper, 1794
Dictyonellidae van Soest, Diaz & Pomponi, 1990
Acanthella cavernosa Dendy, 1922
Acanthella aff. *cavernosa*
Amorphinopsis sp.
Liosina paradoxa Thiele, 1899
Stylissa carteri Dendy, 1889
Stylissa massa Carter, 1887
Halichondriidae Gray, 1867
Axinyssa aplysinoides Dendy, 1922
Axinyssa pitys De Laubenfels, 1954
Axinyssa spp.
Halichondria cartilaginea Esper, 1794
Halichondria (Halichondria) sp.

Agelasida Hartman, 1980
Agelasidae Verrill, 1907
Agelas ceylonica Dendy, 1905
Haplosclerida Topsent, 1928
Haplosclerina Topsent, 1928
Callyspongiidae De Laubenfels, 1936
Callyspongia (Cladochalina) aerizusa Desqueyroux-Faundez, 1984
Callyspongia (Cladochalina) samarensis Wilson, 1925
Callyspongia (Cladochalina) aff *confoederata* Ridley, 1884
Callyspongia (Toxoxhalina) aff. *ramosa* Gray, 1843
Callyspongia (Euplacella) biru de Voogd, 2004
Callyspongia spp
Chalinidae Gray 1867
Chalinula hooperi Nishiyama & Bakus, 2000
Cladocroce sp.
Haliclona (Gellius) amboinensis Lévi, 1959
Haliclona (Reniera) fascigera Hentschel, 1912
Haliclona aff. *fascigera*
Haliclona (Soestella) sp. De Weerdt, 2000
Haliclona spp
Niphatidae van Soest, 1980
Amphimedon paravidiris Desqueyroux-Faundez, 1984
Gelliodes fibulata Ridley, 1884
Gelliodes aff. *hamata* Thiele, 1903
Gelliodes spp.
Niphates olemda De Laubenfels, 1954
Niphates spp.
Pachychalina sp.
Petrosina Boury-Esnault & van Beveren, 1982
Phloeodictyidae Carter, 1882
Oceanapia ramsayi Lendefeld, 1888
Oceanapia sagittaria Sollas, 1902
Oceanapia spp.
Petrosiidae van Soest 1980
Acanthostrongylophora ingens Thiele, 1899
Neopetrosia exigua Kirkpatrick, 1900
Neopetrosia aff. *carbonaria* Lamarck, 1814
Neopetrosia spp.
Petrosia (Petrosia) aff. *alfiani* de Voogd & van Soest, 2002
Petrosia (Petrosia) hoeksemai de Voogd & van Soest, 2002
Petrosia (Petrosia) nigricans Lindgren, 1897
Petrosia (Strongylophora) corticata Wilson, 1925
Xestospongia aff. *mammillata* Pullitzer-Finali, 1982
Xestospongia vansoesti Nishiyama & Bakus, 2000
Xestospongia testudinaria Lamarck, 1813
Xestospongia spp.
Dictyoceratida Minchin, 1900
Thorectinae Bergquist, 1978
Irciniidae Gray, 1867
Ircinia ramosa Keller, 1889
Ircinia spp. Nardo, 1833
Thorectidae Bergquist, 1978
Thorectinae Bergquist, 1978
Hyrtios erectus Keller, 1889
Hyrtios reticulatus Thiele, 1899
Phyllospongiinae Bergquist, Sorokin & Karuso, 1999
Carteriospongia foliascens Pallas, 1766
Phyllospongia papyracea Esper, 1806
Phyllospongia aff. *lamellosa* Esper, 1794
Strepsichordaia aliena Wilson, 1925
Spongiidae Gray, 1867
Leiosella ramosa Bergquist, 1995
Spongia cf. *irregularis* Lendenfeld, 1889
Spongia cf. *ceylonensis* Dendy, 1905
Dysideidae Gray, 1867
Dysidea frondosa Bergquist, 1995
Dysidea aff. *frondosa*
Dysidea aff. *granulosa* Bergquist, 1965
Lamellodysidea herbacea Keller, 1889
Pleraplysilla sp.
Eurospongia sp.
Dendroceratida Minchin, 1900
Darwinellidae Merejkowsky, 1879
Chelonaplysilla aurea Bergquist, 1965
Chelonaplysilla sp.
Darwinella sp.
Dictyodrendillidae Bergquist, 1980
Acanthodendrilla sp. Bergquist, 1995
Verongida Bergquist, 1978
Pseudoceratinidae Carter, 1885
Pseudoceratina purpurea Carter, 1880
Pseudoceratina spp.
Ianthellidae Hyatt, 1875
Hexadella indica Dendy, 1922
Ianthella basta Pallas
Calcarea spp.
Clathrinida Hartman, 1958
Clathrinidae Minchin, 1900
Clathrina sp.
Leucetta chagosensis Dendy, 1913
Leucetta primigenia Haeckel, 1872
Leucosolenida Hartman, 1958
Amphoriscidae Dendy, 1892
Leucilla sp.



Mangrove roots in Kakaban Lake act as a suitable substratum for sponge assemblages. Photo B.W. Hoeksema.

Gastropoda 1: Conidae

Mr. R.G. Moolenbeek [1]

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The species of the family Conidae are a highly diversified group of predators, living from the intertidal till depths of about 500 m. Most species feed on worms, other molluscs or even fish. They belong to the superfamily Toxoglossa, all of which catch their prey using venom. Conidae use their deformed radular teeth to paralyse their prey. The fish-eating species can be lethal to humans. Because of their usually nice colour pattern they attract the attention of a very diverse array of enthusiasts like shell collectors, artists, shell dealers and biologists. Nowadays not only taxonomists, but also molecular biologists and even pharmacologists (for the venom) are interested in this family.

Our knowledge of the occurrence of this family in Indonesia has a long tradition, starting with Rumphius (1704). Recently Röckel et al., 1995) reviewed the species from the Indo-Pacific region. However, the East Kalimantan area is still *'terra incognita'.* The preliminary results of this Expedition are here presented. Most of the species were collected intertidally, by snorkelling and by SCUBA diving to about 30 m depth. Regrettable not any night collecting was done, which is probably the best time to collect as they are nocturnal hunters.

Altogether at least 45 species were recorded (Table 1). Most interesting was to find out the environment where *Conus traillii* A. Adams, 1855 occurs. Up to now this species was only known from its original description, without locality and a few records from material in shell shops originating most probably from the Philippines. We will publish elsewhere in detail about this species. Another interesting find was a still undescribed species belonging to the *Conus sponsalis* complex. A manuscript was prepared (Moolenbeek, in prep.) in which this new taxon (*Conus* spec. A) was described from New Caledonia, but finding of a single specimen in East Kalimantan proves that it has a larger distribution.

Table 1. Conidae species collected alive or dead (†) during the East Kalimantan Expedition (Station number and number of specimens collected).

Conus arenatus	**03** (1); **07** (1†); **22** (1†); **26** (1); **40** (1†); **43** (1)
Conus boeticus	**03** (1†); **39** (1†)
Conus capitaneus	**03** (1); **33** (1&1†); **40** (1); **43** (1†)
Conus chaldaeus	**03** (1†); **49**^{A} (1)
Conus circumcises	**35** (2†)
Conus coffeae	**11** (1†); **39** (1†)
Conus consors	**04** (1†)
Conus coronatus	**03** (3&2†); **49**^{A} (4)
Conus distans	**13** (1); **16** (1†); **17** (1†); **48** (2)
Conus ebraeus	**07** (1&4†); **11** (1); **18**^{A} (1); **49**^{A} (6)
Conus eburneus	**03** (1&2†); 26 (1†)
Conus emaciatus	**09** (1†); **11** (1†); **47** (1†); **49** (1†)
Conus flavidus	**08** (1)
Conus flavidus f. *frigidus*	**08** (2); **38** (1†)
Conus generalis	**03** (1†); **20** (1†)
Conus geographus	**42** (1†)
Conus granum	**35** (1†); **39** (1)
Conus imperialis	**09** (1); **43** (1)
Conus leopardus	**25** (1)
Conus litoglyphus	**38** (1†)
Conus litteratus	**03** (1); **04** (1†); **07** (2†); **08** (2); **10**^{B} (1); **11** (1); **29** (1†); **38** (1); **48** (1); **51** (1)
Conus lividus	**07** (1†); **09** (1)
Conus magus	**03** (5 †); **21** (2); **22** (1); **25** (1)
Conus marmoreus	**03** (1); **09** (2); **26** (1); **38** (1); **42** (1); **49** (1); **49**^{A} (1)
Conus miles	**04** (1); **07** (1); **09** (1); **14** (2); **35** (1); **38** (1&1†)
Conus miliaris	**07** (1†); **09** (1); **47** (2)
Conus moreleti	**01** (1†); **42** (1)
Conus muriculatus	**29** (1†); **39** (1†)
Conus muriculatus f. *sugillatus*	**03** (1†); **04** (1); **10** (1&1†); **11** (1†); **33** (3†); **43** (1†); **48** (1)
Conus musicus	**03** (1); **03**^{B} (1†); **09** (1†); **30** (1); **31** (1); **33** (1&1†); **35** (4†); **36** (1†); **38** (2&6†); **39** (4); **40** (7); **42** (1†); **48** (1); **49** (2&1†);
Conus mustelinus	**01** (1†); **06** (1†); **14** (1†); **36** (1); **37** (1†); **42** (1†); **43** (1)
Conus obscurus	**38** (1†); **40** (1†)
Conus pertusus	**10** (1†); **33** (1†); **38** (1); **40** (1†)
Conus planorbis	**06** (1†); **09** (1†); **38** (2†)
Conus pulicarius	**03** (1†)
Conus quercinus	**04** (1); **11** (1†); **22** (3)
Conus rattus	**11** (1); **38** (1)
Conus sanguinolentus	**49** (1)
Conus sponsalis	**07** (1†); **08** (1†); **38** (2†); **49**^{A} (8)
Conus sponsalis f. *nanus*	**09** (1); **49**^{A} (2)
Conus striatus	**11** (1†); **33** (1†)
Conus terebra	**43** (1)
Conus textile	**01** (1†); **38** (1†); **39** (1); **42** (1†)
Conus traillii	**03** (1†); **07** (7†); **18** (**>** 30); **30** (2†)
Conus varius	**14** (1); **33** (1†); **39** (1†);
Conus vexillum	**09** (1); **10** (1); **19** (1)
Conus virgo	**03** (1); **12** (1†); **38** (2); **48** (1)
Conus sp A	**48** (1†)
unidentified	**03** (1); **07** (10); **22** (1†); **24** (6); **26** (2†); **30** (1); **33** (2†); **36** (1†); **38** (1†); **39** (3&1†)

Gastropoda 2: *Strombus* and *Lambis* (Strombidae)

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Strombus and *Lambis* are genera of herbivorous gastropod snails with a strong association to coral reefs. The geographic range of the family Strombidae matches perfectly the worldwide distribution of coral reefs, although many species live under less pristine circumstances and prefer sea grass fields or even occasionally mangrove area's. Of all strombid genera, *Strombus* is worldwide the most speciose, with c. 55 species, 45 of which have an Indo-Pacific distribution. The vast majority of the *Strombus* species live from the low tide line to depths between 5 and 30 m; few species live till a little over 100 m depth. *Lambis* has a distribution restricted to the Indo-Pacific, with c. 12 species.
Strombus has been divided by former workers into 11 subgenera, 10 of which are represented in the Indo-Pacific (IP). The subgenus *Strombus* is known by 2 living species in the Western Atlantic and 1 in the East Pacific. *Tricornis* has 7 species in the IP and 5 in the Western Atlantic. *Lentigo* occurs with 1 species in West Africa and 4 species in the IP, one of which has an East Pacific distribution. All other subgenera have only an IP distribution.

More than 30 *Strombus* species are living in the Indo Malayan centre of maximum diversity; 50% of these are Indian Ocean species; 70% have (also) a Pacific distribution; 7 species are endemic. The very inexplainable distribution area's from several of these subgenera shows already that the phylogeny of *Strombus* is not reflected in the recent taxonomy of the group. Some preliminary results of a molecular phylogenetic analyses, partly carried out with *Strombus* and *Lambis* tissues from this fieldwork shows that *Strombus* is a paraphyletic group and *Lambis* is polyphyletic, within *Strombus* (s.l.).

From Borneo only very few species have been recorded so far. Abbott (1961) in his monograph on *Strombus*, estimated for a much larger area around Kalimantan some 23 species. For the east coast of Kalimantan he actually only reported 6 species, all from the most northeastern tip of Sabah. Raven (2002) reported 25 species of *Strombus* from the west coast of Malaysian Borneo, summarizing literature records and the results of his own fieldwork, which was carried out during a period over several years while he was living in the area. From Semporna, just north of Kalimantan, in the Sulawesi Sea, he reports 7 species, mainly known from the Mary Saul collections (housed in ZMA nowadays), also collected over a period of many years, while she was living in the area. For *Lambis* he reports 6 species from the west coast of Malaysia and only 2 from the Celebes Sea.

During our fieldwork, 13 species of *Strombus* (of which 3 are endemics) and 4 species of *Lambis* were collected (table 1). All of these were expected to occur in the area, but were actually never collected and reported upon before. From the larger distributions of the *Strombus* species, we would expect some 28 different species occurring along the whole of the east coast of Kalimantan. Strombidae are difficult to collect, for various reasons. First of all the different species all have specialisations for different habitats. Hardly ever more then 2 or 3 species can be found together

during a dive in which both shallow and deeper areas are searched. Some of the *Strombus* species do not tolerate any influx of brackish water. Many shallow-living species migrate during the day into deeper water or simply stay hidden in the bottom sediments. *S. variabilis* for instance was only found because of extensive searching by hand in the upper layers of the sediment. Many species only occasionally migrate into the shallow reef flats. It has been suggested that they gather during mating periods in more shallow water. The few observations of this phenomenon do not show a trend so far.
The highest species diversity in the Berau area was found on the outside of the islands on the coastal barrier (Balik Taba-Panjang, Derawan, Samana) All 17 species of *Strombus* and *Lambis* were collected in that area. On the outer islands (Maratua and Kakaban) we only found 8 species, which is probably due to the much smaller reef flat areas of these islands.

Table 1. *Strombus* and *Lambis* species reported during our fieldwork from the so-called barrier and outer islands. For comparrison the only other data from the east coast of Sabah and Kalimantan are from Sabah, Semporna Island, reported by Raven, 2002.

	East Kalimantan			Sabah
	Berau	barrier	outer islands	Semporna
S. pipus		x		
S. sinuatus		x		
S. latissimus		x		
S. lentiginosus		x	x	x
S. bulla		x		x
S. luhuanus		x	x	x
S. variabilis		x		x
S. erythrinus		x		
S. minimus		x		
S. gibbosus		x	x	x
S. dentatus		x	x	
S. urceus		x	x	x
S. labiatus				x
S. microurceus		x		
L. chiragra		x	x	
L. scorpius		x		
L. lambis		x	x	x
L. millepeda		x	x	x

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Raven, H., 2002. Notes on molluscs from NW Borneo. 1. Stromboidea (Gastropoda, Strombidae, Rostellariidae, Seraphidae). *Vita Malacologica* 1: 3-32.

Large Foraminifera in the Berau-delta: indicators of environmental change?

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Larger benthic foraminifera are large, unicellular organisms. Just like reef-building corals, they house zooxanthellates and prefer similar conditions. Research at the Spermonde Shelf (Southwest Sulawesi) has shown that there is a good correlation between reef coral and larger benthic foraminiferal diversity (Renema & Troelstra 2001). Suspension load, nutrient availability and seasonality, parameters likely to be affected by environmental change, together result in an environment that is either very constant, or highly variable and unpredictable. Benthic foraminifera are very sensitive to the above parameters and respond to those by changing fauna composition (Renema & Troelstra 2001, Renema 2002). Furthermore, environmental conditions are reflected in the shape of the shell (Fig. 1). In areas with a deep photic zone in stable conditions, foraminifera are large and flat, while in more eutrophic, variable conditions the foraminifera have smaller, robust tests (Hallock 1987).

The calcareous tests have a high fossilization potential, so that environmental parameters can be traced back in time. Often monitoring is started at a moment that a change is already observed. By using short cores, the initial situation can be reconstructed, increasing the value of a monitoring programme. The objective of the present study is:

1. To assess the Recent distribution of (larger) benthic foraminfera over the Berau delta.
2. To assess whether changes in the distribution of assemblages of larger benthic foraminfera over the Berau delta have occurred over the last 100-200 years.

Results

In almost 30 boxcores in three transects (Fig. 2) and 130 samples at 40 stations at least 33 species of larger foraminifera have been found (Fig. 3, table 1). In some genera, i.e. *Peneroplis, Soritidae,* and *Calcarinidae*, some taxonomical problems remain, which implies that the number of species might be higher. This compares to the richest reefs in the IWP.

The reef flats of Maratua, Kakaban and Baliktaba are especially rich in larger benthics. Turf-forming algae (*Jania*, *Gelidiopsis*) form a good substrate for many species that are not found elsewhere in the area. The carbonate sands at the reef base of the shelf reefs form another good habitat. Here *Dendritina* spp and *Operculinella cumingii* are characteristic.

On the reef slope rubble and macroalgae are the most important substrates. In the boxcores in transects A and B, living larger foraminifera were only found in the most offshore samples. Here assemblages were dominated by *Operculina complanata*, *Planostegina heterosteginoides* and, furthest offshore, *Cycloclypeus carpenteri*.

Zonation

A zonation along an onshore-offshore gradient can be recognised. Based on the reef flat assemblages, the offshore zones can be divided into two zones. The reefs at the barier islands

(especially Panjang Island and Samama Island) have a fauna characterised by the exclusive occurrence of *Calcarina defrancii* and the dominant occurrence of *Dendritina* spp. In assemblages living on sand, a zonation can be found as well. This zonation cannot directly be translated into the zonations found elsewhere. The defining species are all Nummulitidae though, with the largest and flattest species occuring furthest offshore. The boxcore transects show that at a similar depth, but varying in distance to the shore, the LBF assemblage changes, demonstrating the effect of the river influence on the carbonate environment.

Macroalgae as substrate

Macroalgae were regularly observed as a substrate for larger benthic foraminifera. On the reef slope calcareous algae (*Halimeda, Galaxaura)* yielded many foraminifera, whereas on *Caulerpa* no forams were observed. On the reef flat and shallow slope, smaller calcareous turf-forming algae *(Jania)* and rigid turf-forming algae *(Gelidiopsis)* were most important for larger foraminifera. The assemblage observed living on algae differs markedly from that on rubble. Calcarinids dominate the assemblage on macroalgae, whereas *Heterostegina depressa* and *Amphistegina radiata* are rare. On rubble this is the other way around.

Possible further research

1. Dispersal capacity is unknown for many organisms living on reefs. The presence of some natural boundaries (deep water between Sangalaki I., Kakaban I. and Maratuan I.) and shelf reefs and varying distance makes the Berau area a suitable area for this type of questions.
2. Stable isotope composition of foraminiferal tests along an onshore-offshore gradient.
3. Nutrient availability, hydrodynamics, predictability and transparency are the environmental parameters directly influencing LBF occurrence. Measuring of these parameters over a prolonged period, and assessing the life-history of the LBF at the monitoring site will improve knowledge on the interaction between these parameters and LBF populations. This will improve the indicator value of LBF.
4. The original goal of this project is only possible by using coring equipment that is capable of coring in the carbonate sands in the Berau delta.

References

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Renema, W. & Troelstra, S.R., 2001. Larger foraminifera distribution on a mesotrophic carbonate shelf in SW Sulawesi (Indonesia). *Palaeogeography, Palaeoclimatology, Palaeoecology* **175**: 125-146.

Renema, W. 2002. Larger foraminifera as marine environmental indicators. *Scripta Geologica* **124**: 1-260.

Table 1. Species records in the coastal area of Berau: occurrence reords around reefs (SCUBA) in four zones and in boxcores of the shelf bottom (**++** = abundant, **+** = rare).

Species	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**boxcores**
Amphistegina lobifera	+	++	++	++	
A. lessonii	++	++	++	++	
A. radiata	+	++	++	++	
A. bicirculata					+
Operculina ammonoides		++	++	++	++
O. heterosteginoides					++
O. complanata		+	++		++
Operculinella cummingii		++			
Palaeonummulites venosus		++	++		++
Heterostegina depressa	+	++	++	++	++
Planostegina operculinoides				+	++
Cycloclypeus carpenteri					++
Calcarina spengleri		++	++	++	
C. gaudichaudii			++	++	
C. mayori			++	++	
C. defrancii			++		
C. gaimardi				++	
C. quoyi				+	++
Neorotalia calcar			++	++	
Baculogypsinoides spinosus		++	++	++	++
Alveolinella quoyi		++	++		
Peneroplis pertusus				++	
P. planatus		+	+	++	
P. cf *antillea*				++	
Dendritina striata		++	++		
D. carinata		++	++		
Laevipeneroplis malayensis				++	
Parasorites nov. spec 1				++	
P. nov. spec 2		++	++		
Sorites orbiculus		++	++	++	
Amphisorus spec 1		+	++	++	
A. spec 2				++	
Marginopora vertebralis			++	++	
	4	17	21	20	
Elphidium craticulatum	++	+	+	+	++

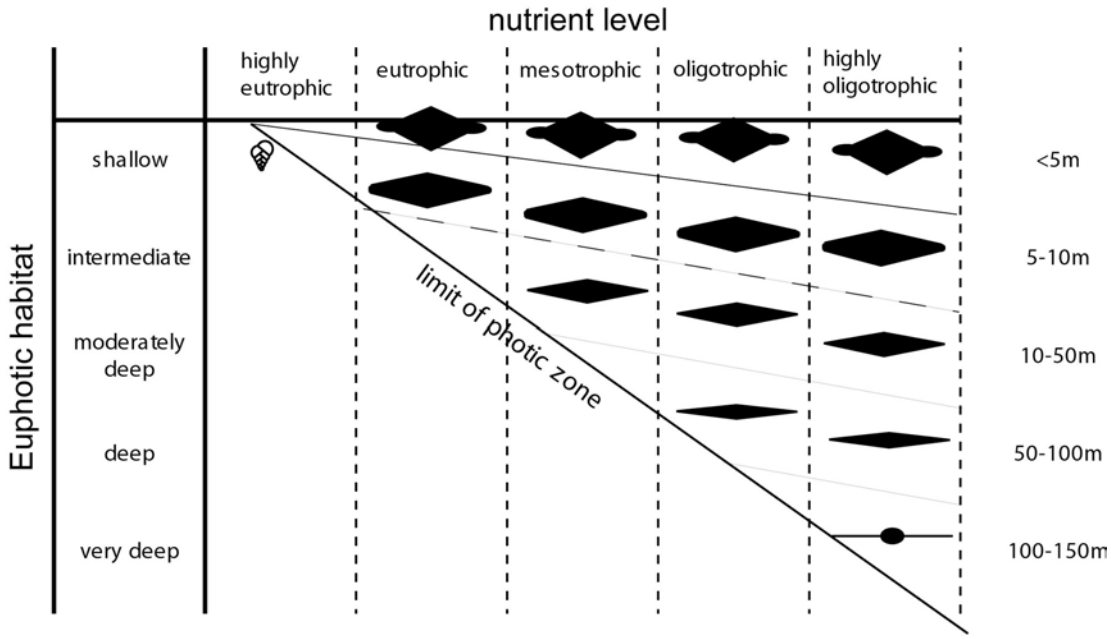

Figure 1. Model showing the relationship between nutrient availability and habitat portioning in larger benthic foraminifera. In oligotrophic conditions transparency is highest and LBF get specialised to a narrower range of light intensity. This is also reflected in the flat shape of the deepest living species. (Hallock 1987, Renema & Troelstra 2001).

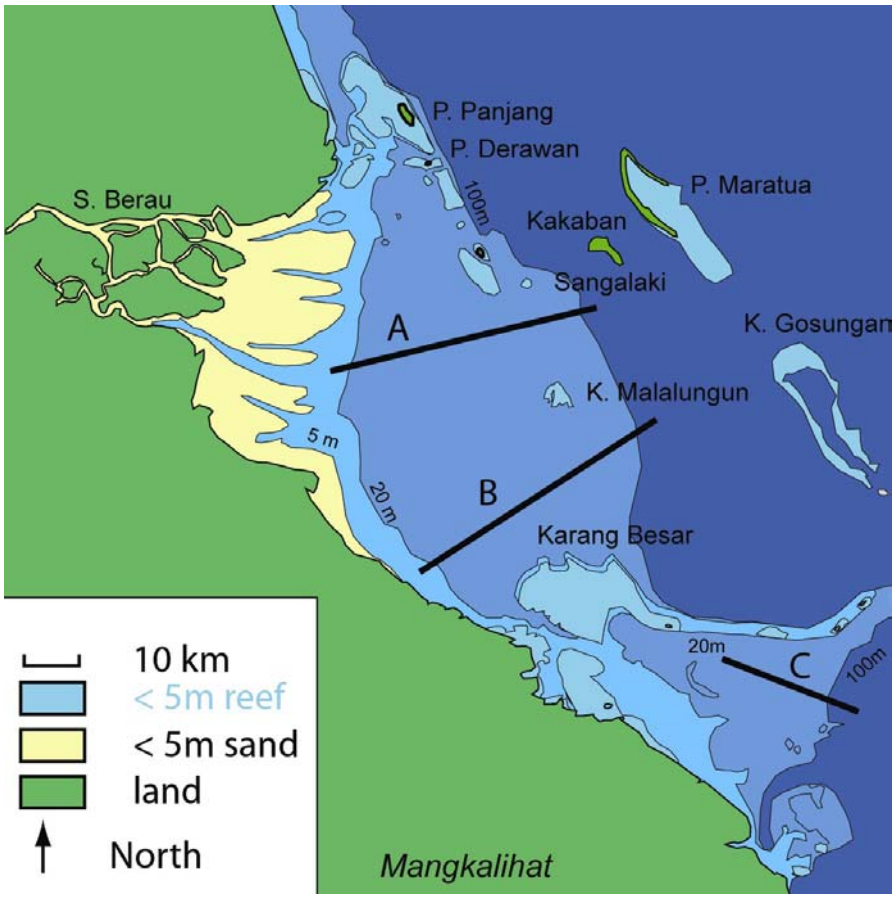

Figure 2. Map showing the boxcore transects which have been sampled.

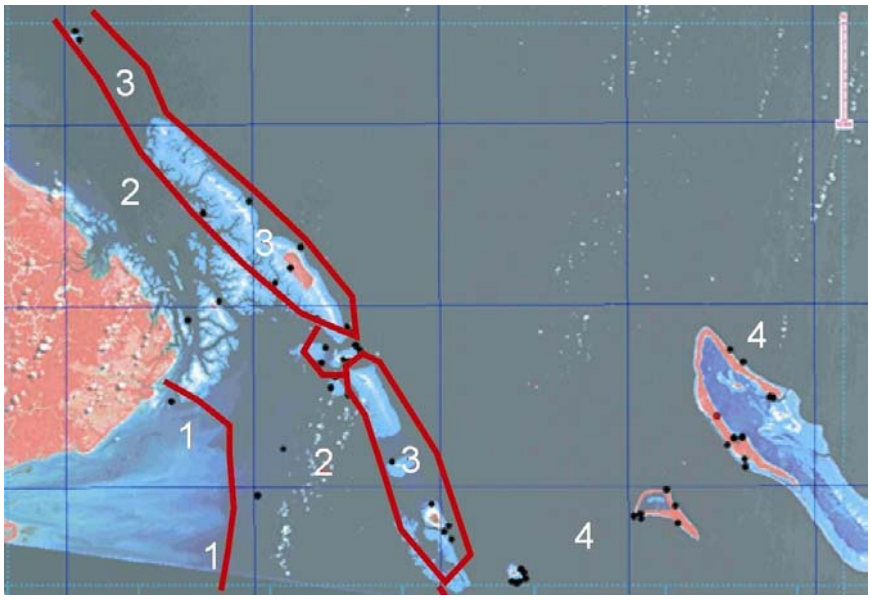

Figure 3. Satelite image showing the sample sites at which samples have been collected by SCUBA-diving. In red the proposed zonal boundaries are drawn.

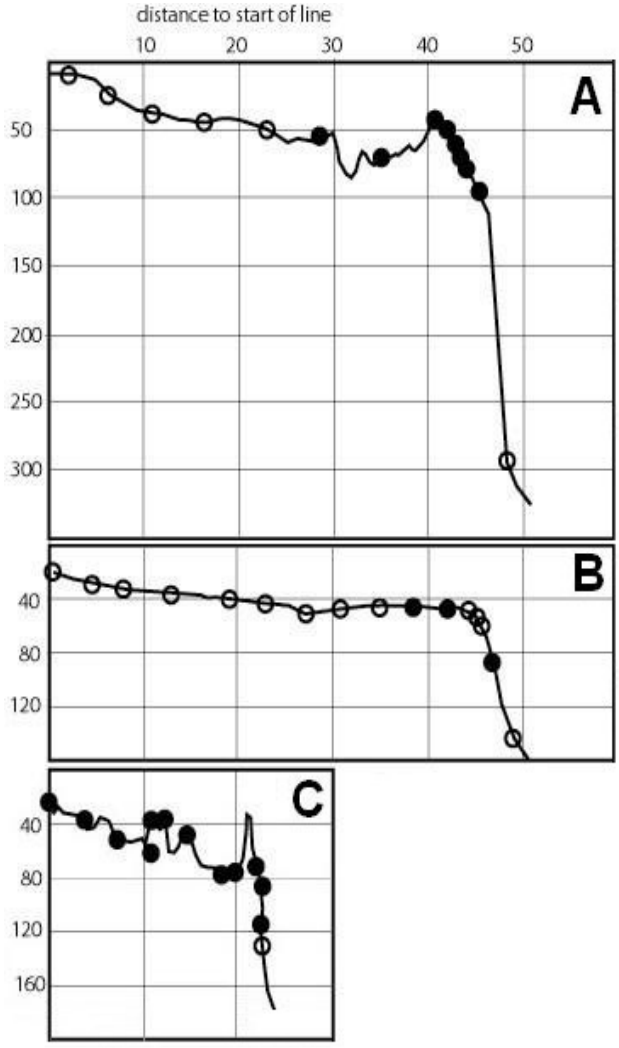

Figure 4. Depth profile and boxcores taken along transects A, B, and C (see Fig. 2). Dark spots indicate boxcores with living larger benthic foraminifera.

Appendix 1.
List of participants (with address, WOTRO project code,.and nationality) of field surveys East Kalimantan-Berau Expedition 2003 (LIPI-KNAW-NWO.).

Dr. BERT WILLEM HOEKSEMA	Naturalis	WT 87-299	Dutch
Dr. CAROLUS HENDRICUS J.M. FRANSEN	Naturalis	WT 87-299	Dutch
Mrs. Drs. NICOLE JOY de VOOGD	Naturalis / ZMA	WT 87-299	Dutch
Drs. LEENDERT PIETER van OFWEGEN	Naturalis	WT 87-299	Dutch
Mr. JEROEN GOUD	Naturalis	WT 87-299	Dutch
Dr. SUHARSONO	PPO-LIPI	WT 87-299	Indonesian
Dra. ANNA E.W. MANUPUTTY MSi	PPO-LIPI	WT 87-299	Indonesian
Mrs. Ir. YOSEPHINE TUTI H.	PPO-LIPI	WT 87-299	Indonesian
Mr. AGUS BUDIYANTO	PPO-LIPI	WT 87-299	Indonesian
Ir. Budiono	RASI	WT 87-300	Indonesian
Dr. MATTHIJS van COUWELAAR	ZMA	WT 87-300	Dutch
Mr. ROBERT GERARD MOOLENBEEK	ZMA	WT 87-300	Dutch
Dr. GERARD van der VELDE	RU/Naturalis	WT 87-301	Dutch
Dr. IVAN ALEXEJ NAGELKERKEN	RU	WT 87-301	Dutch
Mr. JACOBUS van EGMOND	Naturalis	WT 87-301	Dutch
Mr. MARTIN GERARD VERSTEEG	RU	WT 87-301	Dutch
Dr. WILLEM RENEMA	Naturalis	WT 75-397	Dutch
Mr. MACHIEL SLIERINGS	Naturalis	WT 75-397	Dutch
Mrs. Dr. LISETTE N. de SENERPONT DOMIS	NHN	WT 75-397	Dutch
Dr. WILLEM F. PRUD'HOMME VAN REINE	NHN	WT 75-397	Dutch

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Naturalis = National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
NHN = National Herbarium Nederland – Leiden University branch ,PO Box 9514, 2300 RA Leiden, The Netherlands.
PPO-LIPI = Research Center for Oceanography, Jl. Pasir Putih 1, Ancol Timur, Jakarta 14430, Indonesia
RASI = Yayasan Konservasi Rare Aquatic Species of Indonesia, Jl. Kedondong VI, RT 5, No. 2, P.O. Box 1105, Samarinda, Kalimantan Timur, Indonesia.
RU = Department of Animal Ecology and Ecophysiology, Radboud University Nijmegen, Toernooiveld 1, 6525 ED Nijmegen, The Netherlands.
ZMA = Zoological Museum, University of Amsterdam, PO Box 94766, 1090 GT Amsterdam, The Netherlands.

Some members of the biodiversity research team

Appendix 2

Station list. Benthic sampling. East Kalimantan-Berau Exped. 2003.

BER.01: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, E-side, (Coral Garden); 02˚17'32.0" N,118˚15'43.4" E, scuba diving. 4.x.2003.

BER.02: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, W-side, Mangakalase; 02˚16'52.5" N,118˚13'39.4" E, scuba diving. 4.x.2003.

BER-03: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, S-side (jetty Derawan Dive Resort); 02˚17'03.3" N,118˚14'48.8" E, scuba diving. 4.x.2003.

BER.04: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, S-side, Snapper Point ; 02°17’03.4” N,118˚14’49.0” E, scuba diving. 4.x.2003.

BER.04a: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, S-side; 02˚15'04.0" N,118˚15'04.0" E, scuba diving. 18.x.2003.

BER.05: Indonesia, NE Kalimantan, Berau Islands, Berau delta, Lighthouse-2 reef; 02˚09'33.9" N,118˚10'11.4" E, scuba diving. 5.x.2003.

BER.06: Indonesia, NE Kalimantan, Berau Islands, shoal between Lighthouse-2 reef and Derawan Island; 02˚12'08.6" N,118˚11'34.9" E, scuba diving. 5.x.2003.

BER.07: Indonesia, NE Kalimantan, Berau Islands, Kakaban Island, N-side; 02˚09'47.1" N,118˚32'03.3" E, scuba diving. 6.x.2003.

BER.08: Indonesia, NE Kalimantan, Berau Islands, Kakaban Island, marine lake; 02˚08’27.1” N,118˚30’40.3” E, snorkeling. 6.x.2003.

BER.09: Indonesia, NE Kalimantan, Berau Islands, Kakaban Island, S-side; 02˚08'14.1" N,118˚30'42.1" E, scuba diving. 6.x.2003.

BER.10: Indonesia, NE Kalimantan, Berau Islands, Samama Island; 02˚07'31.6" N,118˚20'09.7" E, scuba diving. 7.x.2003.

BER.11: Indonesia, NE Kalimantan, Berau Islands, Karang Pinaka, reef, (NW of Samama Island); 02˚11'22.3" N,118˚17'25.3" E, scuba diving. 7.x.2003.

BER.12: Indonesia, NE Kalimantan, Berau Islands, Sangalaki Island, reef, N-side; 02˚05'25.4" N,118˚24'16.5" E, scuba diving. 8.x.2003.

BER.13: Indonesia, NE Kalimantan, Berau Islands, Sangalaki Island, reef, S-side; 02˚04'46.9" N,118˚23'47.3" E, scuba diving. 8.x.2003.

BER.14: Indonesia, NE Kalimantan, Berau Islands, lighthouse Panjang Island, NE-side; 02˚23'14.2" N,118˚12'33.8" E, scuba diving. 9.x.2003.

BER.15: Indonesia, NE Kalimantan, Berau Islands, Panjang Island, W-side; 02˚19'17.1" N,118˚13'25.5" E, scuba diving. 9.x.2003.

BER.16: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, NE-side; 02˚17'29.2" N,118˚35'29.0" E, scuba diving. 10.x.2003.

BER.17: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, NE-side; 02˚16'48.6" N,118˚36'10.4" E, scuba diving. 10.x.2003.

BER.18: Indonesia, NE Kalimantan, Berau Islands, Danau Haji Buang (southern Maratua Lake); 02˚12'37.8" N,118˚35'40.8" E, snorkeling. 10.x.2003.

BER.19: Indonesia, NE Kalimantan, Berau Islands, off Tanjung Batu; 02˚14'22.4" N,118˚05'36.3" E, scuba diving. 9.x.2003.

BER.19a: Indonesia, NE Kalimantan, Berau Islands, off Tanjung Batu; 02˚14'47.6" N,118˚05'36.6" E, scuba diving. 13.x.2003.

BER.20: Indonesia, NE Kalimantan, Berau Islands, Tanjung Pandan shoal, SW of Panjang Island; 02˚19'15.1" N,118˚06'32.5" E, scuba diving. 13.x.2003.

BER.21: Indonesia, NE Kalimantan, Berau Islands, Panjang Island; 02˚22'05.4" N,118˚11'59.8" E, seagrass, snorkeling. 13.x.2003.

BER.22: Indonesia, NE Kalimantan, Berau Islands, Sangalaki Island, E-side, lighthouse; 02˚04'53.9" N,118˚24'29.9" E, scuba diving. 14.x.2003.

BER.23: Indonesia, NE Kalimantan, Berau Islands, Sangalaki Island, W-side; 02˚04'42.1" N,118˚24'02.1" E, scuba diving. 14.x.2003.

BER.24: Indonesia, NE Kalimantan, Berau Islands, Samama Island, SE-side; 02˚07'50.6" N,118˚20'23.4" E, scuba diving. 15.x.2003.

BER.25: Indonesia, NE Kalimantan, Berau Islands, Samama Island, N-side, creek; 02˚09'03.6" N,118˚19'31.6" E, scuba diving. 15.x.2003.

BER.26: Indonesia, NE Kalimantan, Berau Islands, Buliulin, NE-side (S of Samama Isl.); 02˚07'07.2" N,118˚20'31.6" E, scuba diving. 15x.2003.

BER.27: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, SW-side, barrier; 02˚11'26.2" N,118˚36'12.8" E, snorkeling. 16x.2003.

BER.28: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, N-side, lagoon near entrance; 02˚14'51.0" N,118˚37'47.9" E, scuba diving. 17.x.2003.

BER.29: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, N-side, lagoon near entrance; 02˚14'53.2" N,118˚37'36.4" E, scuba diving. 17.x.2003.

BER.30: Indonesia, NE Kalimantan, Berau Islands, lighthouse-1 reef, N-side (S of Derawan Isl.); 02˚16'02.1" N,118˚14'22.6" E, scuba diving. 18.x.2003.

BER.31: Indonesia, NE Kalimantan, Berau Islands, Panjang Island, NE-side; 02˚25'46.0" N,118˚09'49.1" E, scuba diving. 19.x.2003.

BER.32: Indonesia, NE Kalimantan, Berau Islands, Panjang Island, NW-side; 02˚25'09.1" N,118˚07'22.1" E, scuba diving. 19.x.2003.

BER.33: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, NE-side; 02˚17'48.8" N,118˚15'29.7" E, scuba diving. 20.x.2003.

BER.34: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, NW-side; 02˚17'40.8" N,118˚13'52.8" E, scuba diving. 20.x.2003.

BER.35: Indonesia, NE Kalimantan, Berau Islands, Kakaban Island, W-side; 02˚08'21.0" N,118˚30'20.1" E, scuba diving. 21.x.2003.

BER.36: Indonesia, NE Kalimantan, Berau Islands, Kakaban Island, SE-side; 02˚07'56.6" N,118˚32'39.8" E, scuba diving. 21.x.2003.

BER.37: Indonesia, NE Kalimantan, Berau Islands, lighthouse-1 reef, W-side (S of Derawan Isl.); 02˚15'29.5" N,118˚14'08.9" E, scuba diving. 22.x.2003.

BER.38: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, W-side; 02˚12'16.3" N,118˚35'18.9" E, scuba diving. 23.x.2003.

BER.39: Indonesia, NE Kalimantan, Berau Islands, Baliktaba reef, SW-side (N of Panjang Isl.); 02˚34'43.3" N,118˚00'48.2" E, scubadiving. 24.x.2003.

BER.40: Indonesia, NE Kalimantan, Berau Islands, Baliktaba reef, NE-side (N of Panjang Isl.) 02˚35'14.6" N,118˚00'34.6" E, scuba diving. 24.x.2003.

BER.41: Indonesia, NE Kalimantan, Berau Islands, Panjang Island, Sharkpoint; 02˚18'50.8" N,118˚15'01.7" E, scuba diving. 24.x.2003.

BER.42: Indonesia, NE Kalimantan, Berau Islands, Panjang Island, S of Sharkpoint; 02˚18'34.4" N,118˚15'16.1" E, scuba diving. 25.x.2003.

BER.43: Indonesia, NE Kalimantan, Berau Islands, Derawan Island, SE-side (mushroom coral garden); 02˚16'17.5" N,118˚15'08.4" E, scuba diving. 26.x.2003.

BER.44: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, Danau Tanah Bamban (northern Maratua Lake); 02˚13’48.8” N, 118˚34’48.0” E. 26.x.2003.

BER.45: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, lagoon at entrance southern lake; 02˚12'16.2" N,118˚35’49.5” E. 26.x.2003.

BER.46: Indonesia, NE Kalimantan, Berau Islands, Rabu-Rabu Island, E-side; 02˚20'16.0" N,118˚08’12.3” E, scuba diving. 27.x.2003.

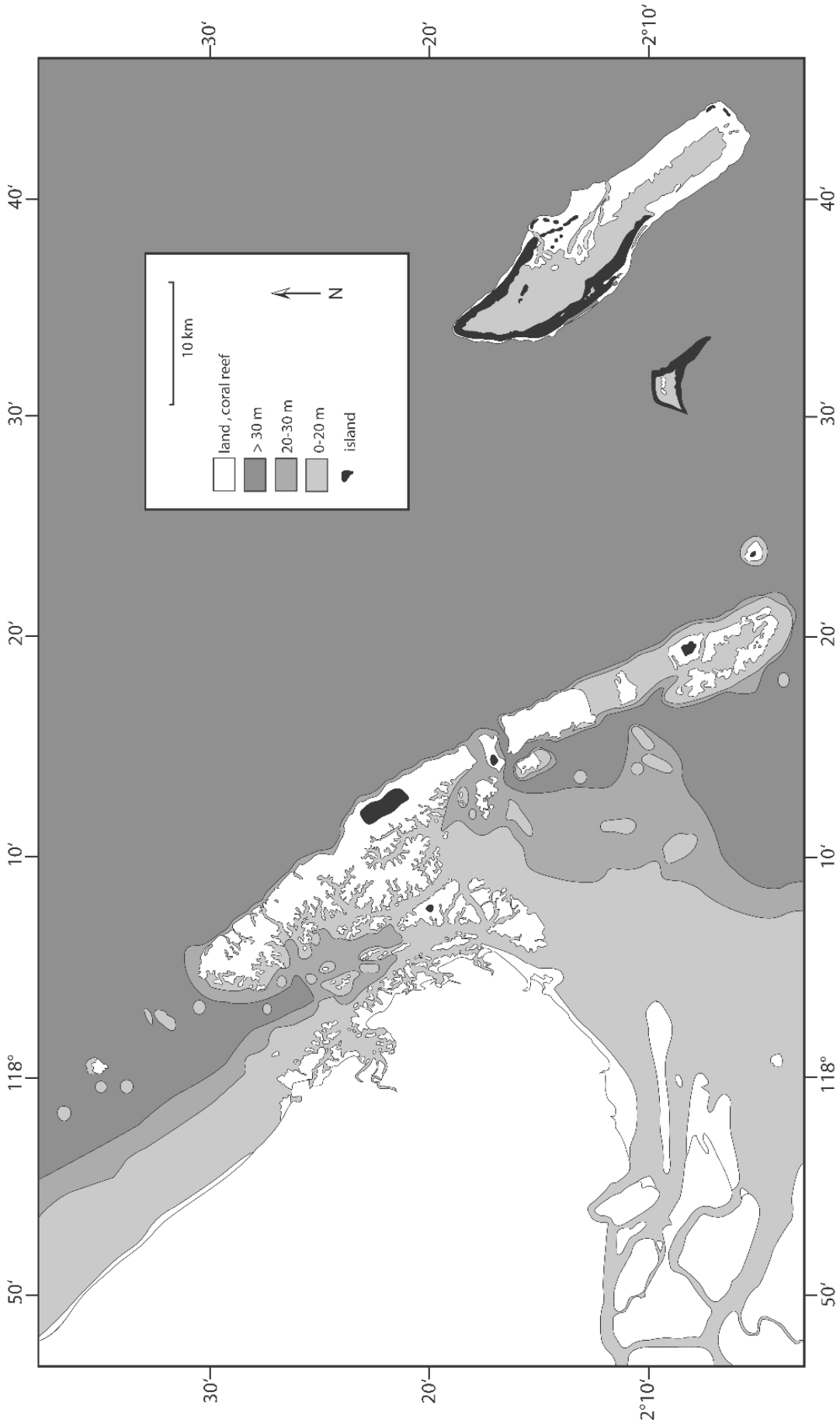
BER.47: Indonesia, NE Kalimantan, Berau Islands, Panjang Island, W-side; 02˚21'17.2” N,118˚11’12.9” E, scuba diving. 27.x.2003.

BER.48: Indonesia, NE Kalimantan, Berau Islands, Maratua Island, S-side, (bay southeast of village); 02˚11'01.6" N,118˚36'15.2" E, scuba diving. 28.x.2003.

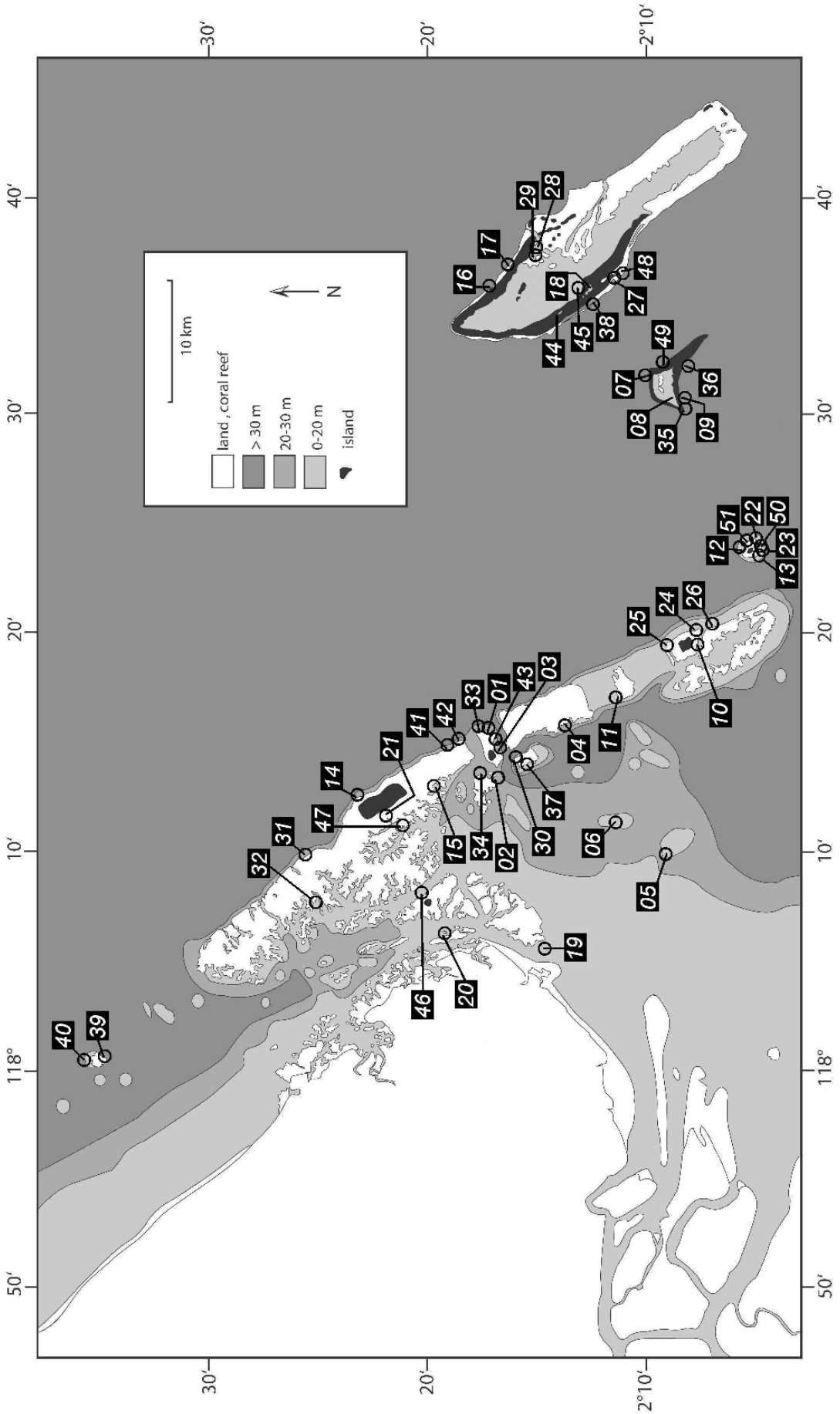
BER.49: Indonesia, NE Kalimantan, Berau Islands, Kakaban Island, NE-side, (entrance of tidal lake Kehe Daing); 02˚08'53.2" N,118˚32'31.6" E, scuba diving. 28.x.2003.

BER.50: Indonesia, NE Kalimantan, Berau Islands, Sangalaki Island, SE-side, S of lighthouse; 02˚04'45.3" N,118˚24’11.2" E, scuba diving. 28.x.2003.

BER.51: Indonesia, NE Kalimantan, Berau Islands, Sangalaki Island, E-side, N of lighthouse; 02˚05'15.0" N,118˚24'24.5" E, scuba diving. 28.x.2003.



Map of the research area with bathymetric countours. Drawing by E.J. Bosch.



Map of the research area with bathymetric countours and benthic sampling station numbers.

Satellite image (Landsat), which has been used for the design of the bathymetric maps.

Appendix 3

Station list. Plankton sampling. East Kalimantan-Berau Exped. 2003.

Station code	Location	Date	Haul	Net mesh µ	Sample code
SAN E	P. Sangalaki, east of —	6-10-2003	1	500	SAN E-1-06
SAN E	P. Sangalaki, east of —	6-10-2003	2	500	SAN E-2-06
SAN E	P. Sangalaki, east of —	6-10-2003	3	2000	SAN E-3-06
SAN N	P. Sangalaki, north of —	6-10-2003	1	500	SAN N-1-06
SAN N	P. Sangalaki, north of —	6-10-2003	2	2000	SAN N-2-06
SAN N	P. Sangalaki, north of —	6-10-2003	3	500	SAN N-3-06
BER E	Berau rivermouth	7-10-2003	1	500	BER E-1-07
TID		7-10-2003	1	500	TID-1-07
DER W	P. Derawan, west of —	7-10-2003	1	500	DER W-1-07
DER S	P. Derawan, south of —	7-10-2003	1	500	DER S-1-07
SAN N2	P. Sangalaki, north of —	10-10-2003	1	500	SAN N2-1-10
KARB	Karang Besar	11-10-2003	1	500	KARB-1-11
TAK S	Taka Sangalan	11-10-2003	1	500	TAK S-1-11
TAK S	Taka Sangalan	11-10-2003	2	500	TAK S-2-11
MAN	Tg. Mankalihat	12-10-2003	1	500	MAN-1-12
MAN	Tg. Mankalihat	12-10-2003	2	500	MAN-2-12
KARB W	Karang Besar West	13-10-2003	1	500	KARB W-1-13
KARB W	Karang Besar West	13-10-2003	2	500	KARB W-2-13
JETTY	Derawan Dive Resort, eastern pier	15-10-2003	1	500	JETTY-1-15
KAK NW	P. Kakaban, northwest of —	16-10-2003	1	500	KAK NW-1-16
KAK NW	P. Kakaban, northwest of —	16-10-2003	2	500	KAK NW-2-16
MAR W	P. Maratua, west of —	16-10-2003	1	500	MAR W-1-16
DER FE	P. Derawan, far east of —	16-10-2003	1	2000	DER FE-1-16
PAN SE	P. Panjang, southeast of —	16-10-2003	1	2000	PAN SE-1-16
DER E	P. Derawan, east of —	15-10-2003	1	500	DER E-1-15
DER E	P. Derawan, east of —	15-10-2003	2	500	DER E-2-15
MAR SL	P. Maratua, southern lake (Danau Haji Buang)	17-10-2003	1	500	MAR SL-1-17
MAR SL	P. Maratua, southern lake (Danau Haji Buang)	17-10-2003	2	hand	MAR SL-2-17
MAR SL	P. Maratua, southern lake (Danau Haji Buang)	17-10-2003	3	hand	MAR SL-3-17
DER S	P. Derawan, south of —	18-10-2003	1	2000	DER S-1-18
DER S	P. Derawan, south of —	18-10-2003	2	2000	DER S-2-18
PAN W	P. Panjang, west of —	19-10-2003	1	500	PAN W-1-19
DER N	P. Derawan, north of —	19-10-2003	1	500	DER N-1-19
KAK L	P. Kakaban, lake	21-10-2003	1	500	KAK L-1-21
KAK L	P. Kakaban, lake	21-10-2003	2	500	KAK L-2-21
KAK L	P. Kakaban, lake	21-10-2003	3	200	KAK L-3-21
KAK L	P. Kakaban, lake	21-10-2003	4	200	KAK L-4-21
KAK L	P. Kakaban, lake	21-10-2003	5	hand	KAK L-5-21
KAK L	P. Kakaban, lake	21-10-2003	6	hand	KAK L-6-21
KAK L	P. Kakaban, lake	21-10-2003	7	80	KAK L-7-21
KAK L	P. Kakaban, lake	21-10-2003	8	80	KAK L-8-21
DER J	Derawan Dive Resort, eastern pier	21-10-2003	1	500	DER J-1-21
DER J	Derawan Dive Resort, eastern pier	22-10-2003	1	500	DER J-1-22
DER J	Derawan Dive Resort, eastern pier	22-10-2003	2	55	DER J-2-22
DER J	Derawan Dive Resort, eastern pier	22-10-2003	3	55	DER J-3-22
DER J	Derawan Dive Resort, eastern pier	23-10-2003	1	500	DER J-1-23
DER J	Derawan Dive Resort, eastern pier	23-10-2003	2	55	DER J-2-23
KAK L	P. Kakaban, lake	23-10-2003	1	55	KAK L-1-23
KAK L	P. Kakaban, lake	23-10-2003	2	55	KAK L-2-23
KAK L	P. Kakaban, lake	23-10-2003	3	55	KAK L-3-23
KAK SW	P. Kakaban, southwest of —	23-10-2003	1	500	KAK SW-1-23
KAK SW	P. Kakaban, southwest of —	23-10-2003	2	55	KAK SW-2-23
KAK SW	P. Kakaban, southwest of —	23-10-2003	3	500	KAK SW-3-23
KAK SW	P. Kakaban, southwest of —	23-10-2003	4	500	KAK SW-4-23

DER S	P. Derawan, south of —	23-10-2003	1	500	DER S-1-23
DER S	P. Derawan, south of —	23-10-2003	2	2000	DER S-2-23
DER S	P. Derawan, south of —	23-10-2003	3	dipnet	DER S-3-23
PAN W	P. Panjang, west of —	25-10-2003	1	55	PAN W-1-25
PAN W	P. Panjang, west of —	25-10-2003	2	55	PAN W-2-25
PAN W	P. Panjang, west of —	25-10-2003	3	dipnet	PAN W-3-25
PAN W	P. Panjang, west of —	25-10-2003	4	2000	PAN W-4-25
MAR NL	P. Maratua, northern lake (Danau Tanah Bamban)	26-10-2003	1	hand	MAR NL-1-26
MAR NL	P. Maratua, northern lake (Danau Tanah Bamban)	26-10-2003	2	hand	MAR NL-2-26
MAR NL	P. Maratua, northern lake (Danau Tanah Bamban)	26-10-2003	3	55	MAR NL-3-26
MAR NL	P. Maratua, northern lake (Danau Tanah Bamban)	26-10-2003	4	55	MAR NL-4-26
LH II	Lighthouse Two	27-10-2003	1	55	LH II-1-27
LH II	Lighthouse Two	27-10-2003	2	55	LH II-2-27
LH II	Lighthouse Two	27-10-2003	3	500	LH II-3-27
DER S	P. Derawan, south of —	27-10-2003	1	2000	DER S-1-27
DER S	P. Derawan, south of —	27-10-2003	2	55	DER S-2-27
SAN E	P. Sangalaki, east of —	28-10-2003	1	500	SAN E-1-28
SAN E	P. Sangalaki, east of —	28-10-2003	2	55	SAN E-2-28
SAN E	P. Sangalaki, east of —	28-10-2003	3	2000	SAN E-3-28
SAN E	P. Sangalaki, east of —	28-10-2003	4	500 /2000	SAN E-4-28

View of Danau Haji Buang, the southernmost anchialine lake at Maratua Island. Photo B.W. Hoeksema.

Appendix 3 (continued)

Station list. Plankton sampling. East Kalimantan-Berau Exped. 2003.

Station	code	H/V/ oblique	Depth (m)	Station code	Position North	Position East	Time (start)	Duration (min.)
SAN E		hor.	6-0	SAN E			11:00	10
SAN E		vert.	12-0	SAN E			11:20	nvt
SAN E		vert.	30-0	SAN E			11:45	nvt
SAN N		hor.	5-0	SAN N			14:15	10
SAN N		hor.	5-0	SAN N			14:30	10
SAN N		hor.	3-0	SAN N			15:00	10
BER E		hor.	5-0	BER E	02°10,9'	118°07,3'	10:50	10
TID		hor.	10-0	TID	02°12,8'	118°09,4'	11:25	10
DER W		hor.	10-0	DER W	02°15,4'	118°10,9'	12:05	15
DER S		hor.	10-0	DER S	02°16,2'	118°14,2'	13:05	20
SAN N2		hor.	0-2	SAN N2			09:30	25
KARB		vert.	80-0	KARB	01°41,5'	118°33,44'	11:15	na
TAK S		vert.	25-0	TAK S	01°21,30'	118°44,05'	14:14	na
TAK S		hor.	2	TAK S	01°21,30'	118°44,05'	14:30	10
MAN		vert.	120	MAN	01°05,23'	118°57,08'	13:00	na
MAN		vert.	120	MAN	01°05,23'	118°57,08'	13:30	na
KARB W		vert.	32-0	KARB W			12:10	na
KARB W		hor.	2	KARB W			12:30	15
JETTY		hor.	2	JETTY			11:00	ca. 15
KAK NW		vert.	125-0	KAK NW	02°14,42'	118°22,10'	10:15	na
KAK NW		vert.	125-0	KAK NW	02°14,42'	118°22,10'	10:35	na
MAR W		vert.	125-0	MAR W	02°15,48'	118°26,50'	11:45	na
DER FE		obl.	100-20	DER FE	02°17,41'	118°21,00'	13:15	15
PAN SE		obl.	90-10	PAN SE	02°20,07'	118°15,55'	15:35	15
DER E		vert.	30-0	DER E			16:00	na
DER E		hor.	3	DER E			16:20	20
MAR SL		hor.	3	MAR SL				
MAR SL		nvt		MAR SL				
MAR SL		nvt		MAR SL				
DER S		hor.	2	DER S			08:40	20
DER S		hor.	2	DER S			14:30	20
PAN W		hor.	2-3	PAN W			15:10	25
DER N		vert.	40-0	DER N			16:00	na
KAK L		hor.	3	KAK L			11:00	
KAK L		hor.	7-8	KAK L			12:00	
KAK L		hor.	0-3	KAK L			12:45	??
KAK L		hor.	0-3	KAK L			13:30	??
KAK L		nvt	0-4	KAK L				
KAK L		nvt	1-3	KAK L				
KAK L		vert.	9-0	KAK L			??	
KAK L		vert.	9-0	KAK L			??	
DER J		hor.	1-2	DER J			21:30	10
DER J		hor.	2	DER J			16:00	20
DER J		vert.	4-0	DER J			17:00	
DER J		vert.	4-0	DER J			17:10	
DER J		hor.	1-2	DER J			04:30	
DER J		vert.	3-0	DER J			05:00	
KAK L		vert.	8-0	KAK L			12:00	
KAK L		vert.	7-0	KAK L			12:30	
KAK L		vert.	9-0	KAK L			13:00	
KAK SW		vert.	80-0	KAK SW				
KAK SW		vert.	15-0	KAK SW				
KAK SW		hor.	3	KAK SW			15:30	10
KAK SW		vert.	60-0	KAK SW			15:45	na

DER S	vert.	30-0	DER S	21:00	
DER S	obl.	25-0	DER S	21:30	
DER S	hor.	0-0	DER S	21:45	
PAN W	hor.		PAN W		
PAN W			PAN W		
PAN W	nvt	0-0	PAN W		
PAN W	hor.	0	PAN W		
MAR NL	nvt		MAR NL		
MAR NL	nvt		MAR NL		
MAR NL	vert.	4-0	MAR NL		
MAR NL	hor.	0	MAR NL		
LH II	vert.	5-0	LH II	14:45	
LH II	vert.	5-0	LH II	15:30	
LH II	hor.	2-3	LH II	17:00	15
DER S	hor.	2-3	DER S	17:45	15
DER S	vert.	10-0	DER S	18:00	
SAN E	hor.	2-3	SAN E	12:00	15
SAN E	vert.	5-0	SAN E	12:30	
SAN E	hor.	2-3	SAN E	12:30	15
SAN E	hor.	2-3	SAN E	15:00	7,5/15

View of Kakaban Lake. Photo B.W. Hoeksema.

Appendix 4

Boat use and diving

Date of field survey	Number of boat sorties	Number of dive tanks
3 October 2003	1	20
4 October 2003	2	24
5 October 2003	3	36
6 October 2003	3	32
7 October 2003	4	40
8 October 2003	5	38
9 October 2003	5	41
10 October 2003	3	40
11 October 2003	4	31
12 October 2003	4	18
13 October 2003	4	36
14 October 2003	4	44
15 October 2003	5	39
16 October 2003	3	38
17 October 2003	6	26
18 October 2003	5	51
19 October 2003	3	40
20 October 2003	2	37
21 October 2003	3	36
22 October 2003	4	37
23 October 2003	3	30
24 October 2003	4	34
25 October 2003	5	40
26 October 2003	3	28
27 October 2003	3	32
28 October 2003	3	37
29 October 2003	1	10

Part of the fleet of dive boats at Derawan Dive Resort. Photo B.W. Hoeksema.

Appendix 5.
Samples of research permits, travel permit, and recommendations (October 2003)

Research permit from LIPI, Jakarta
Recommendation for Police from LIPI, Jakarta
Travel permit Police, Jakarta
Recommendation letter Ministry of Internal Affairs, Jakarta
Recommendation letter East Kalimantan Provincial Government, Samarinda
Recommendation letter Berau District Government, Tanjung Redeb

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4324 / Jakarta 12190

Alamat Kawat : LIPI
Telex : 62554 IA
Fax : 5225640

No.: 5757/SU/KS/2003

Dr. Bert Willem Hoeksema dan Tim

PEMERINTAH PROPINSI KALIMANTAN TIMUR
BADAN KESATUAN BANGSA DAN PERLINDUNGAN MASYARAKAT
Jln. Jenderal Sudirman No. 1 Telp. (0541) 733333 Pos. 242, 232 Fax. 741594
SAMARINDA

NO : 070/ 81 /IV/KBPM.

KEPADA

Yth. DR. BERT WILLEM HOEKSEMA DKK

di - JAKARTA

Dengan PON XVII - 2008 Kita Bangun Kalimantan Timur

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SURAT IZIN PENELITIAN
No.: 5757/SU/KS/2003

Lembaga Ilmu Pengetahuan Indonesia dengan ini menerangkan bahwa telah diberikan izin untuk mengadakan penelitian di Indonesia kepada peneliti berikut:

N a m a	:	Dr. Bert Willem Hoeksema dan tim terlampir (14 orang)
Tempat dan Tanggal Lahir	:	Baarderadeel, The Netherlands; 27 Desember 1957
Warga Negara	:	Belanda
Jabatan	:	Kepala Departemen Invertebrata/Koordinator Riset Kelautan
Alamat	:	Jac. P. Thijsselaan 46, 2341 PC Oegstgeest, The Netherlands
Nomor Paspor	:	M 02506353
Tiba Tanggal	:	29 September 2003
Judul Penelitian	:	" Marine Biodiversity of the Berau Islands, East Kalimantan "
Tujuan Penelitian	:	Implementasi program EKP kerjasama LIPI – WOTRO
Bidang Peneliitan	:	Oseanografi
Lama Penelitian	:	3 (tiga) bulan, mulai bulan September 2003
Daerah Penelitian	:	Kalimantan Timur (Kec. Pulau Derawan di Kab. Berau)
Mitra Kerja	:	Pusat Penelitian Oseanografi – LIPI

dengan ketentuan sebagai berikut :

1. Melaporkan kedatangan dan maksud penelitiannya kepada instansi keamanan setempat dengan menunjukkan Surat Izin Penelitian ini, segera setelah ia tiba ditempat tujuannya, dan melaporkan diri sebelum meninggalkan daerah penelitiannya kepada Pemerintah Daerah dan Mitra Kerja di Indonesia.
2. Berbuat positip terhadap bangsa Indonesia, dan mentaati peraturan-peraturan hukum yang berlaku di Indonesia, khususnya yang berlaku di daerah penelitiannya.
3. Menjaga tata tertib, keamanan, kesopanan dan kesusilaan serta menghindari pernyataan-pernyataan baik dengan lisan maupun tulisan/lukisan yang dapat melukai/menyinggung perasaan, adat istiadat atau menghina agama, dari sesuatu golongan penduduk di Indonesia.
4. Memberikan laporan (yang diketik rangkap lima) kepada LIPI, setiap 3 (tiga) bulan sekali apabila jangka waktu penelitian lebih dari 3 (tiga) bulan mengenai segala kegiatannya termasuk daftar kwesioner dan nama setiap orang yang telah di wawancara (kalau ada).

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5. Sebelum meninggalkan Indonesia, menyerahkan laporan terakhir (yang diketik rangkap lima), dengan menyebutkan beberapa hasil sementara, serta kesan-kesan dari penelitiannya tersebut kepada LIPI, dan menyerahkan abstrak dari penelitiannya tersebut antara satu sampai dua halaman.

6. Tidak dibenarkan membawa barang-barang atau bahan-bahan yang menurut peraturan yang berlaku dilarang untuk dibawa ke luar negeri, kecuali dengan izin instansi yang berwenang menurut peraturan yang berlaku.

7. Apabila penelitian yang akan dilakukan diperkirakan akan menghasilkan hak milik Intellectual Property Rights (IPR) seperti paten, hak cipta dan merk harus dibuat perjanjian tertulis dengan Lembaga Ilmu Pengetahuan Indonesia (LIPI) dan Mitra Kerja, dengan memperhatikan peraturan Perundang-undangan yang berlaku di Indonesia.

8. Memberikan dalam rangkap tiga salinan dari tulisan-tulisan (Thesis/Disertasi, Paper, Report atau Publikasi lain) mengenai hasil penelitiannya tersebut kepada LIPI.

9. Semua tulisan tentang penelitian yang sedang dilakukan, apabila akan diterbitkan di Indonesia harus terlebih dahulu mendapat persetujuan dari Lembaga Ilmu Pengetahuan Indonesia (LIPI).

10. Memberikan 1 (satu) copy foto-foto, slide/microfilm dan film/video casette, casette sebagai hasil penelitiannya kepada LIPI, kalau ada.

11. Surat Keterangan Izin Penelitian ini hanya berlaku selama visa dari Direktorat Jenderal Imigrasi R.I. dan Surat Keterangan Jalan dari Polisi masih berlaku.

12. Setiap usulan perpanjangan dan atau perubahan daerah penelitian harus diajukan kepada LIPI selambat-lambatnya 3 (tiga) bulan sebelum Surat Izin Penelitiannya habis masa berlakunya dengan melampirkan surat rekomendasi dari mitra kerja di Indonesia.

13. Setelah penelitian selesai diharapkan supaya Surat Izin Penelitian ini dikembalikan kepada Biro Kerjasama dan Pemasyarakatan Iptek - LIPI.

14. Permohonan untuk exit dan re-entry permit agar diajukan ke LIPI selambat-lambatnya satu bulan sebelum meninggalkan Indonesia disertai surat permohonan resmi dari yang bersangkutan dan surat rekomendasi dari Mitra Kerja di Indonesia.

Demikian Surat Izin Penelitian No.: 5757 /SU/KS/2003, tanggal 29 September 2003 diberikan kepada **Dr. Bert Willem Hoeksema dan Tim** untuk dapat dipergunakan seperlunya. Kami mohon dengan hormat kiranya instansi-instansi Pemerintah/Swasta maupun perorangan yang dihubungi untuk memberikan bantuannya kepada yang bersangkutan sesuai dengan peraturan yang berlaku.

Jakarta, 29 September 2003

a.n. Kepala Lembaga Ilmu Pengetahuan Indonesia
Ketua Tim Koordinasi Pemberian Izin Penelitian Bagi Orang Asing

Drs. Arjuno Brojonegoro, M.Sc
NIP. 320000863

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LAMPIRAN

SURAT IZIN PENELITIAN NO.: 5757 /SU/KS/2003 TANGGAL 29 SEPTEMBER 2003

DAFTAR NAMA ANGGOTA TIM DR. BERT WILLEM HOEKSEMA

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1.	Dr. Carolus Henricus J.M. Fransen	Belanda	N 85779246
2.	Dr. Willem Renema	Belanda	ND 3698097
3.	Dr. Gerard Van der Velde	Belanda	N 92571276
4.	Dr. Ivan Alexej Nagelkerken	Belanda	M 12130503
5.	Dr. Matthijs Van Couwelaar	Belanda	N 93098518
6.	Dr. Willem Frederik Prud'homme Van Reine	Belanda	NB 9044562
7.	Drs. Leendert Pieter Van Ofwegen	Belanda	M 07098704
8.	Drs. Nicole Joy de Voogd	Belanda	M 09419804
9.	Drs. Lisette Nicole de Senerpont Domis	Belanda	N 86365462
10.	Mr. Jacobus Van Egmond	Belanda	ND 7272279
11.	Mr. Martin Gerard Versteeg	Belanda	NC 0591893
12.	Mr. Machiel Slierings	Belanda	ND 7272334
13.	Mr. Jeroen Goud	Belanda	N 95077157
14.	Mr. Robert Gerard Moolenbeek	Belanda	ND 7624588

Jakarta, 29 September 2003

a.n. Kepala Lembaga Ilmu Pengetahuan Indonesia
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Telp. : 511542 (8 saluran)

Alamat kawat : LIPI
Telex : 62554 IA
Fax : 5207226

Tromol Pos : 1250/Jakarta 10012

Annex to Research Permit (Surat Ijin Penelitian) No. Dated

1. Research conducted with Indonesian counterpart (s) should be reported jointly.

2. Written report as mentioned in points 4 and 5 page 1, should supply details of the followings :

   I. **Quarterly progress report** should contain detailed but succinet account of:
      (1) Research objectives
      (2) Description of study sites
      (3) Research materials or objects to be investigated
      (4) Research approach and/or methods
      (5) Provisional results
      (6) Problems encountered
      (7) Planned activities in the next three months.

   II. **Tentative final report** should cover the following detailed but succinet account of :

      (1) **Introduction**
         - o Background information
         - o Scientific justification on the selection of subjects and sites to be investigated
         - o Reviews on and comparison with other studies that have been done previously on the same subject and/or in the same region or else where with similar conditons
         - o Hypotheses to be tested if any

      (2) **Objectives**
      State clearly the research objectives and the scope of studies.

      (3) **Implementation**
         - o Detailed description of research site (s) covering physical (geography, topography, climatology, etc), biological, socio economic, cultural and other aspects relevant to the scope of the studies.
         - o Detailed account of and reason for selecting the approach and methods used.

      (4) **Results and discussion**
         a. Detailed account of the results obtained during the studies.
         b. Discussion of the results covering the meaning, interpretation and significance of the results and directions of future studies.
         c. Benefits for Indonesian Development Programmes.

      (5) **Conclusion**
         - o State important points that can be drawn from the results.
         - o Indicate whether the results can answer and solve the problems and whether they can support or reject the hypotheses put forward in the objectives.

3. Submit the tentative final reports and abstract before leaving Indonesia.

4. Send quarterly and final reports to the Bureau of Science and Technology Cooperation LIPI and the sponsoring agencies (in Indonesia).

5. Failure to comply with the above requirements may and up in the withdrawal of the research permit.

LEMBAGA ILMU PENGETAHUAN INDONESIA
(Indonesian Institute of Sciences)

SASANA WIDYA SARWONO
Jl. Jenderal Gatot Subroto No. 10, Jakarta 12710
Telp. : 5251542, 5225711

Tromol Pos : 1250 / Jakarta 10012
4324 / Jakarta 12190

Alamat kawat : LIPI
Telex : 62554 IA
Fax : 5207226

No. : 5731/SU.3/KS/2003

Jakarta, 29 September 2003

Lampiran / Encls. :

Perihal / Subj. Matter : Permohonan Surat Keterangan Jalan

Kepada Yth.:
Kasubdit A.4 – Dit.A
BAINTELKAM
Mabes POLRI
Jl. Trunojoyo No.3
Jakarta Selatan

Dengan hormat,

Menunjuk keputusan Tim Koordinasi Pemberian Izin Penelitian (TKPIP) Nomor.: 034/SU/TKPIP/2003 tanggal 21 Juli 2003, dengan ini kami memberitahukan bahwa pada tanggal 29 September 2003 telah melapor ke LIPI:

	Nama	Warga Negara	Nomor Paspor
1.	Dr. Bert Willem Hoeksema	Belanda	M 02506353
2.	Dr. Carolus Henricus J.M. Fransen	Belanda	N 85779246
3.	Dr. Willem Renema	Belanda	ND 3698097
4.	Dr. Gerard Van der Velde	Belanda	N 92571276
5.	Dr. Ivan Alexej Nagelkerken	Belanda	M 12130503
6.	Dr. Matthijs Van Couwelaar	Belanda	N 93098518
7.	Dr. Willem Frederik Prud'homme Van Reine	Belanda	NB 9044562
8.	Drs. Leendert Pieter Van Ofwegen	Belanda	M 07098704
9.	Drs. Nicole Joy de Voogd	Belanda	M 09419804
10.	Drs. Lisette Nicole de Senerpont Domis	Belanda	N 86365462
11.	Mr. Jacobus Van Egmond	Belanda	ND 7272279
12.	Mr. Martin Gerard Versteeg	Belanda	NC 0591893
13.	Mr. Machiel Slierings	Belanda	ND 7272334
14.	Mr. Jeroen Goud	Belanda	N 95077157
15.	Mr. Robert Gerard Moolenbeek	Belanda	ND 7624588

adalah peneliti yang akan melakukan penelitian di daerah Kalimantan Timur (Kec.Pulau Derawan di Kab. Berau), dalam bidang Oseanografi, dengan judul "Marine Biodiversity of the Berau Islands, East Kalimantan", dalam rangka implementasi program EKP kerjasama LIPI - WOTRO.

Penelitian tersebut diperkirakan akan memerlukan waktu selama 3 (tiga) bulan, mulai bulan September 2003, dan ditinjau dari segi ilmiah LIPI tidak berkeberatan atas maksud tersebut.

Sehubungan dengan hal tersebut, kami mohon bantuan serta kebijaksanaan Saudara kiranya kepada yang bersangkutan dapat diberikan Surat Keterangan Jalan (SKJ) selama 3 (tiga) bulan, bilamana hal tersebut tidak bertentangan dengan peraturan yang berlaku.

Atas perhatian, bantuan dan kerjasama Saudara, kami mengucapkan terima kasih.

Kepala Biro Kerjasama dan Pemasyarakatan Iptek

Ridwan Jacub, SH
NIP. 320002901

C:\Pol\.skj.p27.ind

MARKAS BESAR
KEPOLISIAN NEGARA REPUBLIK INDONESIA
BADAN INTELIJEN KEAMANAN

SURAT KETERANGAN JALAN / *TRAVELLING PERMIT*

No. Pol. : SKJ / Subbid Oras-9477/ IX / 2003 / Baintelkam

DIBERIKAN KEPADA / *ISSUED TO*

1. Nama / Name	:	**BERT WILLEM HOEKSEMA**
2. Tempat dan tgl. Lahir / *Place and date of birth*	:	Baarderaoleel, 27 Desember 1957
3. Warga Negara / *Nationality*	:	Belanda
4. Pekerjaan / *Occupation*	:	Research
5. No. Paspor, tgl dan berlaku s/d / *Pasport No. Place and date of issued valid until*	:	M 02506353 tgl. 18-05-2000 18-05-2005
6. Dokumen lain / *Others document*	:	Visa. B.423 No.: 7H/001579/2003, untuk selama 60 hari Tiba tgl. 28-09-2003
7. Atas perintah/persetujuan / *Applied/approved by*	:	LEMBAGA ILMU PENGETAHUAN INDONESIA
8. Tersebut dalam suratnya tgl / *Re-letter of, date*	:	29-09-2003 No.: 5732/SU.3/KS/2003
9. Maksud kunjungan / *Purpose of visit*	:	Kunjungan penelitian dalam bidang Oseanografi.
10. Ke / *To*	:	Balikpapan, Samarinda, Berau, Perawan, Maratua.
11. Dalam rangka / *In accordance with*	:	Melakukan penelitian dengan judul " Marine Biodiversity of the Berau Islands, East Kalimantan.
12. Mulai tanggal / *From*	:	29 September 2003 s/d / till 27 November 2003

PERHATIAN / *ATTENTION++*

a. Penanggung jawab penginapan wajib menyampaikan daftar tamu OA kepada Kantor Kepolisian Negara RI setempat, selambat-lambatnya 24 (dua puluh empat) jam sejak tanggal kedatangan OA yang bersangkutan, (PP No. 31/1994 Pasal 9 ayat (2)).

Manager of hotels, inns, boarding houses an the like are obligated to submit list of foreign visitors to the local office of the state Police not later than 24 hours since the arrival of the foreigners, (PP No. 31/ 1994 Pasal 9 ayat (2)).

b. Setiap orang yang memberikan kesempatan OA menginap di tempat kediamannya wajib melaporkan kepada kantor Kepolisian RI atau pejabat Pemerintah Daerah setempat dalam jangka waktu 24 (dua puluh empat) jam sejak tanggal kedatangan OA tersebut, (PP No. 31/1994 Pasal 10)

Anybody providing the opportunity to stay for foreigners is obligated to report to the office of the state Police or the local Regional Administration within 24 hours since the arrival of the foreignrs, (PP No. 31/1994 Pasal 10).

Pas photo dan tanda tangan pemegang
Fotograph and Signature of bearer

Dikeluarkan di / *Issued at* : Jakarta
Pada tanggal / *Date* : 29 September 2003

A.n. KEPALA BADAN INTELIJEN KEAMANAN
KABID YANMIN

MARKAS BESAR KEPOLISIAN NEGARA RI
KEPALA
BADAN INTELIJEN KEAMANAN

Drs. J.A.NARDJI, MBA
KOMISARIS BESAR POLISI NRP. 49070279

DEPARTEMEN DALAM NEGERI REPUBLIK INDONESIA

DIREKTORAT JENDERAL KESATUAN BANGSA

Jalan Medan Merdeka Utara Nomor 7 Jakarta 10110

SURAT PEMBERITAHUAN PENELITIAN

(S P P)

NOMOR : 070/1284-D-IV

MEMBACA : Surat Karo Kerjasama dan Pemasyarakatan Iptek LIPI Nomor : 5755/SU.3/KS/2003 tanggal 29 September 2003.

MENGINGAT :
1. Keputusan Menteri Dalam Negeri Nomor 40 Tahun 2001, tentang Organisasi dan Tata Kerja Departemen Dalam Negeri.
2. Surat Keputusan Presiden Republik Indonesia Nomor : 100 Tahun 1993 tentang Izin Penelitian Bagi Orang Asing.
3. Surat Menteri Dalam Negeri Nomor : 1270/SOSPOL/D.V/X/1980 tanggal 21 Oktober 1980 tentang Pengawasan Terhadap Kegiatan Orang Asing.

MEMPERHATIKAN :
1. SIP LIPI Nomor : 5757/SU/KS/2003 tanggal 29 September 2003.
2. SKJ POLRI Nomor : SKJ/Subbid Oras – 9476, 9484, 9485, 9486, 9488, 9489, 9487, 9490, 9482, 9483, 9481, 9480, 9477, 9478, 9479/IX/2003/ Baintelkam tanggal 29 September 2003, berlaku 29 September 2003 s/d 27 November 2003.

N A M A : **Dr. BERT WILLEM HOEKSEMA, dkk.**

ALAMAT : Jac. P. Thijsselaan 46, 2341 PC Oegstgeest, The Netherlands.

PEKERJAAN : Kepala Departemen Invertebrata/Koordinator Riset Kelautan.

KEBANGSAAN : Belanda

JUDUL PENELITIAN : " Marine Biodiversity of the Berau Islands, East Kalimantan "

BIDANG : Oseanografi

DAERAH : Provinsi Kalimantan Timur

LAMA PENELITIAN/ KEGIATAN : 3 (tiga) bulan, sejak SPP dikeluarkan.

PENGIKUT : **Dr. CAROLUS HENRICUS J.M. FRANSEN, Dr. WILLEM RENEMA, Dr. GERARD VAN DER VELDE, Dr. IVAN ALEXEJ NAGELKERKEN, Dr. MATTHIJS VAN COUWELAAR, Dr. WILLEM FREDERIK PRUD'HOMME VAN REINE, Drs. LEENDERT PIETER VAN OFWEGAN, Drs. NICOLE JOY DE VOOGD, Drs. LESETTE NICOLE DE SENERPONT DOMIS, Mr. JACOBUS VAN EGMOND, Mr. MARTIN GERARD VERSTEEG, Mr. MACHIEL SLIERINGS, Mr. JEROEN GOUD, Mr. ROBERT GERARD MOOLENBEEK.**

PENANGGUNG JAWAB/ KOORDINATOR : LIPI

SPONSOR : Pusat Penelitian Oseanografi – LIPI

MAKSUD/TUJUAN : Implementasi Program EKP Kerjasama LIPI - WOTRO

AKAN MELAKUKAN PENELITIAN, DENGAN KETENTUAN SEBAGAI BERIKUT :

1. Sebelum melakukan kegiatan penelitian harus melaporkan kedatangannya kepada Gubernur Cq. Kepala Badan Kesatuan Bangsa setempat dengan menunjukkan Surat Pemberitahuan ini.
2. Tidak dibenarkan melakukan penelitian yang tidak sesuai/tidak ada kaitannya dengan judul penelitian dimaksud.
3. Harus mentaati sesuai ketentuan perundang-undangan yang berlaku serta mengindahkan adat istiadat yang berlaku.
4. Apabila masa berlaku surat pemberitahuan ini berakhir, sedangkan pelaksanaan penelitian belum selesai perpanjangan penelitian harus diajukan kepada instansi pemohon.
5. Surat pemberitahun ini akan dicabut kembali dan dinyatakan tidak berlaku, apabila ternyata pemegang Surat Pemberitahuan tidak mentaati/mengindahkan ketentuan-ketentuan seperti tersebut diatas.

Dikeluarkan di : Jakarta
Pada Tanggal : 1 - 10 - 2003.

A.n. MENTERI DALAM NEGERI
DIREKTUR JENDERAL KESATUAN BANGSA
U.b
SEKRETARIS,

DEPARTEMEN DALAM NEGERI REPUBLIK INDONESIA

DRS. MOHAMMAD ROEM, MM
Pembina Utama Madya
NIP. 010092180

Tembusan :

1. Yth. Gubernur Kalimantan Timur
   Up. Kaban Kesbang Provinsi
2. Yth. Karo Kerjasama dan Pemasyarakatan Iptek LIPI
   Di Jakarta

PEMERINTAH PROPINSI KALIMANTAN TIMUR

BADAN KESATUAN BANGSA DAN PERLINDUNGAN MASYARAKAT

Jalan Jenderal Sudirman No. 1 Telp. (0541) 733333 Pes. 242, 232 Fax. (0541) 741594

SAMARINDA

SURAT PEMBERITAHUAN PENELITIAN

(SPP)

Nomor : 070 / 181 /IV/KBPM.

MEMBACA : Surat dari Direktorat Jenderal Kesatuan Bangsa No. 070/1284-D.IV/2003, tanggal 1 Oktober 2003, perihal surat pemberitahuan penelitian.

MENGINGAT :

1. Keputusan Menteri Dalam Negeri Nomor : 9 A Tahun 2002 tanggal 22 April 2002 tentang Uraian tugas Direktur Jendral Kesatuan Bangsa dilingkungan Departemen Dalam Negeri.
2. Surat Keputusan Dirjen Sospol Dep.Dagri Nomor : 14 Tahun 1981 tentang Surat Pemberitahuan Penelitian.
3. Surat Dirjen Sospol Dep. Dagri No. 070/2170/tanggal 10 Juni 1981 tentang Surat Pemberitahuan Penelitian bagi pelaksanaan penelitian ke daerah-daerah dikeluarkan oleh Dirjen Sospol dalam rangka pengawasan dan pengamanan.
4. Undang-Undang No. 8 Tahun 1985 tentang Organisasi Kemasyarakatan.
5. Surat Gubernur KDH Tingkat I Kalimantan Timur No. 070/083/TUP/BAPP/tanggal 30 Mei 1996 tentang Instruksi izin penelitian di Propinsi antara Bappeda Propinsi dengan Direktorat Sosial Poitik Propinsi Kaltim berhubungan dengan penerbitan Surat Pemberitahuan Penelitian (SPP).
6. Undang-Undang No. 22 Tahun 1999 tentang pemerintah Daerah.
7. Surat Keputusan Gubernur Kalimantan Timur No. 4 Tahun 2001 tanggal 24 April 2001 tentang pembentukan Susunan Organisasi dan Tata Kerja Lembaga Teknis Propinsi Kalimantan Timur.

MEMPERHATIKAN : Proposal Penelitian yang bersangkutan.

MEMBERITAHUKAN BAHWA :

N A M A : **Dr. Bert Willem Hoeksema,dkk**
ALAMAT : Jac. P. Thijsselaan 46, 2341 PC Oegstgeest, The Netherlands.

PEKERJAAN : Kepala Departemen Invertebrata/Koordinator Riset Kelautan.

KEBANGSAAN : Belanda.

JUDUL PENELITIAN : Marine Biodiversity of the Berau Islands, East Kalimantan.

BIDANG : Osernografi.

DAERAH : Prop Kaltim / Kab. Berau

LAMA PENELITIAN : 3 (tiga) Bulan, sejak SPP dikeluarkan.

PENGIKUT. . . . . .

PENGIKUT : 14 (Orang)
PENANGGUNG JAWAB : LIPI.
SPONSOR : Pusat penelitian Oseanografi (LIPI).
MAKSUD & TUJUAN : Implementasi Program EKP Kerjasama LIPI- WORTO.

Akan melakukan kegiatan penelitian dengan ketentuan sebagai berikut:

1. Sebelum melakukan kegiatan penelitian supaya melaporkan kedatangannya kepada Bupati/Walikota Cq. Kepala Badan Kesatuan Bangsa dan Perlindungan Masyarakat setempat dan Camat Kepala Wilayah yang bersangkutan.
2. Tidak dibenarkan melakukan penelitian yang tidak sesuai/tidak ada kaitannya dengan judul penelitian yang bersangkutan.
3. Harus mentaati sesuai ketentuan perundang-undangan yang berlaku serta mengindahkan adat-istiadat setempat.
4. Apabila masa berlaku surat pemberitahuan ini sudah berakhir, sedangkan pelaksanaan penelitian belum selesai, perpanjangan penelitian harus diajukan keapa instansi pemohon.
5. Surat pemberitahuan ini akan dicabut kembali dan dinyatakan tidak berlaku, apabila ternyata pemegang surat pemberitahuan tidak mentaati/mengindahkan ketentuan-ketentuan tersebut di atas.
6. Setelah selesai penelitian agar menyampaikan laporan kepada Gubernur Propinsi Kalimantan Timur Up. Kepala Badan Kesatuan Bangsa dan perlindungan Masyarakat.

DIKELUARKAN DI : SAMARINDA
PADA TANGGAL : 2 Oktober 2003.
AN. KEPALA BADAN KESBANG DAN LINMAS
PROPINSI KALIMANTAN TIMUR,
Kabid Pengembangan Masyarakat.

Drs. H. SUHIRMAN TAHIR. SH, MM.
NIP. 550 006 801.

Tembusan :

1. *Gubernur Prop. Kaltim (sebagai laporan)*
2. *Kepala Balitbangda Prop. Kaltim.*
3. *Kepala Bidang Penelitian dan Pengkajian Bappeda Prop. Kaltim*
4. *Bupati Berau.*
   Up. Kakan Kesbang dan Linmas Ybs.
5. *Karo kerjasama dan Pemasyarakatan Iptek LIPI.*
6. *Pertinggal.*

PEMERINTAH KABUPATEN BERAU
BADAN KESATUAN BANGSA DAN PERLINDUNGAN MASYARAKAT
Jalan Dr. Murjani II Telp (0554) 21222 Fax (0554) 21222
Tanjung Redeb

SURAT PEMBERITAHUAN PENELITIAN

Nomor : 302/HAKB1/Kes-Lin/2003

MEMBACA : Surat Pemberitahuan Penelitian (SPP) Badan Kesbang dan Linmas Prop. Kal-Tim Nomor : 070/181/IV/KBPM Tanggal 2 Oktober 2003

MENGINGAT :

1. Undang - Undang Nomor 8 Tahun 1985 Tentang Organiuasi Kemasyarakatan
2. Undang - Undang Nomor 22 Tahun 1999 Tentang Pemerintahan Daerah
3. Keputusan Menteri Dalam Negeri Nomor 9 A Tahun 2002 Tanggal 22 April 2002 Tentang Uraian Tugas Direktorat Jendral Kesatuan Bangsa Dilingkungan Departemen Dalam Negeri.
4. Surat Keputusan Dirjen Sospol Depdagri No. 14 Tahun 1981 ttg Surat Pemberitahuan Penelitian
5. Surat Dirjen Sospol Depdagri No. 070/2170/1981 Tgl. 10 Juni 1981 tentang surat pemberitahuan Penelitian bagi pelaksanaan penelitian ke daerah-daerah dikeluarkan oleh Dirjen Sospol dalam rangka pengawasan dan pengamanan
6. Keputusan Bupati Berau Nomor 9 Tahun 2001 Tentang Pembentukan Struktur Organisasi dan Tata Kerja Badan Kesbang dan Linmas Kab. Berau

MEMPERHATIKAN : Proposal Penelitian Yang Bersangkutan

MEMBERITAHUKAN BAHWA :

1. N A M A : Dr. BERT WILLEM HOEKSEMA, DKK
2. A L A M A T : Jac. P. Thijsselaan 46, 2341 PC Oegstgeest, The Netherlands
3. PEKERJAAN : Kepala Departemen Invertebrata/Koordinator Riset Kelautan
4. KEBANGSAAN : Belanda
5. JUDUL PENELITIAN : Marine Biodiversity of the Berau Islands, East Kalimantan
6. B I D A N G : Osernografi

7. DAERAH PENELITIAN : Kabupaten Berau
8. LAMA PENELITIAN : Bulan Oktober s/d Desember 2003
9. PENGIKUT : 14 (Empat Belas) Orang
10. PENANGGUNG JAWAB : L I P I
11. SPONSOR : Pusat Penelitian Oseanografi (LIPI)
12. MAKSUD DAN TUJUAN : Implementasi Program EKP Kerjasama LIPI-WORTO

Akan melakukan kegiatan penelitian dengan ketentuan sebagai berikut :

1. Sebelum melakukan kegiatan penelitian supaya melaporkan kedatangannya kepada Camat setempat
2. Tidak dibenarkan melakukan penelitian yang tidak sesuai/tidak ada kaitannya dengan judul penelitian yang bersangkutan
3. Harus mentaati sesuai ketentuan perundang-undangan yang berlaku serta mengindahkan adat-istiadat setempat
4. Apabila masa berlaku surat pemberitahuan ini sudah berakhir, sedangkan pelaksanaan penelitian belum selesai, perpanjangan penelitian harus diajukan kepada instansi pemohon
5. Surat pemberitahuan ini akan dicabut kembali dan dinyatakan tidak berlaku, apabila ternyata pemegang surat pemberitahuan tidak mentaati/mengindahkan ketentuan-ketentuan tersebut diatas
6. Setelah selesai penelitian agar menyampaikan laporan kepada Bupati Berau melalui Kepala Badan Kesatuan Bangsa dan Perlindungan Masyarakat Kabupaten Berau.

DIKELUARKAN DI : TANJUNG REDEB
PADA TANGGAL : 07 OKTOBER 2003

BADAN KESBANG DAN LINMAS KAB. BERAU
K E P A L A

BASYARUDDIN, SH
PEMBINA TK. I
NIP. 170 008 615

Tembusan Disampaikan Kepada Yth :

01. Bupati Berau di - Tanjung Redeb (Sebagai Laporan)
02. Ketua DPRD Kabupaten Berau di - Tanjung Redeb (Sebagai Laporan)
03. Kapolres Berau di - Tanjung Redeb
04. Kepala Kejaksaan Negeri di - Tanjung Redeb
05. Dan Dim 0902/Trd di - Tanjung Redeb
06. Kepala Dinas Perikanan & Kelautan Kab. Berau di - Tanjung Redeb
07. Kepala Bappelda Kabupaten Berau di - Tanjung Redeb
08. Kepala Sahbandar Kab. Berau di - Tanjung Redeb
09. Kadis Pariwisata & Kebudayaan Kab. Berau di - Tanjung Redeb
10. Ketua Bappeda Kabupaten Berau di - Tanjung Redeb
11. Kepala Dispenda Kab. Berau di - Tanjung Redeb
12. Camat-Camat Masing-Masing di - T e m p a t

Appendix 6.

Abstract of presentation at ICOMAR International Symposium on Terrestrial and Marine Research at East Kalimantan, Samarinda (20-21 October 2003)

East Kalimantan Programme:
Biodiversity of the coastal zone of NE Kalimantan (Berau district)

Dr. Bert W. Hoeksema
National Museum of Natural History . Naturalis
Leiden, The Netherlands

The coastal waters of East Kalimantan probably form part of the western boundary of the Indo-West Pacific centre of maximum marine biodiversity. This will be tested on selected model taxa by various specialists, which will give direct results for hypothesis testing by comparison of NE Kalimantan marine biota with those of neighbouring areas. Emphasis is put on the species-rich Berau district with coral reefs, mangroves, seagrass beds, and algae. A range of habitats will be surveyed, varying in distance offshore (with decreasing salinity, turbidity, sedimentation and nutrient load): fringing reefs along the mainland shore, offshore patch reefs, delta-front barrier reefs, and uplifted atolls. The atolls consist of limestone rock and contain shallow land-locked marine lakes with a unique marine fauna and flora. The various marine environments at NE Kalimantan will enable the selection of taxa and sites that can be used for future research on climate change records (e.g. corals, sponges and molluscs), molecular (genetic) divergence within species between separated populations, and environmental effects on species diversity. Biodiversity data will be important as an instrument raising public awareness regarding sustainable use of natural resources, such as through diving tourism.

Note 1. Participation was funded by WOTRO and Naturalis.

Note 2. At 22-23 October 2003, some of the EKP participants (Dr. Suharsono, Dr. Bert W. Hoeksema, Dr. Willem Renema) attended a workshop at Derawan Island organized by The Nature Conservancy: “Experts Workshop on Conservation Planning for Derawan Islands”.
Participation was funded by WOTRO and Naturalis.

ICOMAR Symposium, Samarinda. Dr. Jan Sopaheluwakan (LIPI) presents a key lecture.
Photo B.W. Hoeksema.

Appendix 7.

Acknowledgements.

This research has been made possible by project grants from WOTRO (WT 75-397, WT 87-299, WT 87-300, WT 87-301) through de WOTRO-ALW-KNAW East Kalimantan Programme, individual travel grants (WOTRO) and institutional support from Naturalis. LIPI (Bureau for Cooperation and Promotion of Science and Technology) has been of great assistance in the issue of research permits. Dr. Jan Sopaheluwakan (Deputy Chairman for Earth Sciences, LIPI) and Dr. Ir. H. Ono Kurnaen Sumadhiharga (Director, PPO-LIPI) are gratefully acknowledged for their personal support. The Nature Conservancy (TNC) in Jakarta, Samarinda, Tanjung Redeb) and the Conservation Foundation for Rare Aquatic Species of Indonesia (RASI) have supplied support in East Kalimantan. Without the logistic assistance supplied by the management and staff of Derawan Dive Resort at Derawan and PT Bhumi Manimbora Interbhuwana, the research at Berau could not have been performed in such a good and positive way as experienced during the field work.