Cryptic marine biota of the Raja Ampat island group

Preliminary results of the Raja Ampat Expedition (2007),
Ekspedisi Widya Nusantara (E-Win)
of the Indonesian Institute of Sciences (LIPI)

Progress report

December 2008

Editors:
Dr. B.W. Hoeksema
Drs. S.E.T. van der Meij

LIPI

. naturalis

PROGRESS REPORT

Preliminary results of the LIPI – Naturalis expedition to Raja Ampat, Papua, Indonesia,
17 November - 17 December 2007.

The expedition was part of the Ekspedisi Widya Nusantara (E-Win)
of the Indonesian Institute of Sciences (LIPI).

Naturalis
National Museum of Natural History Naturalis,
P.O. Box 9517, 2300 RA Leiden, the Netherlands

LIPI
Research Center for Oceanography, Indonesian Institute of Sciences (RCO-LIPI),
Jl. Pasir Putih I, Ancol Timur, Jakarta 14430, Indonesia.

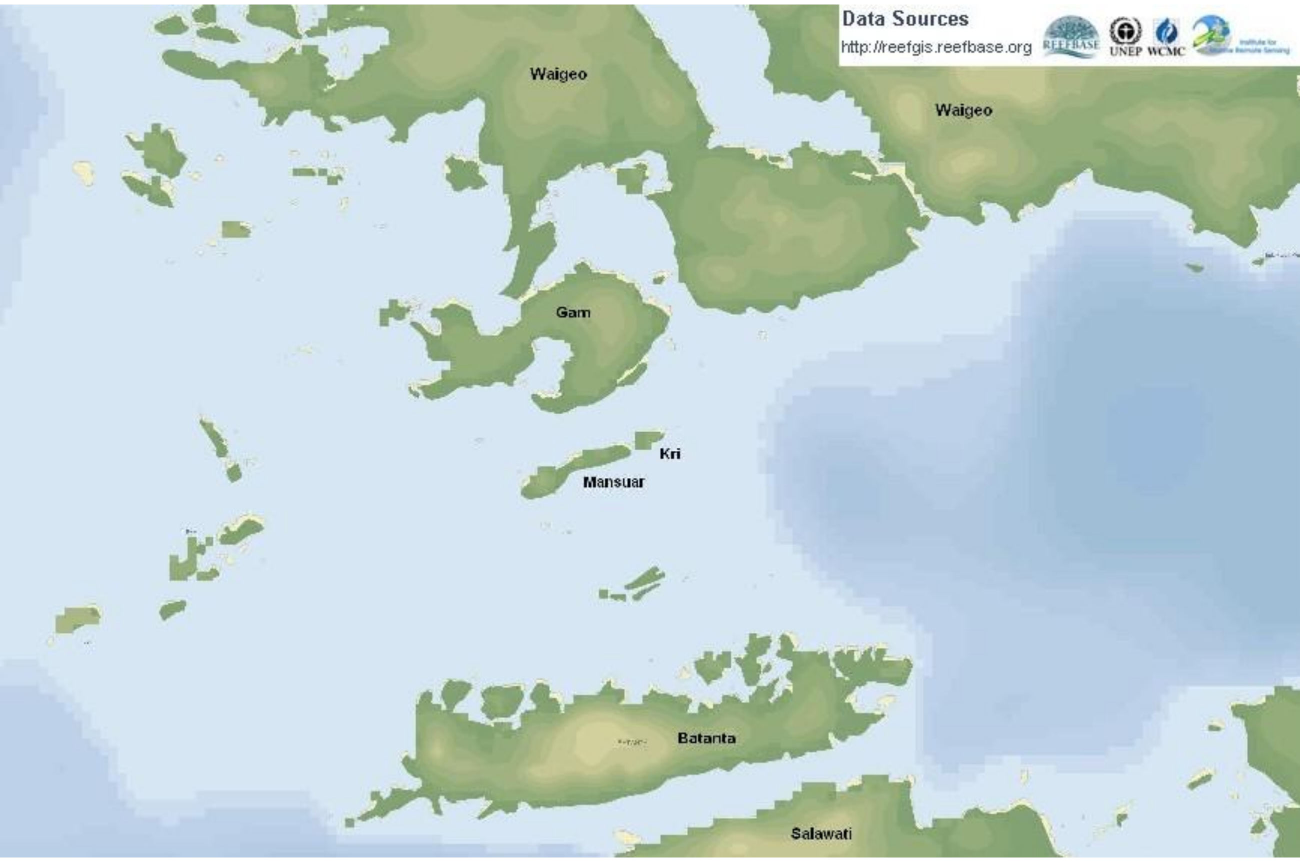
Pygmy seahorse (*Hippocampus* sp.) on gorgonian host, *Anella* sp., at Raja Ampat (B.W. Hoeksema).

Contents

Introduction

Organization

The Raja Ampat expedition in 2007 was organized by the National Museum of Natural History Naturalis in Leiden in cooperation with the Research Centre for Oceanography (RCO-LIPI, Jakarta) as part of Ekspedisi Widya Nusantara (E-Win expedition) of the Indonesian Institute of Sciences (LIPI). The research team consisted of scientists from Indonesia, the Netherlands, Palau and the United States. The Raja Ampat islands are located northwest of Bird's Head' peninsula in Papua, Indonesia. This area has recently gained much media attention due to its high marine biodiversity and the recent discovery of several new species of corals and fish. The expedition was based at Kri Eco Resort of Papua Diving, on Kri Island.



Research area of the Raja Ampat Expedition 2007 (map: http://reefgis.reefbase.org).

Cryptic biota

The expedition aimed to study cryptic biota, which consist of species that lead hidden lives. They may be difficult to find because of their small size, their successful camouflage or mimicry, or because they live in habitats that are nearly inaccessible or easily overlooked. Some species resemble phylogenetically related species, called sibling species, which can be detected with the help of molecular (DNA) analyses. Use of camouflage is seen in many animals that live in close association with a host. In the case of such interspecific associations, the expedition members also studied the host organisms. Marine lakes, deep land inward bays, narrow channels, and deep sandy bottoms underneath reef slopes are examples of habitats that were studied despite their limited accessibility. All together, many different marine environments were studied.


Cryptic fauna by camouflage: a parasitic mollusc (*Prosimnia draconis*) on a fan coral (*Melithaea* spec.) (B.T. Reijnen).

The picture above shows a well-camouflaged mollusc on its host, a fan coral. This relationship is not mutually advantageous since the mollusc feeds on the fan coral and the coral does not get anything in return. Not all symbiotic relationships involving cryptic species appear to be harmful to their hosts. The picture below portrays a shrimp on a coral that is not visibly harmed by the presence of this 2-3 cm long inhabitant. This coral, *Heliofungia actiniformis*, is characterized by long tentacles, giving it the appearance of a sea anemone. It gives shelter to many other animals that are hiding between its tentacles, such as a diminutive pipe fish (next page).


Cryptic fauna: The head of the shrimp *Periclimenes kororensis* resembles the tentacle tips (acrospheres) of its host, the mushroom coral *Heliofungia actiniformis* (B.W. Hoeksema).

Cryptic fauna: The small pipe fish *Siokunichthys nigrolineatus* lives between the tentacles of its host, the mushroom coral *Heliofungia actiniformis* (B.W. Hoeksema).

Marine lakes

Marine lakes are little known, yet fascinating, habitats. These land-locked salt water bodies are thought to have been formed since the last glacial maximum and have maintained a marine character through a network of submarine connections to the sea. As a result of this relative isolation from surrounding seas, the lakes harbour numerous unique species. Various lakes are known from the Raja Ampat Island group (e.g. on the Wayag islands and on Mansuar island, close to the base camp). More lakes are expected to be discovered in the karstic landscape of Raja Ampat. It consists of a limestone underground that is also present in other areas where marine lakes occur, such as East Kalimantan. A detailed search of satellite images has in fact resulted in the discovery of several marine lakes, which have been investigated during the expedition. The present expedition is the first to document in detail the flora and fauna of the marine lakes of Raja Ampat.

View on Mansuar marine lake (L.E. Becking).

A hypothetical coral triangle based on mushroom coral species numbers obtained during field surveys (presence / absence data) and the contours of continental shelves; the research area is indicated by the red circle (B.W. Hoeksema).

Naturalis marine research team

The Naturalis marine research team conducts research on the biodiversity of coastal areas, especially coral reefs, in and around the so-called Coral Triangle, the centre of maximum marine biodiversity. This area includes the Philippines, Sabah (eastern Malaysia), eastern Indonesia, Timor-Leste, northern Papua New Guinea, and the Solomon islands. Several tectonic plates come together in this area. The Raja Ampat expedition of 2007 took place in the presumed epicentre of the triangle.

The members of the Naturalis research team are all researchers specialized in a variety of animal taxa. Their approach is multi-facetted in order to encompass as many research aspects as possible. Species are identified in the field and collected if in-situ identification is not possible. Underwater photographs are made to record the colours of the live animals and their natural environment. Collected samples are furthermore used for DNA analysis to investigate phylogenetic relationships between species and their evolutionary history. The collected specimens are stored in the collection of Naturalis as reference material for future research.

Understanding the relationships between species and their evolutionary history is of fundamental scientific importance. In order to generate effective conservation schemes and guidelines for the sustainable exploitation of natural resources, the dynamics of the distribution and abundance of organisms in relation to environmental, spatial and temporal processes needs to be understood. The present research, together with the historic collections in Indonesia and the Netherlands, can be used to document changes in Indonesian marine biodiversity over time.

Scientific expedition team

The research in Raja Ampat was organized by the National Museum of Natural History Naturalis in Leiden and the Research Center for Oceanography (RCO-LIPI) in Jakarta, as part of E-Win (Ekspedisi Widya Nusantara) of LIPI (Indonesian Institute of Sciences). The research team consisted of 21 specialists from different countries. Dr. Bert W. Hoeksema, head of the Department of Zoology / Marine Research at Naturalis, was expedition leader.

Indonesia

Dra. Anna E.W. Manuputty, MSi (RCO-LIPI) - octocorals
Ir. M.I. Yosephine Tuti H. (RCO-LIPI) - octocorals
Drs. Winardi (RCO-LIPI) – GIS/Remote sensing
Inayat Al-Hakim, MSi (RCO-LIPI) - polychaetes

The Netherlands

Dr. Bert W. Hoeksema (Naturalis) - stony corals, associated organisms
Dr. Stefano G.A. Draisma (National Herbarium Netherlands) – macro-algae
Dr. Charles H.J.M. Fransen (Naturalis) - crustaceans
Dr. Leen P. van Ofwegen (Naturalis) - octocorals
Dr. Willem Renema (Naturalis) – larger Foraminifera
Prof. Dr. Gerard van der Velde (Radboud University) – flatworms/nudibranchs
Ms. Leontine E. Becking, MSc (Naturalis) - sponges, marine lakes
Ms. Sancia E.T. van der Meij, MSc (Naturalis) - stony corals, molluscs, gall crabs
Mr. Bastian T. Reijnen, MSc (Naturalis) - octocorals, molluscs
Mr. Frank R. Stokvis, MSc (Naturalis) - octocorals, pygmy sea horses
Mr. Koos van Egmond (Naturalis) - logistic support, collection management
Ms. Eva M. van der Veer (Leiden University) - stony corals, associated shrimps

Palau

Mrs. Lori J.B. Colin (Coral Reef Research Foundation) - marine lakes
Ms. Sharon Patris (Coral Reef Research Foundation) - marine lakes

United States

Dr. Michael Dawson (University of California, Merced, Ca.) - marine lakes
Dr. Laura E. Martin (University of California, Merced, Ca.) - marine lakes
Prof. Dr. James D. Thomas (National Coral Reef Institute, Fort Lauderdale, Fl.) – amphipods

This *Halimeda* ghost pipe fish (with a filled brood pouch) was encountered at Yenweres Bay, East Gam (B.W.Hoeksema).

Research topics

Stony corals (Fungiidae) – Dr. Bert W. Hoeksema

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Hoeksema@naturalis.nl

Research efforts with regard to stony corals were concentrated on the distribution of mushroom corals (Fungiidae) as a pilot group. 39 species were encountered in 48 samples (Table 1). The species accumulation curves (Fig. 1) show that the estimated species number reaches the observed species number very closely, with an error of less than 1. In theory, additional sampling could have resulted in one more species. An additional species, *Polyphyllia novaehiberniae*, was indeed encountered at Waigeo during a previous expedition (Hoeksema, 1989). Therefore, the total number of mushroom coral species is 40, which is the maximum number found, like at Berau (East Kalimantan) and Madang (PNG). Hence, Raja Ampat can certainly be considered part of the center of maximum marine diversity (Fig. 2). The numbers of species recorded per station is very variable (Table 1), depending on the available reef conditions. The Passage (Sta RAJ 44), a narrow channel between Waigeo and Gam with no reefal conditions, was the poorest site (1 species), whereas Yenweres Bay (Sta RAJ 46) with a gradually declining slope and full coral cover at the eastern side of Gam was the most species-rich (28 species). Obviously, some species were very abundant, present at 45 stations, while others were very rarely encountered, at only one locality.

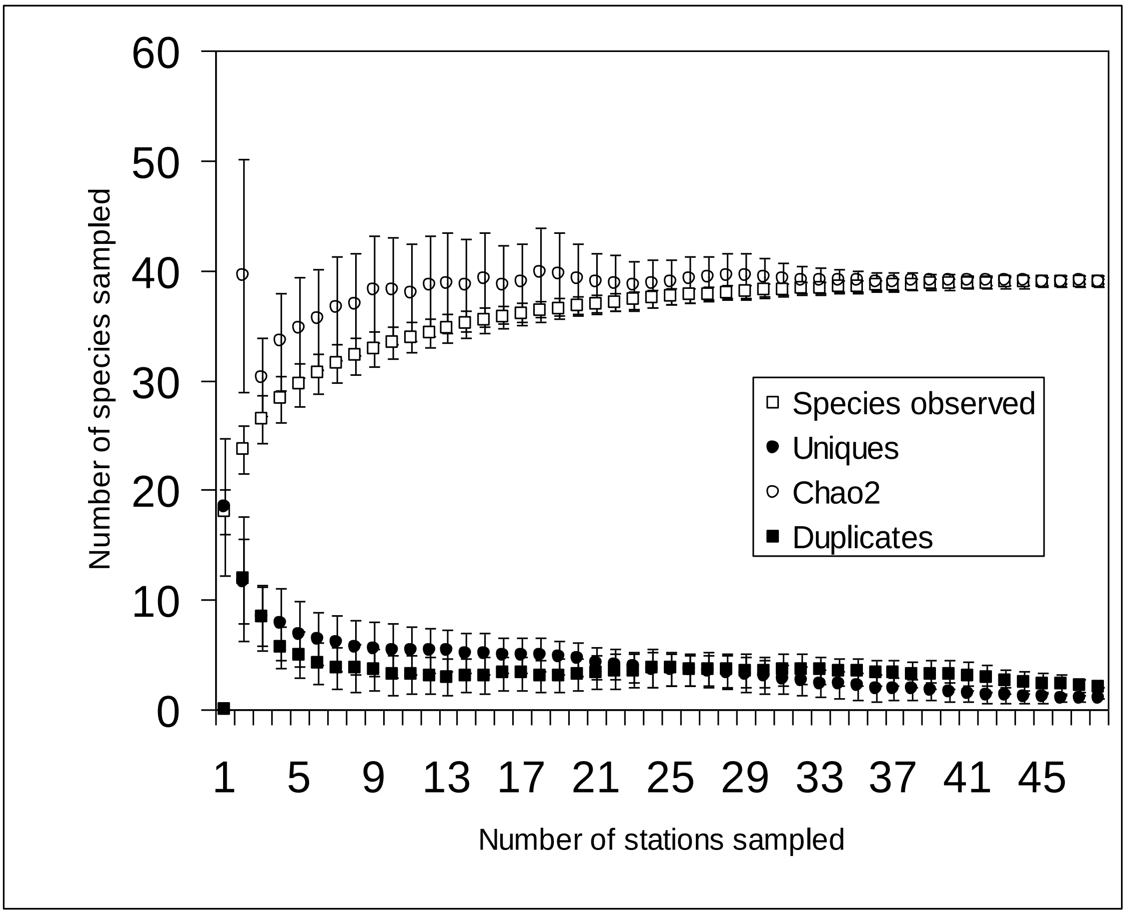


Fig. 1. Species accumulation curves (species observed, Chao2) indicating numbers (and standard deviations) of mushroom species observed (n=39) and to be expected (n=40) in Raja Ampat (data source: Table 1) at 48 stations (species numbers ranging 1-28). Since an additional species record is known from Waigeo (Hoeksema, 1989), the total number of species is 40. The numbers of Uniques species and Duplicates reach 1 and 2, respectively. For statistics, see: Colwell, R. K. 2006. EstimateS: Statistical estimation of species richness and shared species from samples. Version 8. User's Guide and application published at: http://purl.oclc.org/estimates.

Fig. 2. Mushroom coral species numbers based on presence / absence data with additional records. Raja Ampat is indicated by the red circle.

Some species that are common in western Indonesia have not been observed in Raja Ampat, such as *Fungia scabra* and *Lithophyllon undulatum*. Raja Ampat may be outside their distribution range, since they have not been recorded in any nearby areas in the Pacific Ocean*. L. ranjithi* has also not been found and therefore its known distribution area remains East Sabah and East Kalimantan, at the northeastern side of Borneo. On the other hand, the observation of *Cantharelus jebbi* at Raja Ampat (Fig. 5) is the westernmost so far, and the first for Indonesia, although its first record is Papua New Guinea (Hoeksema, 1993). For *Polyphyllia novaehiberniae*, Waigeo is also the westernmost distribution record. The new record *of F. taiwanensis* is the most eastward so far (Figs. 3-4). The rare occurrence of a *Podabacia* cf. *sinai* is also noteworthy (Fig. 6). *Halomitra clavator* is a rare species (Fig. 7), like *Fungia hexagonalis* (Fig. 8), which was found on silty substrates in sheltered bays with *F. spinifer* (Fig. 9).

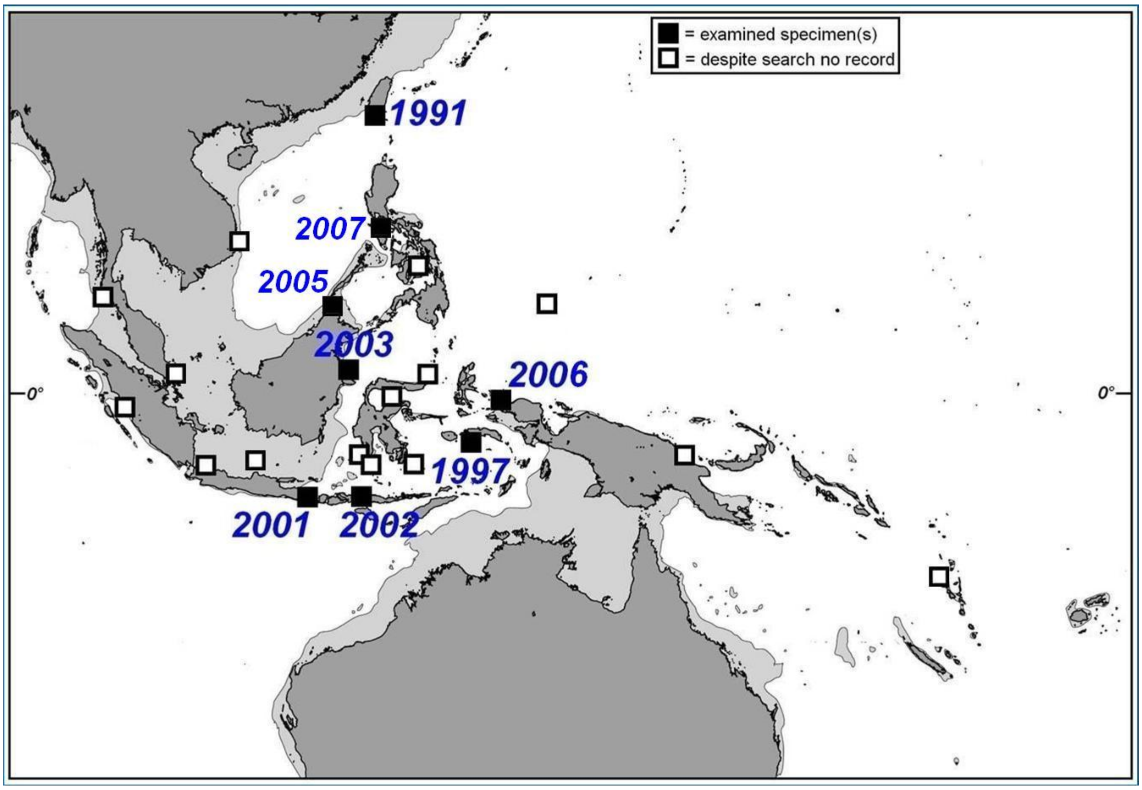


Fig. 3. *Fungia taiwanensis* has since 1991 been recorded from various places, including Raja Ampat. Records based on presence / absence surveys.

Fig. 4. Two specimens of the rarely recognized *Fungia taiwanensis* at Raja Ampat, the easternmost limit of its known distribution range (B.W. Hoeksema)

Fig. 5. *Cantharellus jebbi* at its westernmost known locality (B.W. Hoeksema).

Fig. 6. *Podabacia* cf. *sinai* at Raja Ampat (B.W Hoeksema).

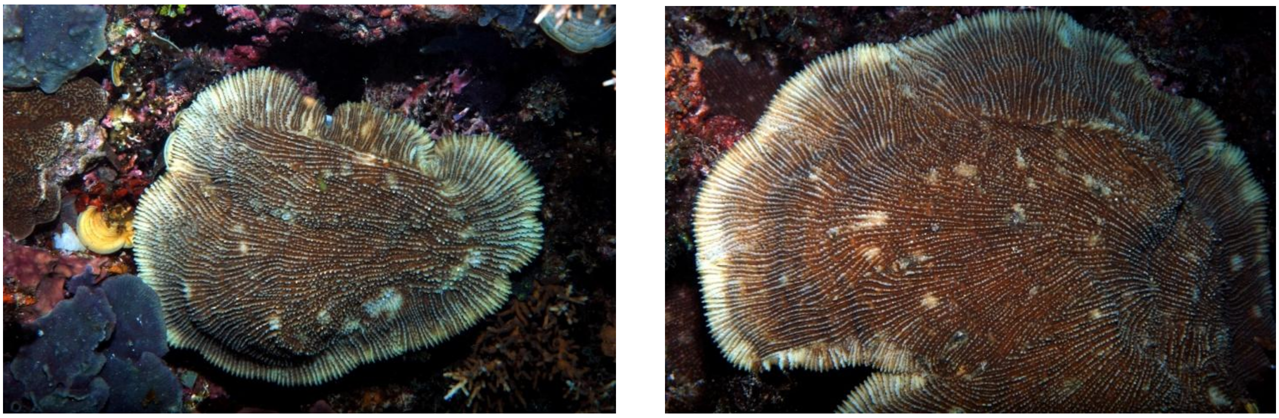


Fig. 7. *Halomitra clavator*, a rare species present at Raja Ampat, known from few localities in Indonesia, Philippines and Malaysia. Due to its thin corallum and fragility it is very variable in shape (B.W. Hoeksema)

Fig. 8. *Fungia hexagonalis* has been found on soft substrates in sheltered bays (B.W. Hoeksema).

Fig. 9. *Fungia spinifer* was also encountered on soft substrates (B.W. Hoeksema).

Table 1. Fungiidae observed at Raja Ampat stations.

Sample number	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
Station number	2	3	5	6	7	8	11	12	14	15	19	20	21	25	26	28	29	32	33	37	38	40	41	43	44
Fungiidae per station	20	20	25	26	18	23	16	11	22	20	17	14	18	17	22	24	21	18	18	22	24	22	20	3	1
Fungia (C.) sinensis	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
F. (C.) cyclolites	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F. (C.) distorta	0	0	1	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	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0
F. (C.) costulata	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0
F. (C.) tenuis	0	0	1	1	1	1	0	0	1	1	0	0	1	0	1	1	1	0	0	1	1	0	1	0	0
F. (C.) spec.	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
F. (C.) vaughani	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F. (C.) somervillei	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
F. (C.) hexagonalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
F. (V.) concinna	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0
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	0	0
F. (V.) spinifer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
F. (D.) fralinae	1	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	1	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	0	0
F. (D.) scruposa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
F. (F.) fungites	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
F. (W.) granulosa	0	1	1	1	1	1	0	0	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	0	0
F. (L.) scutaria	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	0	0	0	1	1	1	0	0	0
F. (P.) moluccensis	1	0	1	1	0	1	0	0	1	0	0	0	0	1	1	1	1	1	1	0	0	1	1	0	1
F. (P.) gravis	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1	1	1	0	0
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	0	0
F. (P.) taiwanensis	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0
Heliofungia actiniformis	1	1	1	1	0	1	0	0	1	1	1	0	0	1	0	1	1	1	1	1	1	0	1	1	0
C. albitentaculata	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	0	0
C. echinata	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
C. crassa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0
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	0	0
Polyphyllia talpina	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0
P. novaehiberniae	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
Sandalolitha dentata	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	1	1	1	0	0	0
S. robusta	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Zoopilus echinatus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
Halomitra pileus	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	0	0	0	1	1	1	1	0	0
H. clavator	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
Litophyllon mokai	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Cantharellus jebbi	1	1	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	1	1	1	1	0	0	1	0	1	0	1	1	0	1	0	1	1	1	1	1	0	1	0	0	0
P. motuporensis	0	1	1	0	1	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	1	1	0	0
Podabacia cf. sinai	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 number	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	Total
Station number	5	2	45	46	48	49	55	8	56	57	58	59	46	60	61	62	63	64	65	66	67	69	70	number
Fungiidae per station	17	21	13	25	16	25	25	24	20	20	7	7	28	22	24	11	14	3	18	22	14	8	18	of stations
Fungia (C.) sinensis	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6
F. (C.) cyclolites	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4
F. (C.) distorta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
F. (C.) fragilis	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	1	0	0	11
F. (C.) costulata	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	0	1	1	0	0	0	36
F. (C.) tenuis	1	0	0	0	0	1	1	1	1	0	0	0	1	1	0	0	0	0	1	1	0	0	0	22
F. (C.) spec.	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	8
F. (C.) vaughani	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
F. (C.) somervillei	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
F. (C.) hexagonalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
F. (V.) concinna	1	1	0	1	1	1	1	1	0	1	1	0	1	1	1	0	1	0	0	1	1	1	1	39
F. (V.) repanda	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	45
F. (V.) spinifer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
F. (D.) fralinae	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	10
F. (D.) horrida	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	44
F. (D.) scruposa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	43
F. (F.) fungites	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	45
F. (W.) granulosa	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	1	0	0	28
F. (L.) scutaria	1	0	1	0	1	1	1	1	1	1	0	0	1	1	0	0	0	0	1	1	0	0	0	27
F. (P.) moluccensis	0	1	0	1	0	1	1	0	0	1	0	1	1	0	1	1	1	0	0	0	1	0	0	25
F. (P.) gravis	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	1	1	1	0	1	36
F. (P.) paumotensis	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	1	1	0	1	42
F. (P.) taiwanensis	1	0	0	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	12
Heliofungia actiniformis	0	1	0	1	1	1	1	1	0	0	1	0	1	1	1	1	1	0	1	1	1	1	1	34
C. albitentaculata	0	1	0	1	0	1	1	1	1	0	0	0	1	1	1	0	0	0	0	1	0	0	1	20
C. echinata	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	43
C. crassa	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	1	1	0	0	1	35
Herpolitha limax	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	43
Polyphyllia talpina	0	0	0	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	1	29
P. novaehiberniae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandalolitha dentata	1	0	1	1	0	1	1	1	1	1	0	0	1	1	1	0	0	0	0	1	0	0	1	20
S. robusta	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	42
Zoopilus echinatus	0	1	0	1	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	1	0	0	1	11
Halomitra pileus	0	1	1	1	0	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	0	0	1	30
H. clavator	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Litophyllon mokai	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	4
Cantharellus jebbi	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Podabacia crustacea	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	0	1	1	1	1	1	0	1	33
P. motuporensis	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	15
Podabacia cf. *sinai*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	3

References

Hoeksema, B.W., 1989. Taxonomy, phylogeny and biogeography of mushroom corals (Scleractinia: Fungiidae), *Zoologische Verhandelingen Leiden* **254**: 1-295.

Hoeksema, B.W., 1993. Mushroom corals (Scleractinia: Fungiidae) of Madang Lagoon, northern Papua New Guinea: an annotated check-list with the description of *Cantherellus jebbi* spec. nov., *Zoologische Mededelingen Leiden* **67**: 1-19.

Soft corals – Dr. Leen P. van Ofwegen, Dra. A.E.W. Manuputty & Ir. Y. Tuti H.

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Ofwegen@naturalis.nl

Research Center for Oceanography, Indonesian Institute of Sciences (RCO-LIPI), Jl. Pasir Putih I, Ancol Timur, Jakarta 14430, Indonesia.
aew_manuputty@yahoo.com; yostuti@yahoo.co.id

The soft coral fauna of Raja Ampat appears to be incredibly rich. Already during the third dive a specimen belonging to the rather uncommon soft coral genus *Chromonephthea* was found. This Indo-Pacific genus was described earlier (Ofwegen, 2005) to include species previously erroneously included in the genera *Nephthea* and *Stereonephthya*. About 50 species are regarded to belong to this new genus, 33 of which are new. Most remarkable of *Chromonephthea* is that all species apparently are endemics and that the animals assumedly live in rather turbid water. No species was recorded from West Papua before and because of the endemic character of *Chromonephthea* species, it is very well possible that the recently found specimen represents a yet undescribed new species. More remarkable is that the collected specimen lived in crystal clear water, unlike specimens of other species of the genus. It is unclear if this is an exception to the rule or whether the habitat preferences of *Chromonephthea* species has to be reconsidered.

During the expedition, Octocorallia and Antipatharia were collected and photographed. The specimens were preserved in alcohol 75% for further examination in Indonesia and The Netherlands. Several samples were stored in alcohol 95 % for molecular studies. In general the number of octocoral genera found during the expedition was comparable with previous expeditions to Kalimantan, Sulawesi, Bali, and Ambon. Based on underwater observations, photographs, and preliminary identifications, 55 genera of soft corals and gorgonians were recognized (Table 1). Identification of several genera and most species is only possible after microscopic examination of the skeleton sclerites. Therefore, undoubtedly, the number of observed genera will slightly increase after examination.

A clear difference with previous expeditions was the large number of *Chromonephthea* specimens found, probably including several different species. This recently described genus (Ofwegen, 2005) is rather rare in Indonesia. Although not present in every locality in Raja Ampat, it was common in some. Surprisingly, the genus *Ctenocella* was not found. This easily recognizable genus with species with unique lyre-shaped colonies is normally present in Indonesian waters. Furthermore, members of the family Xeniidae, known for being opportunistic organisms capable of growing in all kind of marine environments, were scarce.

References

Ofwegen, L.P. van, 2005. A new genus of nephtheid soft corals (Octocorallia: Alcyonacea: Nephtheidae) from the Indo-Pacific. *Zoologische Mededelingen Leiden* **79 (4)**: 1-236.

Chromonephthea sp. (B.W. Hoeksema).

Chironephthya sp. (B.W. Hoeksema).

Table 1. Indo-Pacific genera of reef-dwelling Octocorallia recorded in Raja Ampat.

<u>Order Helioporacea</u>
Heliopora coerulea

<u>Order Pennatulacea</u>
Family Pteroeidae
Family Virgularidae

<u>Order Alcyonacea (soft corals & sea fans)</u>

<u>The Stolonifera Group</u>
Family Clavulariidae
Carijoa
Clavularia
Paratelesto

Family Coelogorgiidae
Coelogorgia

Family Tubiporidae
Tubipora

<u>The Alcyoniina Group</u>
Family Alcyoniidae
Cladiella
Klyxum
Lobophytum
Paraminabea
Sarcophyton
Sinularia

Family Nephtheidae
Capnella
Chromonephthea
Dendronephthya
Lemnalia
Nephthea
Paralemnalia
Scleronephthya
Stereonephthya
Umbellulifera

<u>Family Xeniidae</u>
Xenia
Heteroxenia

<u>Family Nidaliidae</u>
Nidalia
Nephthyigorgia
Siphonogorgia
Chironephthya

Family Paralcyoniidae
Studeriotes

<u>The Scleraxonia Group</u>
Family Briareidae
Briareum

Family Anthothelidae
Alertigorgia
Iciligorgia
Solenocaulon

Family Suberogorgia
Annella
Subergorgia

Family Melithaeidae
Melithaea
Acabaria

<u>Suborder Holaxonia</u>
Family Acanthogoriidae
Acanthogorgia
Muricella

Family Plexauridae
Astrogorgia
Bebryce
Echinogorgia
Echinomuricea
Euplexaura
Menella
Vilogorgia

Family Gorgoniidae
Guaiagorgia
Hicksonella
Rumphella
Pinnigorgia

<u>Suborder Calcaxonia</u>

Family Ellisellidae
Ellisella
Junceella
Dichotella
Verrucella

Family Ifalukellidae
Plumigorgia

Family Isididae
Isis hippuris


Dendronephthya sp. and *Melithaea* sp. (B.W. Hoeksema).


Studeriotes sp. , a typical soft-bottom dweller among the octocorals (B.W. Hoeksema).

Pontoniine shrimps – Dr. Charles H.J.M Fransen

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Fransen@naturalis.nl

The coral reef hosts many species of brightly coloured shrimps. Most of these belong to the subfamily Pontoniinae, (Decapoda, Caridea, Palaemonidae). This subfamily forms the most dominant group within the Palaemonoidea, which has been selected as target taxon. At present about 550 species are recognized, ca 400 of which have been recorded from the Indo-Pacific. Every year tens of new species are discovered. An interesting character of this group is the associations they form with other invertebrates. They can be found inside sponges, on a variety of cnidarians like hydroids, black corals, gorgonians, alcyonarians, stony corals and sea pens, on echinoderms, and inside bivalves and sea squirts.

Periclimenes soror on the blue sea star *Linckia laevigata* at 1 m depth (C.H.J.M. Fransen).

The scientific literature mentions only few records of these shrimps from West Papua. Most of the shrimps in this report are represent first records from Raja Ampat. Many species in this group have a cryptic life-style. They live in association with a single or a few host species. These shrimps are hard to identify based on traditional morphological characters. Sometimes the colour pattern gives an indication that different species are involved. Recent research using DNA-techniques revealed that many cryptic species can be expected. For these DNA-studies special attention will be given to a few genera living in association with stony corals, bivalves and sea squirts. Hopefully, after further analysis of the results, new species and associations will be found.

Periclimenes venustus on the fungid coral *Heliofungia actiniformis* at 15 m depth (C.H.J.M. Fransen).

Pontonides unciger on the black coral *Cirripathes* spec. at 20 m depth (C.H.J.M. Fransen).

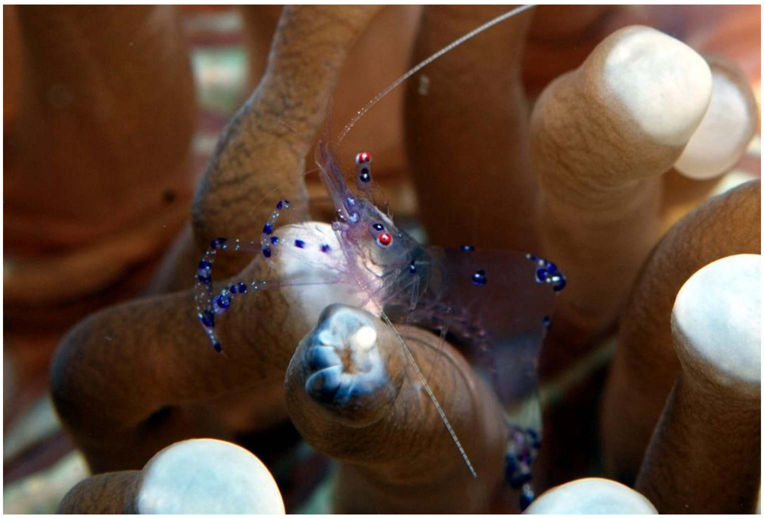
Shrimps were photographed on the host before collecting. During 36 dives a total of over 1200 underwater photographs were made of shrimps and their hosts. There were nearly 200 samples collected, comprising ca. 400 specimens. Preliminary identification of the material yielded ca. 77 species (table 1). This number is comparable with the diversity measured in other localities within the area of maximal marine diversity (table 2): East Kalimantan (2003: ca. 90 species), Cebu (1999: ca. 87 species), Sulawesi (1994: ca. 80 species), Ambon (1996: ca. 90 species) and Bali (2001: ca. 90 species), and distinctly higher than the localities outside this area: Seychelles (1992: 57 species), Pulau Seribu (2005: 60 species). It was observed that the diversity is high in the area as a whole, but seemingly moderate per dive site. The results will be compared with those of previous expeditions in the Indo-Malayan area to contribute to the knowledge of the location and delimination of the 'Centre of maximum marine diversity'.

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

	Raja Ampat	*P. Seribu*	*Kalimantan*	*Bali*	*Cebu*	*Ambon*	*Sulawesi*	*Seychelles*
	2007	*2005*	*2003*	*2001*	*1999*	*1996*	*1994*	*1992/93*
Free-living	6	1	8	4	6	6	4	6
Porifera	8	4	6	22	10	6	10	4
Hydrozoa	1	1	1	2	2	2	2	2
Actiniaria	8	3	8	2	6	8	8	2
Corallimorpharia	1	1	1	1	1	1	1	1
Scleractinia	23	16	23	18	25	22	20	20
Alcyonaria	3	4	7	3	2	8	5	5
Gorgonaria	4	4	8	3	4	5	4	11
Antipatharia	3	1	6	8	9	5	6	5
Echinoidea	0	1	1	2	2	1	1	1
Asteroidea	1	1	1	1	2	1	1	1
Crinoidea	7	5	9	12	9	9	10	3
Holothuroidea	1	1	1	0	0	1	1	1
Bivalvia	6	9	8	6	8	7	7	9
Ascidiacea	8	5	10	9	3	8	4	3

Table 2. Preliminary list of pontoniine species collected during the Raja Ampat Expedition.

Anchiopontonia hurri (Holthuis, 1981)
Anchistus custoides Bruce, 1977
Anchistus/Paranchistus spec. 1
Anchistus/Paranchistus spec. 2
Brucecaris tenuis (Bruce, 1969)
Climeniperaeus spec. 1
Conchodytes meleagrinae Peters, 1852
Coralliocaris graminea (Dana, 1852)
Coralliocaris superba (Dana, 1852)
Dactylonia ascidicola (Borradaile, 1898)
Dactylonia holthuisi Fransen, 2002,
Dasella herdmaniae (Lebour, 1939)
Dasycaris zanzibarica Bruce, 1973
Exoclimenella spec. 1
Hamodactylus boschmai Holthuis, 1952
Hamodactylus noumeae Bruce, 1970
Hamopontonia corallicola Bruce, 1970
? *Hamopontonia* spec. 1
Harpiliopsis spec. 1
Harpiliopsis spec. 2
Ischnopontonia lophos (Barnard, 1962)
Jocaste japonica (Ortmann, 1890)
Jocaste spec.
Kemponia kororensis (Bruce, 1977)
Kemponia tenuipes (Borradaile, 1898)
Kemponia spec. 1
Kemponia spec. 2
Laomenes amboinensis De Man, 1888
Manipontonia psamathe (De Man, 1902)
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)
Periclimenaeus pachydentatus Bruce, 1969
Periclimeneaeus spec. 1
Periclimeneaeus spec. 2
Periclimeneaeus spec. 3
Periclimeneaeus spec. 4
Periclimeneaeus spec. 5
Periclimenella spinifera (De Man, 1902)
Periclimenes brevicarpalis (Schenkel, 1902)
Periclimenes commensalis Borradaile, 1915
Periclimenes holthuisi Bruce, 1969
Periclimenes imperator Bruce, 1967
Periclimenes incertus Kemp, 1922
Periclimenes inornatus Kemp, 1922
Periclimenes lanipes Kemp, 1922
Periclimenes magnificus Bruce, 1979
Periclimenes ornatus Bruce, 1969
Periclimenes sarasvati Okuno, 2002
Periclimenes soror Nobili, 1904
Periclimenes venustus Bruce, 1990
Periclimenes watamuae Bruce, 1976
Periclimenes spec. nov. (in press.)
Periclimenes spec. 1
Periclimenes spec. 1
Philarius gerlachi (Nobili, 1905)
Platypontonia spec. nov.
Pliopontonia furtiva Bruce, 1973
Pontonides unciger Calman, 1939
Pontoniopsis comanthi Borradaile, 1915
Rapipontonia galene (Holthuis, 1952)
Thaumastocaris streptopus Kemp, 1922
Vir colemani Bruce, 2003
Vir euphyllius Marin & Anker, 2005
Vir philippinensis Bruce & Svoboda, 1984
Vir smiti Fransen & Holthuis, 2007
Vir spec. nov.
Pontoniinae spec. 1
Pontoniinae spec. 2
Pontoniinae spec. 3
Pontoniinae spec. 4
Pontoniinae spec. 5



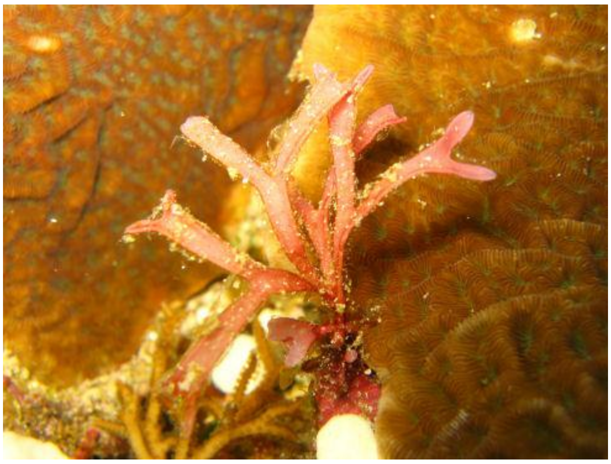
Periclimenes sp. on a mushroom coral, *Heliofungia actiniformis* (B.W. Hoeksema).

Macro algae – Dr. Stefano G.A. Draisma

Nationaal Herbarium Nederland - Universiteit Leiden, P.O. Box 9514, 2300 RA Leiden, The Netherlands
Draisma@nhn.leidenuniv.nl

As marine plants, algae are at the base of the food chain in the sea. Nevertheless, very few algae were observed on the reefs of Raja Ampat. Because the water is so clear, there cannot be a lot of phytoplankton either. Many algae live a hidden life on the reef. For example, some unicellular species live as "endosymbionts" in corals and other animals. They are largely responsible for the host's brown colour. The present research concerns large algae, the seaweeds, which are called 'gangang laut' in Indonesian; sometimes erroneously 'rumput laut', which means seagrass. They can be divided into two categories: 1) slow growers that can defend themselves against herbivores, and 2) fast growers that grow so fast that herbivores cannot keep up with them. The former group includes algae that can produce calciumcarbonate (limestone) as a defence against herbivory. In Raja Ampat many encrusting red algae were encountered. Many of the last group are blue-green algae (i.e., cyanobacteria). These and other filamentous algae are trimmed every day by fishes and echinoderms that live on the reef. So there is a very high turnover rate. Mangroves and seagrass beds also contain their own flora, although only consisting of a limited number of species; *Halimeda* sp., *Udotea* sp. (both green algae), and *Halymenia durvilei* (red alga).

Halimeda hederacea (S.G.A. Draisma)



Dichotomaria marginata (S.G.A. Draisma)

Gibsmithia hawaiiensis (S.G.A. Draisma)

My goal during this expedition was to make an inventory of the seaweed diversity of the region and to collect samples for DNA studies of certain algal groups that are subject of current phycological studies. My special interest concerns the green algal genus *Caulerpa* and the brown algal genus *Sargassum*, but not many of these were found. A *Caulerpa* specimen is in fact a very large unicellular alga which can have many shapes. Using DNA sequences, we try to unravel the relationships between the species of this genus. *Sargassum* is a seaweed genus with many described species, but their morphology is so variable that it is difficult to identify them. Again we use DNA sequences to act as an independent referee to identify species.

In the field, a picture of the alga is taken, after which it is collected and stored in a small numbered jar, to which a note on the depth is added. Part of the specimen is stored in silica in order to preserve it for later DNA extraction. This can also be done by storing the sample in alcohol (the alcohol replaces the water in the cells, which is called dehydration). After the DNA sample has been taken, the remainder of the alga is conserved in a 5% solution of formalin in sea water. Back home this will be preserved as a herbarium voucher for reference. After the treatment with formalin the specimen is usually unsuitable for DNA extraction. Collections were made at the following (RAJ) stations 1, 2, 3, 5, 6, 7, 8, 11, 12, 14, 15, 17, 18, 19, 20, 21, 22, 25, 26, 27, 28, 29, 31, 32, 33, 35, 37, 38, 40, 41, 43, 44, 45, 46, 47, 48, 49, 53, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, and Sungai Rabia (no RAJ number). Material collected by other expedition members came from RAJ 4, 9, 13, 16, 23, 30, 39, and 50.

In total, 823 collections were made belonging to an estimated 95+ genera and ca. 160 species; 239 collections green algae (Chlorophyta), 148 collections brown algae (Phaeophyceae), and 430 collections red algae (Rhodophyta). The first week of the expedition resulted in the collection of ca. 60 different species of macro algae. The collection grew to ca. 100 and ca. 120 species in respectively the 2nd and the 3rd week. In the 4th and last week some remote stations were visited and the collection was expanded to ca. 160 different species. On previous expeditions in Indonesia over 200 species of seaweeds were found. Additionally also a chrysophyte, a seagrass, some forams and 3 sponges were collected. Vouchered material will be submitted to the collection of the Nationaal Herbarium Nederland – Universiteit Leiden branch. Some collections have been sent to colleagues for identifications and they can use the ethanol/silica samples for their research.

- *Dictyota* and *Dictyopteris* specimens were sent to dr. O. de Clerck (Ghent, Belgium)
- *Codium* and *Halimeda* specimens were sent to dr. H. Verbruggen (Ghent, Belgium)
- *Padina*, *Lobophora*, *Distromium*, and *Ulva* specimens were sent to prof. H. Kawai (Kobe, Japan)
- Brown crusts (cf. *Ralfsia*) were sent to dr. M. Parente (Azores, Portugal)
- Corallinales, *Chondrophycus*, and *Laurencia* specimens were sent to prof. B. de Reviers (Paris, France)

Summary of collections and field identifications:

<u>Chlorophyta</u>

Anadyomene (4x), *Avrainvillea* (4x), *Boergesenia forbesii* (2x), *Boodlea* (7x), *Bryopsis* (5x), Caulerpa (66x, 19 spp.), *Chaetomorpha* (6x), *Chlorodesmis* (4x), *Cladophora* (11x), *Cladophoropsis* (1x), *Codium* (3x, 3 spp.), *Derbesia* (1x), *Dictyosphaeria* (11x), *Halimeda* (49x), *Microdyction* (5x), *Neomeris* (8x), *Pseudocodium* (1x), *Rhipidosiphon* (2x), *Rhipilia* (3x), *Rhipiliopsis* (4x), *Rhizoclonium* (1x), *Tydemania expeditionis* (8x), *Udotea* (3x), *Ulva* (3x), *Valonia* (9x), Other unidentified green algae (20x).

<u>Heterokontophyta</u>

Chrysophyceae : *Chrysocystis fragilis* (1x)

Phaeophyceae : Brown crusts (cf. *Ralfsia*, 8x), brown filamentous (ectocarpalean, 1x), *Canistrocarpus* (6x), *Dictyopteris* (8x, 2 spp.), *Dictyota* (25x, 9+ spp.), *Distromium* (2x), *Hormophysa cuneiformis* (3x), *Hydroclathrus* (1x), *Lobophora* (13x), *Padina* (36x), *Sargassum* (23x), *Stypopodium* (1x), *Turbinaria* (22x, 4 spp.).

<u>Rhodophyta</u>

Acanthophora (4x), *Actinotrichia* (2x), *Amansia* (2x, 2 spp.), *Amphiroa* (5x), *Ceramium* (4x), *Champia* (2x), *Chondria* (1x), *Chondrophycus papillosus* (3x), cf. *Crouania* (4x), *Dasya* (1x), *Dichotomaria marginata* (85x), *Digenea simplex* (3x), *Erytrocolon podagricum* (1x), *Ethelia* (3x), *Euptilota* (14x), *Galaxaura obtusata* (1x), *Gelidiella acerosa* (1x), *Gelidiopsis* (10x), *Gibsmithia* (27x, 2 spp.), *Gracilaria* (3x), *Grateloupia* (6x), *Griffithsia* (1x), cf. *Halichrysis* (3x), *Haloplegma dupereyi* (4x), *Halymenia* 25x), *Hydropuntia* (1x), *Hypnea* (36x, mainly *pannosa*), *Hypoglossum* (3x), *Jania* (2x), *Kallymenia* (3x), *Kappaphycus* (2x), *Laurencia* (2x), *Leveillea* (2x), *Lithothamnion* (2x), *Martensia fragilis* (3x), *Mastophora* (2x), *Melanamansia glomerata* (1x), *Meristotheca procumbens* (2x), *Neogoniolithon laccadivicum* (2x), cf. *Neosiphonia* (2x), *Neurymenia fraxinifolia* (2x), cf. *Nitophyllum* (1x), *Peysonnelia* (22x), cf. *Platoma* (1x), *Polysiphonia* (4x), *Portieria hornemannii* (4x), *Predaea* (29x), *Pterocladiella* (2x), cf. *Renouxia* (1x), (cf.) *Rhodymenia* (13x), cf. *Sebdenia* (1x), *Spyridia* (1x), *Titanophora* (10x, 3 spp.), *Tricleocarpa* (5x, 2 spp.), *Vanvoorstia coccinea* (5x), cf. *Wrangelia* (6x), *Zellera tawallina* (5x). Other unidentified red algae (34x).

<u>Magnoliophyta</u>

Halophila (1x)

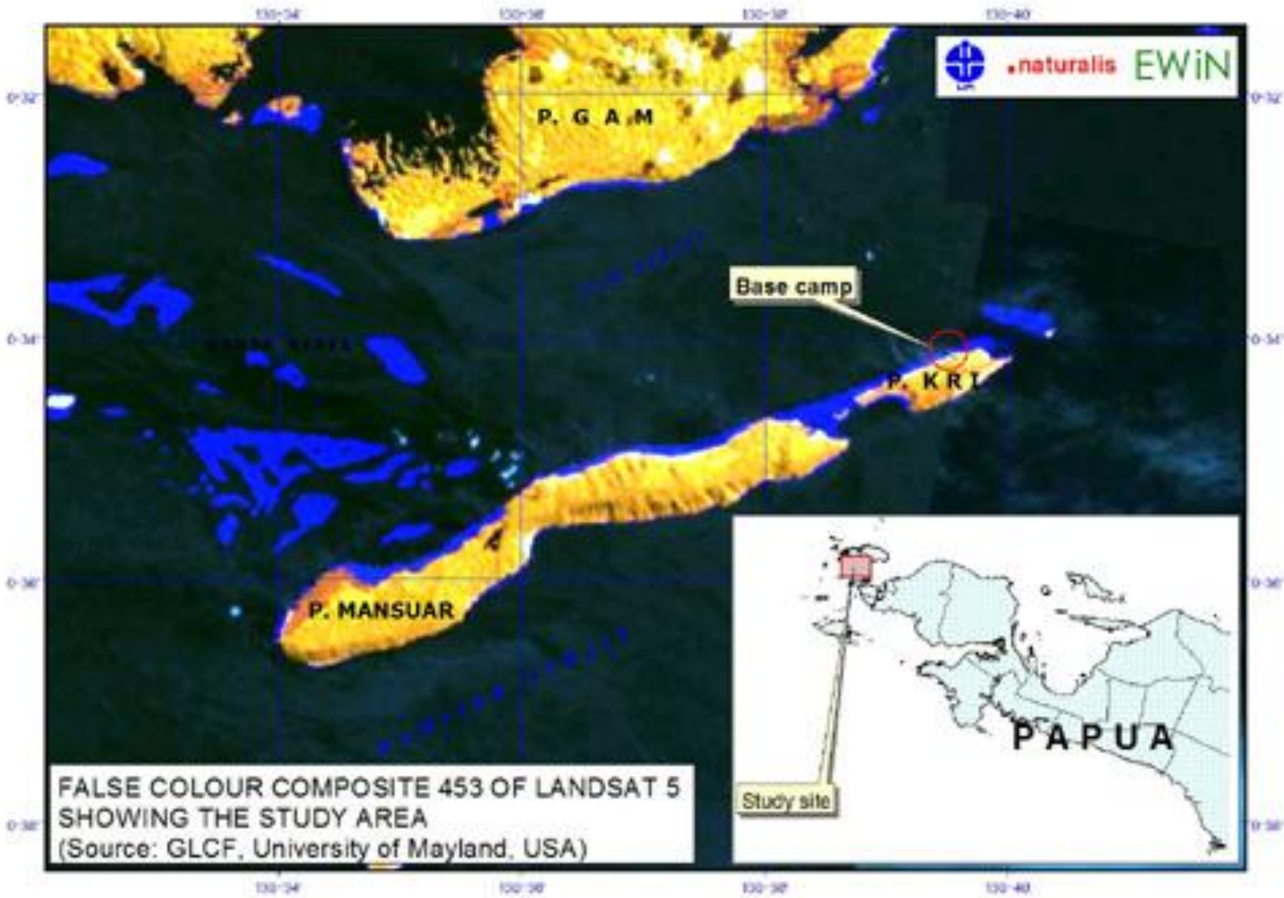
<u>Animalia</u>

sponge (3x, with possible algal endo-symbionts)

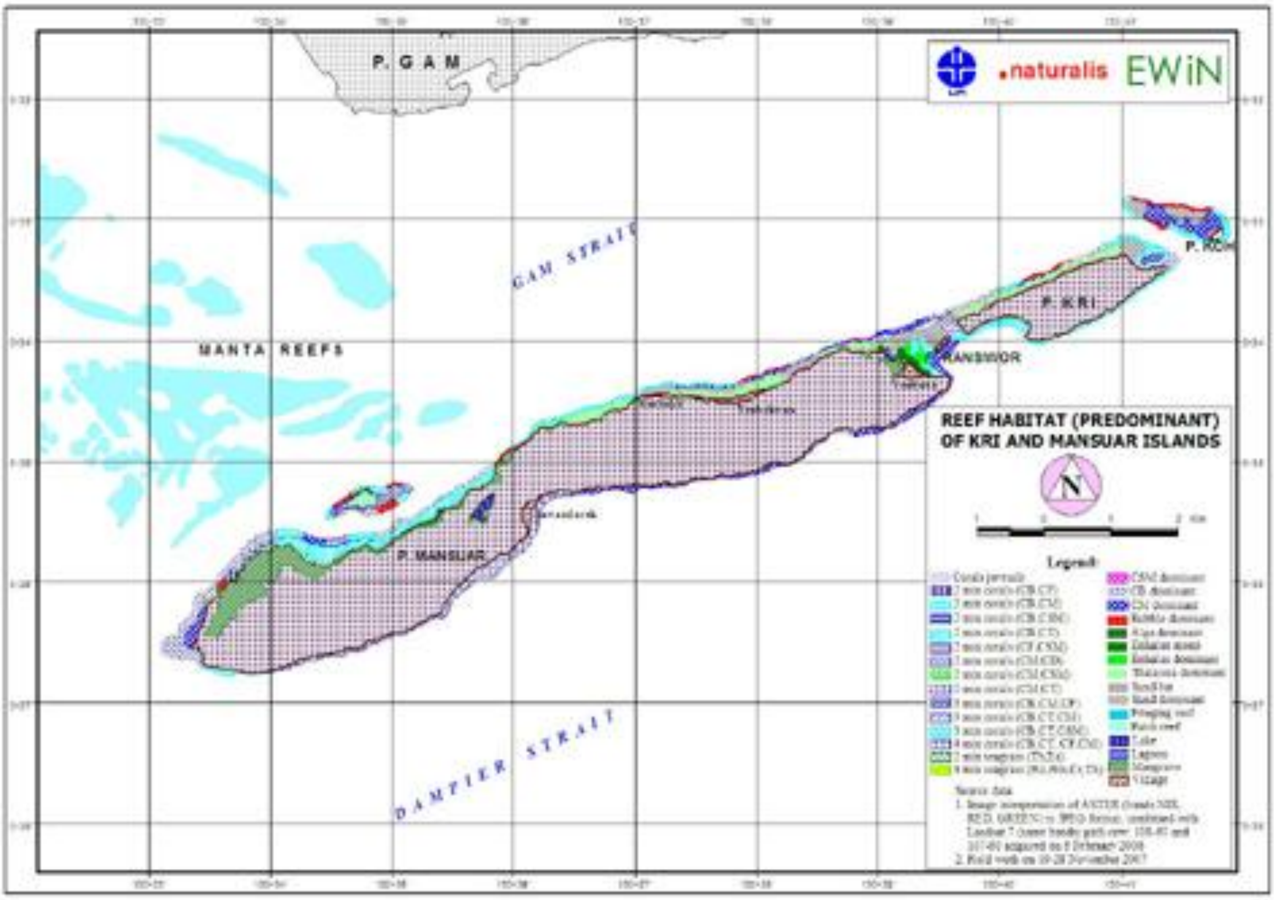
Reef flats of Mansuar and Kri - Drs. Winardi

Research Center for Oceanography, Indonesian Institute of Sciences (RCO-LIPI), JL. Pasir Putih I, Ancol Timur, Jakarta 14430, Indonesia.
winardi@coremap.or.id

A survey to map the reef condition of Mansuar Island, Kri Island and surroundings (Raja Ampat Regency, West Papua Province, Indonesia) was carried out 19-30 November 2007. This study is part of the Expedition of Widya Nusantara (EWiN) conducted by LIPI in collaboration with Naturalis, the Netherlands.
Based on the preliminary survey results, the reef flats of the study area are mostly composed of sea grass beds, sand flats, and coral reefs. The sea grass species *Thalassia hemprichii, Enhalus acoroides, Cymodocea rotundata, Cymodocea serrulata, Halodule pinifolia, Halophila minor* and *Halophila ovalis* were recorded. The marine fauna associated with the sea grass beds was mostly dominated by sea stars, with a cover of about one individual per 25 square metres. Sea cucumbers were only found in very low densities during the survey. Some sponge species, sea anemones, and algae (mostly belonging to the genera *Caulerpa* and *Halimeda*) were also found on the reef flats.



Several coral life forms can be recognised on the reefs, such as branching, massive, sub-massive, tabulate, digitate and foliose coral. In addition, Heliopora corals (blue corals) were found. Soft-corals of the genera *Lobophytum, Sarcophyton, Xenia,* and *Sinularia* were also recorded. Coral damage caused by dynamite fishing was obviously present in some areas.



All the recorded data was used to compose a map containing the predominant reef habitats of Kri and Mansuar Island. Satellite images of the study area were used as a starting point for this study.

The seacucumber *Thelenota rubralineata* is found on deeper reef slopes, here at SW Mansuar I. (B.W. Hoeksema).

Soft corals as host for pygmy seahorses - Drs. Frank R. Stokvis & Dr. L.P. van Ofwegen

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Stokvis@naturalis.nl; Ofwegen@naturalis.nl

Pygmy seahorses belong to the genus *Hippocampus* (Pisces: Syngnathidae: Hippocampus), in which 33 species are recognized worldwide. Partially as a result of the growing popularity of underwater photography a number of pygmy seahorses have recently been described. They occur predominantly on sea fans and hydroids. These host species possess stinging cells (nematocysts) in their tentacles, which function in food capturing and as a defence against predators. As commensal symbiont of Cnidaria, pygmy seahorses are probably immune to the poison.

The camouflage of pygmy seahorses practically makes them nearly undetectable on their host. The surface of the host species is being imitated in the finest detail. Skin-structures of these pygmy seahorses resemble the polyps of the hosts. Furthermore, as the name suggests, pygmy seahorses are of minute proportions (about 5 mm). Because of their perfect camouflage, the search for pygmy seahorses is a time-consuming business. The occurrence of the host species from 20 meters depth downward severely limits the available dive time to track them. So far, four species have been discovered during the expedition, partially thanks to the trained eyes of the dive guides. Three of these species seem very host-specific, which suggests a co-evolution of host and symbiont . However, the sea fans with which we are dealing can only be identified with certainty after microscopical research of their skeletal elements: the sclerites.

The relation between the fourth discovered species and its host remains unclear. While photographing under water these pygmy seahorses proved to be very mobile and constantly jumping over to different species of hydroids.

Hippocampus bargibanti on *Muricella* spec. (F.R. Stokvis).

Hippocampus denise on *Anella* spec. (F.R. Stokvis).

Hippocampus spec. on *Anella* spec. (F.R. Stokvis).

Hippocampus spec. on hydroid (F.R. Stokvis).

Records and samples

In total 163 samples of Octocorallia were collected, consisting of 37 genera (Table 1). Of each sample three photographs were taken: 1) Overview; 2) Close-up of the branch tips with polyps extended; 3) Close-up of branch tips with polyps retracted.

21 records of *Hippocampus* were made (Table 2), of which 18 were successfully photographed. These consist of four species, of which two are yet undescribed.

Table 1. Overview of Octocorallia genera collected in Raja Ampat.

Order	Suborder	Family	Genus
Alcyonacea	Stolonifera	Clavularidae	*Carijoa*
			Paratelesto
			Telesto
		Tubiporidae	*Tubipora*
	Alcyoniina	Alcyoniidae	*Paraminabea*
		Nephtheidae	*Chromonephthea*
			Scleronephtya
		Nidaliidae	*Siphonogoria*
			Chironephthya
			Studeriotes
		Anthothelidae	*Iciligorgia*
			Solenocaulon
			Alertigorgia
		Subergorgiigae	*Subergorgia*
			Annella
		Melithaeidae	*Melithaea*
			Acabaria
Gorgonacea	Holaxonia	Acanthogorgiidae	*Acanthogorgia*
			Anthogorgia
			Muricella
		Plexauridae	*Euplexaura*
			Bebryce
			Echinomuricea
			Echinogorgia
			Menella
			Astrogorgia
		Gorgoniidae	*Rhumphella*
			Hicksonella
			Guaiagorgia
			Pinnigorgia
	Calcaxonia	Ellisellidae	*Ellisella*
			Junceella
			Dichotella
			Verrucella
		Ifalukellidae	*Plumigogia*
		Isididae	*Isis*

Table 2. Overview of pygmy seahorse species encountered and their coral host (with collector) in Raja Ampat.

Species	Host	Colony height	Locality	Depth	Observer
Hippocampus bargibanti	*Muricella* spec.	30 cm	RAJ.05	18 m	Veer, E. van der
Hippocampus bargibanti	*Muricella* spec.	25 cm	RAJ.05	18 m	Reijnen, B.T.
Hippocampus bargibanti	*Muricella* spec.	60 cm	RAJ.12	14 m	Veer, E. van der
Hippocampus bargibanti	*Muricella* spec.	70 cm	RAJ.20	12 m	Stokvis, F. R.
Hippocampus bargibanti	*Muricella* spec.	30 cm	RAJ.55	16 m	Stokvis, F. R.
Hippocampus bargibanti	*Muricella* spec.	70 cm	RAJ.55	21 m	Stokvis, F. R.
Hippocampus bargibanti	*Muricella* spec.	70 cm	RAJ.05	23 m	Stokvis, F. R.
Hippocampus bargibanti	*Muricella* spec.	100 cm	RAJ.05	21 m	Stokvis, F. R.
Hippocampus bargibanti	*Muricella* spec.	80 cm	RAJ.69	23 m	Stokvis, F. R.
Hippocampus denise	*Annella* spec.	80 cm	RAJ.22	20 m	Stokvis, F. R.
Hippocampus denise	*Annella* spec.	100 cm	RAJ.03	22 m	Stokvis, F. R.
Hippocampus denise	*Annella* spec.	50 cm	RAJ.05	22 m	Stokvis, F. R.
Hippocampus denise	*Echinogorgia/ Annella*	50 cm	RAJ.05	20 m	Stokvis, F. R.
Hippocampus spec. 1 "pontohi"	Hydroid	–	RAJ.03	26 m	Stokvis, F. R.
Hippocampus spec. 1 "pontohi"	–	–	RAJ.08	20 m	Stokvis, F. R.
Hippocampus spec. 1 "pontohi"	Hydroid	20 cm	RAJ.21	8 m	Veer, E. van der
Hippocampus spec. 2 "white"	*Annella* spec.	60 cm	RAJ.57	24 m	Stokvis, F. R.
Hippocampus spec. 2 "white"	*Annella* spec.	30 cm	RAJ.57	24 m	Hoeksema, B.W.
Hippocampus spec. 2 "white"	*Annella* spec.	30 cm	RAJ.57	24 m	Veer, E. van der
Hippocampus spec. 2 "white"	*Annella* spec.	30 cm	RAJ.65	22 m	Stokvis, F. R.
Hippocampus spec. 2 "white" red variant	*Annella* spec.	40 cm	RAJ.57	22 m	Stokvis, F. R.

An octocoral, *Annella reticulata*, as habitat for a specimen of *Hippocampus denise* (B.W. Hoeksema).

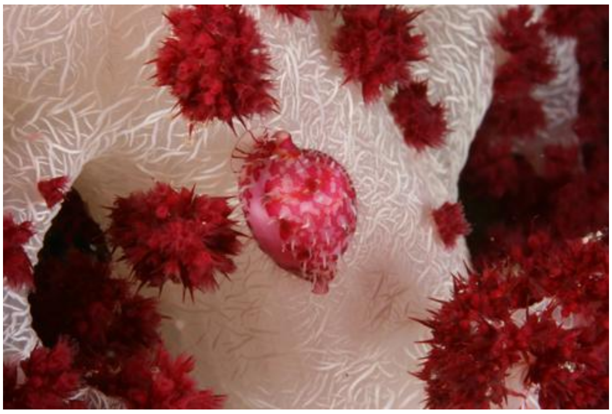
Ovulid snails and soft corals – Drs. Bastian Reijnen & Dr. L.P. van Ofwegen

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Reijnen@naturalis.nl; Ofwegen@naturalis.nl

Snails of the family Ovulidae live primarily on soft corals, but also on hydrocorals and black corals. They occur all over the world in both temperate and tropical oceans. The highest species diversity occurs in the Indo-Pacific. In the North Sea one species is known (*Simnia patula*), which it is often found by trawling. A characteristic feature of most ovulid species is that they can copy the appearance of their host by camouflage. Ovulidae have a mantle that covers their shell. The mantle of the snails, like e.g. *Dentiovula eizoi*, can have bright colours and remarkable textures resembling the branches of the coral host. In order to investigate the evolution of how the snails have developed the ability to copy the colour or texture of their host, we have collected samples of both snails and the soft coral hosts for DNA analysis. The samples are used to investigate if there is a specific relationship between the snails and corals. For example, is one soft coral species always inhabited by the same snail species or do we find different species of snails living on a single host? Many host corals may look identical but through a study of the sclerites, they may appear to be separate species. In case a soft coral species is new to science, a description or identification is impossible without tissue samples.

During a previous inventory of the mollusc fauna (Wells, 2002), which took place during a Rapid Assessment of Conservation International, four species of Ovulidae were recorded: *Calpurnus verrucosus*, *Diminovula punctata*, *Ovula ovum* and *Prionovolva brevis*. These four species were found at nine localities, but their coral hosts were not recorded.

Dentiovula eizoi on *Acanthogorgia* spec. (B.T. Reijnen).



Pseudosimnia culmen on *Dendronephthya* spec. (B.T. Reijnen).

Prosimnia piriei on *Euplexaura* spec. (B.T. Reijnen).

Prosimnia draconis on *Acabaria* sp. (B.T. Reijnen).

The only study on Indo-Pacific Ovulidae with records on their host species was made by Schiaparelli *et al.* (2005). They collected 17 ovulids and their hosts. In the present report, the host corals are identified to genus level. With the help of microscopic slides and SEM photography we will try to identify the sampled soft corals and to elucidate the symbiotic relations between the ovulid snails and their soft coral hosts. A total of 105 samples of Ovulidae were collected. One sample may contain multiple individuals.

Preliminary identifications indicate 21 species divided over 11 genera (Table 1). After the first three weeks of collecting, around 20 species of Ovulidae were found on various soft coral species. Due to their camouflage, the Ovulidae were difficult to find, which restricted the number of observations.

Almost all soft coral species are identified on genus level and approximately 30% is identified at species level. Identification of soft coral species is still pending but preliminary identifications of the corals show at least 18 different genera and 23 different species. Specimens of *Phenacovolva* sp., which lived on the black coral *Antipathes* sp., were found in muddier and more sheltered localities while all other species were found on the coral reef slopes in between 0,1 and 25 metres of depth. The best locations to collect Ovulidae proved to be to sheltered reefs with a moderate current. Overall, the best place for ovulids was 'Mike's Point' (RAJ05) at the South of Gam Island, which was visited several times. This locality was far from fresh water runoff, which may have had a positive influence on the abundance of soft corals and Ovulidae. Ovulidae were almost absent at reefs or bays that are exposed to fresh water runoff or strong current. Night dives appeared the most effective to find the snails. A maximum number of five different species in a dive was sampled during a night dive at the Jetty of the resort (RAJ01). In night time, the snails tend to climb and crawl on their host instead of hiding underneath the bushy branches or substrate.

References

Wells, F.E. 2002. Molluscs recorded at the Raja Ampat Islands. *RAP Bulletin of Biological Assessment* 22: 113-131. Conservation International, Washington, DC.

Schiaparelli S, Barucca M, Olmo E, Boyer M, Canapa A. 2005. Phylogenetic relationships within Ovulidae (Gastropoda: Cypraeoidea) based on molecular data from the 16S rRNA gene. *Marine Biology* 147: 411-420.

Table 1. Overview of ovulids species combined with soft coral host records.

#	Species	Samples	Individuals	Host corals (# corals)
1	*Crenavolva rosewateri* Cate, 1973	4	11	*Stereonephthya* sp. (4)
2	*Cymbovula deflexa* (Sowerby 2nd, 1848)	2	4	*Rumphella* sp. (2)
3	*Cymbovula kurziana* Cate, 1976	4	8	*Rumphella* sp. (4)
4	*Dentiovula dorsuosa* (Hinds, 1844)	2	3	*Siphonogorgia* sp. (2)
5	*Dentiovula eizoi* Cate & Azuma, 1973	6	15	*Acanthogorgia* sp. (6)
6	*Habuprionovolva aenigma* (Azuma & Cate, 1971)	6	6	*Dendronephthya* sp. (6)
7	*Habuprionovolva hervieri* (Hedley, 1899)	1	1	*Dendronephthya* sp. (1)
8	*Hiata coarctata* (Adams & Reeve, 1848)	1	1	*Viminella* sp. (1)
9	*Hiata rugosa* Cate & Azuma, 1973	5	6	*Ellisella* sp. (4); unknown (1)
10	*Ovula ovum* (Linnaues, 1758)	2	2	*Sarcophyton* sp. (2)
11	*Pedicularia pacifica* (Pease, 1865)	10	39	*Stylaster* sp. (10)
12	*Pedicularia vanderlandi* Goud & Hoeksema, 2001	4	20	*Distichopora* sp. (4)
13	*Phenacovolva gracilis* (Adams & Reeve, 1848)	2	3	*Antipatharia* sp. (2)
14	*Phenacovolva philippinarum* Sowerby 2nd, 1848	6	8	*Annella* sp. (4); unknown (2)
15	*Prionovolva* cf. *ericae* (Cossignani & Calo, 2002)	10	35	*Dendronephthya* sp. (10)
16	*Prionovolva* sp.	1	1	*Stereonephthya* sp. (1)
17	*Prosimnia draconis* Cate, 1973	7	15	*Acabaria* sp. (2); *Melithaea* sp. (3); unknown (2)
18	*Prosimnia piriei* (Petuch, 1973)	2	2	*Euplexaura* sp. (1); *Subergorgia* sp. (1)
19	*Prosimnia semperi* (Weinkauff, 1881)	11	19	*Melithaea* sp. (5); *Mopsella* sp. (1); unknown (5)
20	*Pseudosimnia (Inflatovula) culmen* Cate, 1973	6	7	*Dendronephthya* sp. (6)
21	*P. (Inflatovula) marginata* (Sowerby 1st, 1828)	13	32	*Nephthea* sp. (11); *Stereonephthya* sp. (2)
	Total	105	238	


Ovulid snails, *Cymbovula kurziana,* crawling over their coral host, *Rumphella* sp., during a night dive at Mike's Point (B.W. Hoeksema).


The chromodorid nudibranch *Glossodoris astromarginata* (B.W. Hoeksema).

Large benthic foraminifera – Dr. Willem Renema

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Renema@naturalis.nl

Foraminifera are unicellular organisms with a calcareous skeleton. Because they are usually abundant and can easily fossilise, they are well-known by palaeontologists. The large benthic foraminifera, which were studied during the present expedition, form an informal group that includes reef-dwelling species. They are generally recognised by their relatively large size (often >0.5 mm). A better characterization of the group is that they are symbiont-bearing, just like reef corals. They harbour a diverse suite of algae which photosynthesise. The foraminifera (host) supplies them with energy by feeding, which is used by the algae (symbiont) to produce energy. The excess energy is utilised by the host to grow and eventually reproduce. Because of similar environmental requirements to corals, large benthic foraminifera are often used as indicators of reef quality. During this expedition I was mostly interested in the bio-geographical patterns, i.e. which species occur in Raja Ampat, and in which other areas these species occur as well. At two-thirds of my stay at Kri about 23 species were observed. After inspection of the collected samples by microscope there will be some additions.

Three distinct assemblage types, associated with different reef habitats, occur in large benthic foraminifera. In the shallow part of the reef, say less than 3-4m deep, a diverse group of forams lives on algae and coral rubble. The second group lives on the reef slope, from 3-4 m depth down to the end deepest part of coral rubble. Between areas this is a relatively homogeneous group of 6-7 species with a wide distribution in the Indonesia and the Pacific. The last group lives on the sediment below the reefs, where they can live down to >100m depth (the limit of the penetration of light in the water column). Obviously this is too deep to sample by diving, and for a full assessment of this group grab samples taken from a boat are needed. However at some places, e.g. steep walls or caves, deep living species can occur shallower. Three of the species that I did not yet encounter in Raja Ampat, but were present in other species-rich areas in Indonesia, are from this group. They are likely to be found when we sample deeper sediments. However, also one species occurring on reef slopes, and another occurring on shallow flats, have not been found either.

Operculinella cummingii, a typical species of the large benthic foraminifera living on sand (W.Renema).

Amphisorus sp. This not yet described species occurs on the shallow parts of the reefs. The size of this specimen is 3 mm (W. Renema).

Heterostegina depressa, one of the most abundant species on the reef slope (W. Renema).

Research Center for Oceanography, Indonesian Institute of Sciences (RCO-LIPI), Jl. Pasir Putih I, Ancol Timur, Jakarta 14430, Indonesia.
Inayayt.lipi@gmail.com

During the expedition, polychaetes were sampled at RAJ stations with shallow water pools, beaches, as well as in the marine lakes in the area. A total of 353 indivuals and 25 polychaete families were found in the Raja Ampat island group. Special attention has been paid to the Syllidae, a family which was extensively studied at Naturalis in November 2008.

Table 1: Polychaete families found in Raja Ampat, counted as the total number of individuals per family.

	st.1	st.2	st.3	st.4	st.5	st 6	Mansuar Lake	Mansuar Lake	Cape Kri	St 2.	Wallace Lake	Akber Reef	st.2	st. 1	st.2	st.1	st.2	st.3	st.4		st. 1	st. 2	Ctenophore Lake	st. 4
RAJ Stations	01	01	01	01	01	01	04	06	07	07	13	14	15	18	18	18	18	18	18	18	21	22	23	29
Family																								
Aphroditidae															1		1						1	
Amphinomidae																								
Capitellidae			3	1	1	1									2									1
Chaetopteridae															1									
Eunicidae		1	3	2	2	1					6										1		7	1
Glyceridae																	1							1
Hesionidae																	1						2	
Lumbrineridae					1						1										1		1	
Magellonidae															1									
Maldanidae			1	1	1	3																		
Nephtyidae																								
Nereididae				1	1	1	9	14			5				2		1		2	33			41	
Onuphidae		1	1	9	2	8											1							
Opheliidae									1						1			1	1	5				
Orbiniidae				4	1	3												3	2					
Paraonidae	1		1	4										1		1								
Pilargidae																								
Phyllodocidae	1														1					1				
Poechilochaetidae				1																				
Sabellidae			1	12		7						1			1					1				
Scalibregmatidae	1					1					1		1	2	3	1								
Serpulidae											3													
Spionidae				2					1	2					2	1	11			1				
Syllidae	15	5	5	8	8	5		4	1	3	1				3	1				3		1	5	
Terebellidae	1			3						1	2								1	1			1	
Total Individuals	**19**	**7**	**15**	**48**	**17**	**30**	**9**	**18**	**3**	**6**	**19**	**1**	**1**	**3**	**18**	**4**	**16**	**4**	**6**	**45**	**2**	**1**	**58**	**3**

Table 1: continued.

	st. 1	st. 4	intertidal	st. 3	st. 3	Passage	Jenanas	st.2	Passage	st.1	st .1	st 1.	st 2.	st 4.		st. 2	st. 1 Kri	st. 5	st 1. lake 8	st 2. lake 8	st 3. lake 8	outside lake 8	**TOTAL**
RAJ Stations	33	33	35	37	38	43	43	43	43	44	47	48	48	48	49	49							
Family																							
Aphroditidae																							**3**
Amphinomidae								1															**0**
Capitellidae																							**9**
Chaetopteridae																							**1**
Eunicidae	1									1	4	1										1	**24**
Glyceridae		1			1														1	1			**2**
Hesionidae				1																			**3**
Lumbrineridae																							**4**
Magellonidae	2																						**1**
Maldanidae												1											**6**
Nephtyidae								1						1									**0**
Nereididae			1	1									2				17						**110**
Onuphidae											3												**22**
Opheliidae						1						1						1					**9**
Orbiniidae																							**13**
Paraonidae				2			1	1			5												**8**
Pilargidae														1									**0**
Phyllodocidae																							**3**
Poechilochaetidae														2	1								**1**
Sabellidae											2		1		1	1							**23**
Scalibregmatidae	1																	1					**10**
Serpulidae																							**3**
Spionidae		1		1							6				1	1				2			**20**
Syllidae		3		2		1	4		13		5				1		2						**68**
Terebellidae											3										2		**10**
Total Individuals	**4**	**5**	**1**	**7**	**1**	**2**	**5**	**3**	**13**	**1**	**28**	**3**	**3**	**4**	**4**	**2**	**19**	**2**	**1**	**3**	**2**	**1**	**353**

Flatworms and nudibranchs – Prof. Dr. Gerard van der Velde

Radboud University, Animal Ecology & Ecophysiology, P.O. Box 9010, 6500 GL Nijmegen, The Netherlands & National Museum of Natural History – Naturalis, P.O. Box 9517, 2300 RA Leiden, The Netherlands.
g.vandervelde@science.ru.nl

Flatworms and nudibranchs are colourful free-living animals on reefs, in mangroves and in saline lakes. Any resemblance between both groups is superficial and they are evolutionary very different. Flatworms are the most primitive 2-sided symmetrical, multi-cellular animals. They possess primitive eyes, an extensive intestinal system and a muscularly pharynx, which is protruded into a prey for the injection of enzymes. In this way digested food can be sucked up by the muscular pharynx. The food particles are taken up directly by the cells of the intestine. An anus is lacking. Flatworms form a thin layer and do not possess gills. Usually, two tentacles are visible at the head. Flatworms are hermaphrodites and possess male as well as female genitalia. Recently it became known that polyclad flatworms fight duels for a fathership. They do a lot of effort to fertilise another individual with their sperm.

Polyclad flatworm, *Pseudoceros lindae* (B.W. Hoeksema).

Polyclad flatworm, *Pseudoceros* sp. (B.W. Hoeksema).

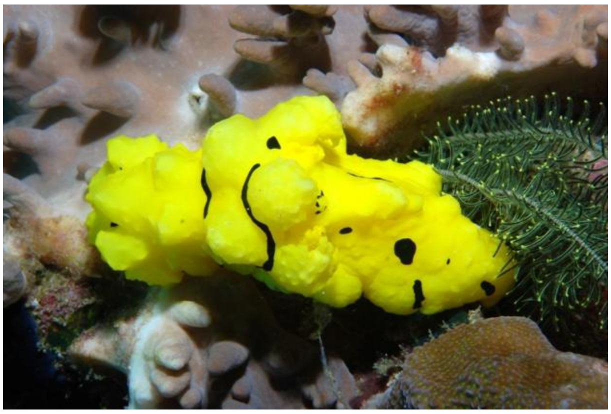
Acoel turbellarian flatworms on underside of a fungiid, *Fungia* sp. (B.W. Hoeksema).

Acoel turbellarian flatworms on a faviid, *Platygyra* sp. (S.E.T. van der Meij).

About 16 species of flatworms were recorded in Raja Ampat: 14 polyclads and 2 acoelens, all collected till depths of 25 m. All species were photographed alive and subsequently fixed in alcohol. Some polyclad flatworms appeared to be very good swimmers. Polyclads in particular possess a large colour variation for camouflage or warning, which indicates that the animals is not edible. They feed very often on tunicates from which they use the poisons for their own chemical defence against predators. Some flatworm species possess the same poison as puffer fish, one of the most deadly poisons. Interestingly, some fish species show mimicry with respect to colours, colour patterns and form of the flatworms although these fishes themselves are not poisonous (mimicry of Bates). Some flatworms and nudibranchs resemble eachother (mimicry of Mueller). Flatworms disintegrate easily when they are stressed for example by higher temperatures than normal of non-refreshed water. Therefore it is important to photograph the animals quickly after they have been collected. Preserved animals loose all their distinctive colours and they coil in irregular shapes, which is why little is known about them and why still many species have to be described or named.

Nudibranchs are much better known. As an adult these animals bear no longer a shell. Ca. 50 species of Opisthobranchia, to which also the Nudibranchia belong, have been collected. The nudibranchs are photographed alive and subsequently preserved in alcohol. The snails have more body mass than the flatworms and possess external gills to obtain oxygen from the water. Location, number and form of the gills are important for their systematics. Nudibranchs are highly developed snails at which the shell reduced in the course of the evolution. Their defence is chemical by mucus, poisons and nematocysts obtained from their prey such as ascidians and hydroids. Just as at the polyclad flatworms many colour patterns are known for camouflage or warning for predators. Many species are insufficiently studied anatomically and highly variable species may consist of several species. Therefore also DNA research is needed.


Nudibranch, *Chromodoris willani* (B.W. Hoeksema).


Nudibranch, *Notodoris minor* (B.W. Hoeksema).

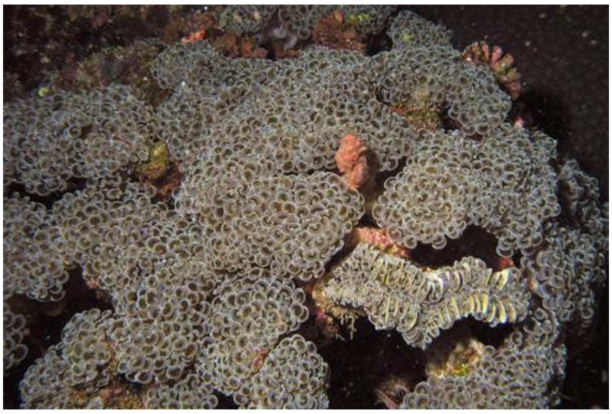

Elysiid nudibranch, *Thurdilla* sp. (B.W. Hoeksema).


Nudibranch, *Phyllidia* sp. (B.W. Hoeksema).

Shrimps of the genus *Vir* and their coral hosts – Ms. Eva van der Veer & Dr. C.H.J.M. Fransen

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Veer@naturalis.nl; Fransen@naturalis.nl

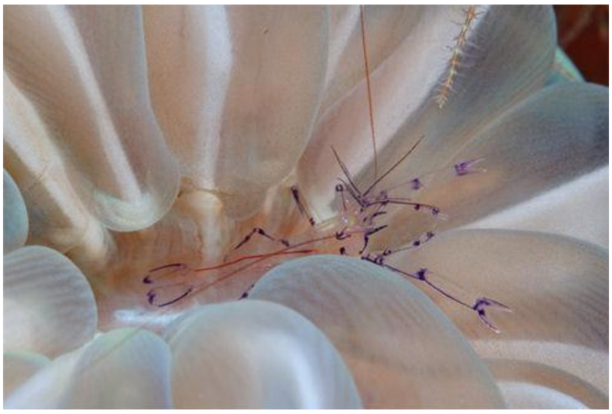
The high species diversity of Indonesian coral reefs is partly related to numerous interspecific associations between species. We studied the evolutionary relationship between coral hosts and symbiotic shrimps. The corals of the bubble-coral family Euphylliidae have fleshy tentacles, which are exposed day and night. They provide shelter to shrimps of the shrimp genera *Vir* and *Periclimenes*. Some corals may host different shrimp species. The main research question is whether co-speciation between the host and the symbiont has occurred. Co-speciation implies that species that live together have a linked evolutionary development. For example, if the host evolves into a new species, does the symbiont co-evolve as well? One way to detect possible co-speciation is by projecting the symbiont group's phylogenetic model on that of the host species. These phylogenetic reconstructions can be obtained by analyses of specific morphological characters and DNA. Therefore, photographs of the coral hosts and their shrimps were taken. The colour patterns were used for species identifications. Collected shrimps were preserved in alcohol, whereas also a sample of host DNA has been taken. Eventually, almost all coral species searched for were found during the expedition, 14 species in five genera (Veron, 2000). Of these 14 species, ten were found at Raja Ampat (Table 1). The symbiotic shrimps found on these corals were also collected, and after comparison of the morphology and the photographs taken, at least five of the six species within the genus *Vir* were found (Table 2).



Euphyllia ancora (E. van der Veer).

Vir euphyllius on *Euphyllia ancora* (C.H.J.M. Fransen).

Plerogyra sinuosa (E. van der Veer).



Shrimp with intermediate colour pattern between *Vir philippinensis* and *Vir colemani* (C.H.J.M. Fransen).

Table 1: Overview of coral species	Number of specimens
Euphyllia cristata Chevalier, 1971	15
Euphyllia glaberescens (Chamisso and Eysenhardt, 1821)	19
Euphyllia ancora Veron and Pichon, 1980	12
Euphyllia parancora Veron, 1990	7
Euphyllia yaeyamaensis (Shirai, 1980)	7
Euphyllia divisa Veron and Pichon, 1980	9
Catalaphyllia jardinei (Saville-Kent, 1893)	1
Plerogyra sinuosa (Dana, 1846)	9
Plerogyra simplex Rehberg, 1892	1
Physogyra lichtensteini (Milne Edwards and Haime, 1851)	30

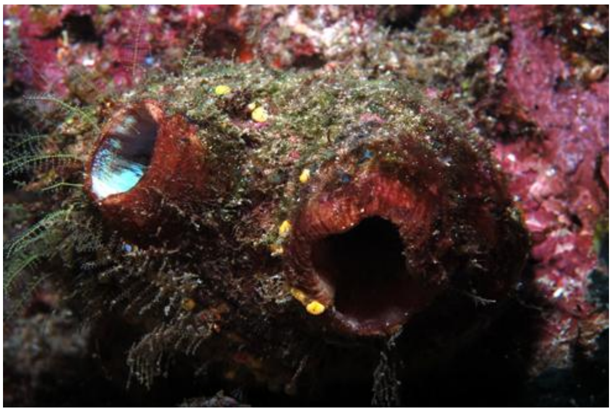
Table 2: Overview of shrimp species	Number of specimens
Vir smiti Fransen & Holthuis, 2007	5
Vir euphyllius Marin & Anker, 2005	5
Vir philippinensis Bruce and Svoboda, 1984	1
Vir colemani Bruce, 2003	5
Vir orientalis (Dana, 1852)	3 (?)
Vir spec. nov. (Fransen, in prep)	11
Periclimenes sarasvati Okuno, 2002	1
Periclimenes magnificus Bruce, 1979	3
Periclimenes venustus Bruce, 1990	4
Hamopontonia corallicola Bruce, 1970	4
Vir spec. unidentified	31

Catalaphyllia jardinei is a coral species that lives semi-buried in sand. The only specimen found during the expedition did not contain symbiotic shrimps (B.W. Hoeksema).

Commensal amphipods and host associations – Prof. Dr. James D. Thomas

NSU Oceanographic Center, 8000 North Ocean Drive, Dania Beach, FL 33004, USA
thomasjd@nova.edu

As insects dominate the earth's terrestrial environment, amphipods dominate in aquatic environments. Occupying significant and crucial roles in ecosystem function and health, amphipods occur in all of the world's marine habitats. Amphipods in the family Leucothoidae possess a number of extraordinary features that include: 1) living an astonishing range of marine habitats; 2) commensal ecology; 3) evolution of extended parental care, nest guarding, and eusocial behaviour. A better understanding of how interactions between behaviour, life-history strategies, habitat diversity (including host ecology and distribution), and biogeography may reveal how commensal and eusocial strategies enabled this single family to become so widespread geographically across all ocean habitats. Leucothoids are of scientific interest for their unusual ecology as commensal inhabitants of sessile invertebrates such as sponges, sea squirts, and bivalves.



This tunicate, *Polycarpa* sp., also known as sea squirt, common host of amphipods (B.W. Hoeksema)

Specimen photographed through a dissecting microscope (J.D. Thomas).

Obligate commensal species have evolved highly characteristic and unusual morphologies and feeding strategies due to their commensal way of life. Because virtually no detailed studies of leucothoids-host diversity has been done, leucothoids are greatly underrepresented in museum collections. Specialized in-situ underwater collecting techniques that take the amphipods directly from their host are beginning to reveal the vast extent of leucothoid diversity.

Recent research by Thomas suggest high diversity areas may be areas of "composite" lineages assembled in specific regions by plate tectonics that juxtaposes historically once distant groups and argues for consideration of alternative worldviews of biogeography. Such data provide intriguing counterpoints to current models currently used to interpret marine biogeography patterns. I hope that data and specimens from the Raja Ampat expedition will contribute to further understanding of marine biodiversity of the Indo-Malayan region. Already during the Raja Ampat expedition, I have already confirmed specific host associations for five tunicates, four sponges, and two bivalve molluscs. In the first week at least five new species of commensal leucothoids have been documented. A more complete understanding and interpretation of bio-geographic pattern within leucothoids and other commensal amphipod groups await comprehensive monographic treatment from all ocean regions. It is anticipated that collaborative efforts with scientists on the Raja Ampat expedition will help develop exciting new avenues of research and collaboration in the area of cryptic marine biodiversity.

Ongoing field and lab studies by the author and colleagues suggest that potentially hundreds of new species remain to be discovered and described. While leucothoid amphipods offer interesting avenues of investigation including host associations, distribution and behavior patterns, eusocial structure, and extended parental care, their wider use by investigators is constrained by taxonomic confusion within the group. This taxonomic constraint is addressed by workers in marine invertebrate groups that encounter specimens of *Leucothoe* in their studies, declaring that the "…genus is in urgent need of taxonomic revision" Many cryptic species groups exist in the Leucothoidae, a situation clearly illustrated by the current research in the Raja Ampat region which has revealed at least 21 distinct new species and documented a number of specific invertebrate host associations for the first time.

Recently, the author completed a monographic treatment of Leucothoid amphipods from the Great Barrier Reef, Australia, documenting 17 species, 15 of which were new to science. This work, combined with other taxonomic work by the author on reefs in Papua New Guinea and Sulawesi now provide a comparative taxonomic baseline for the studies Raja Ampat leucothoids. Prior to the expedition, the expectation was that the leucothoid fauna of Raja Ampat reefs would be similar to recently documented areas with perhaps some evidence of local endemism within the Leucothoidae. After completion of preliminary taxonomic investigations the Raja Ampat, the leucothoid amphipod fauna reveals high levels of regional endemism, greatly exceeding preliminary estimates. The 21 species new to science were discovered with virtually no species overlap with Great Barrier Reef material. What affinities there are among the species enumerated appear to align with Sulawesi, Papua New Guinea, and the Great Barrier fauna in descending order of relationship. Several new species of leucothoid amphipods appear to be highly regionalized endemics, possibly found only in the Raja Ampat Island complex. Additional sampling and comparative taxonomies will provide a more cogent view of these relationships in the future as systematics on the group becomes more highly resolved.

During the expedition, 65 stations were sampled resulting in nearly 90 lots of material consisting of over 500 specimens in three genera: *Anamixis* [1new species]; *Leucothoe* [19 new species]; *Paranamixis* [1 new species]. Material was preserved for morphological study in two percent buffered formalin and representative samples were fixed in 96% ETOH for subsequent molecular analysis.

Host Associations:

17 host species documented (all new records for Pacific)

1. Ascidians (8): *Polycarpa aurata, P. pigmentator, Rhopalaea crassa, Phallusia juninea, Plurella sp, Herdmania sp, Lossoclinum patellum,* Phleboranchids [white and yellow morphs]

2. Sponges (8): *Niphates callista, Pericharax sp., Callyspongia* [5 morphospecies], *Haliclona* sp.

3. Mollusks (1): *Pteria penguin*

Notes:

- Two ascidian and 1 mollusk host species each housed a unique amphipod commensal species [*Herdmania* sp, *Lossoclinum patellum; Pteria penguin*]

- Five ascidian host species housed 2-5 different amphipod species, but generally with no more than two separate amphipod species per host per sample

- Four leucothoid species were collected only from rubble habitats where specific host data are lacking but aresuspected to be small sponges and ascidians

***Biogeographic Summary*:**

Recent monographic revisions within the leucothoids allow at least preliminary comparisons of Raja Ampat taxa with other coral fauna (Sulawesi, Madang Lagoon, Lizard and Orpheus Islands [GBR], cool temperate Australia, Asia, Pacific Plate, Indian Ocean, and Caribbean).

Endemicity: of 21 species of leucothoid amphipods collected in Raja Ampat in 2007, all 21 species are distinct new taxa. The emerging pattern supports an explanation of recent radiations and localized endemic speciation. There is little support for a more deeply branched lineage-based diversity as exemplified in the Madang Lagoon region. Thus, preliminary data support a geotectonic process model (vs dispersalist model) for speciation of RA taxa.

- 4 species show no other relationships with known taxa (neo endemics)

- 5 species suggest sister taxa relationships with GBR fauna (plate endemics)

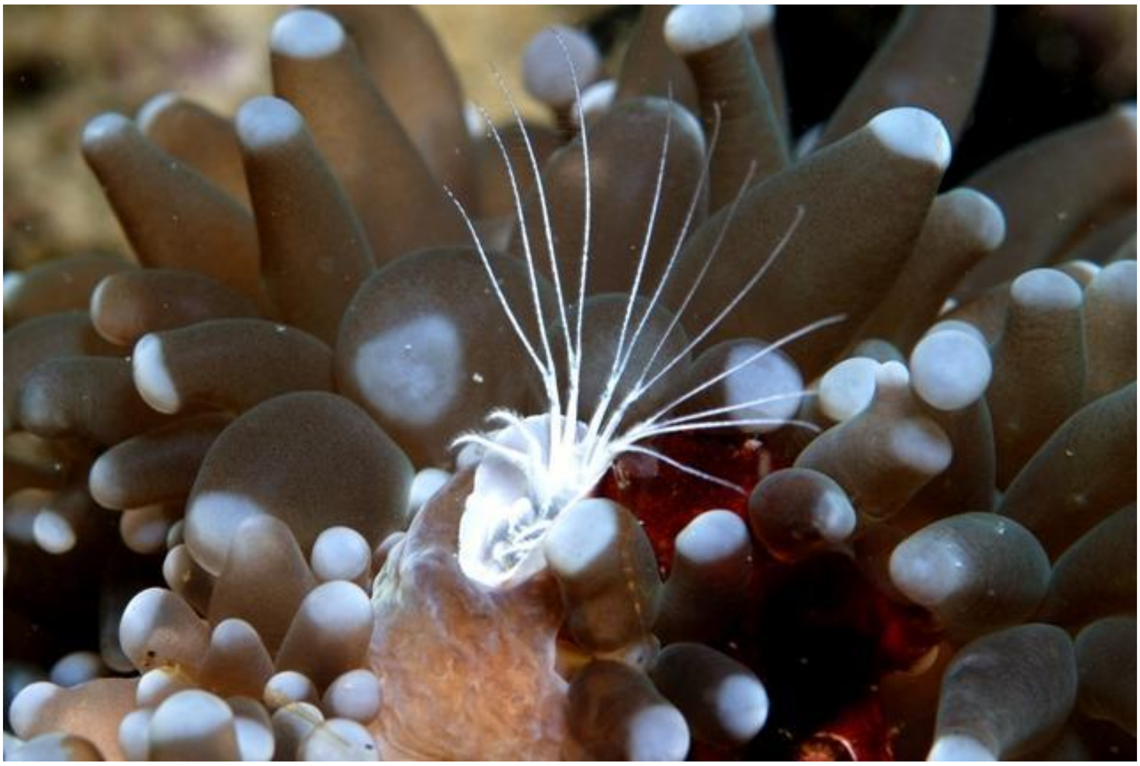
- 2 species show nearest related taxa in Madang & Sulawesi (regional endemics)

- 11 species indicate close taxon relationships with Sulawesi (based on Nicole sponge data from Sulawesi-not otherwise noted)

- 1 species appears to be recently-described species from western Caribbean (Belize)

Recent comparative research in reef systems in Indonesia (Sulawesi, Raja Ampat) and Papua New Guinea suggests high diversity areas may be a mix of ancient "composite" lineages and more recent neoendemic species assembled and distributed in specific regions by plate tectonics that juxtaposes historically once distant groups. Recent evolutionary events account for areas of locally high endemism such as that in the Raja Ampat archipelago [this report]. Such varying patterns argue for consideration of alternative worldviews of biogeography and provide intriguing counterpoints to widely accepted models and paradigms now used to interpret and assess marine biogeography patterns.

Coral barnacle in an *Astreopora* sp. (B.W. Hoeksema).



Coral barnacle in an *Euphyllia* sp. (B.W. Hoeksema).

Coral gall crabs and boring mussels – Drs. Sancia E.T. van der Meij & Dr. Bert W. Hoeksema

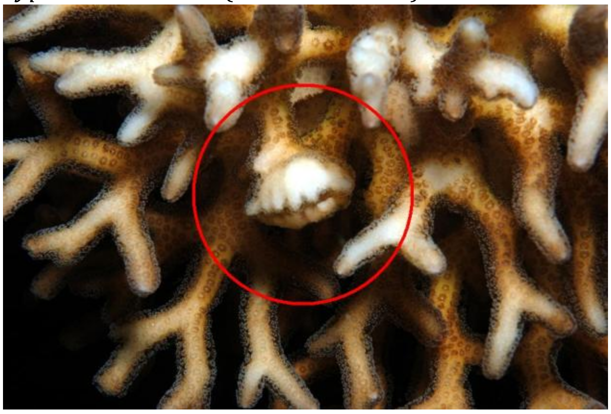
National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Meijs@naturalis.nl; Hoeksema@naturalis.nl

Several families of stony corals (Scleractinia) have species that may become infested by gall crabs (Cryptochiridae). These very small crabs of some mm in diameter are so tiny that they are very hard to detect. One has to develop a search image in order to find these crabs, or to detect the holes that they produce inside their coral hosts. We investigate whether gall crab species are very host-specific or whether they are able to settle in more coral host species. We concentrate on coral hosts of the families Faviidae (massive and foliaceous corals), Fungiidae (either free-living or attached mushroom corals), and Pocilloporidae (branching corals). At first the crabs appeared difficult to find, especially in Faviidae corals, but after one week many different host species were recorded. The holes of the crabs may differ in shape, depending on the crab and the coral host. The crab species also differ in maximum size, which probably depends on the thickness of the coral. Usually the crabs are found in pairs, a female and a male together. Some of the females contained colourful eggs, like orange. After the larvae get released, they will swim to another host coral. The pictures show a mushroom coral (*Fungia repanda*) infested by two gall crabs, with their holes covered by an overhang, whereas a massive coral of *Cyphastrea serailia* has a hole that was released of its crab by the scientists. The branching corals *Stylophora pistillata* and *Seriatopora hystrix* have crabs that are nearly completely enclosed by the coral skeleton except for some small ventilation pores.

Fungia repanda with gall crabs galls (B.W. Hoeksema).

Gall crab removed from its host, a specimen of *Cyphastrea serailia* (B.W. Hoeksema).

Gall crab gall inside a branch of *Stylophora pistillata* (B.W. Hoeksema).



Gall crab gall enclosed in branches of *Seriatopora hystrix* (B.W. Hoeksema).

The first week it proved to be rather difficult to distinguish the holes and perforations of boring mussels (Mytilidae) and gall crabs from other coral boring species. However, after a couple of dives it became apparent what to search for, and the totals added up to 85 samples of boring mussels, 80 samples of gall crabs encountered in 111 samples of stony corals. 76 species of stony corals were sampled. Most of the symbiont samples contain more than one specimen. The number of encountered symbiont species cannot be given until proper identification of the collected material. A rough estimate would be between 10 and 15 species of boring mussels and between 15 and 20 species of gall crabs. A list of the stony coral species is provided below.

Family	Genus	Species
Faviidae	*Cyphastrea*	*chalcidium*
		micropthalma
		serailia
		spec.
	Diploastrea	*heliopora*
	Echinopora	*hirsutissima*
		lamellosa
		pacificus
		spec. 1
		spec. 2
	Favia	*favus*
		helianthoides
		matthaii
		pallida
		rotundata
		spec. 1
		spec. 2
		speciosa
		cf. *truncatus*
	Favites	*chinensis*
		cf. *flexuosa*
		complanata
		halicora
		micropentagona
		pentagona
	Goniastrea	*aspera*
		edwardsi
		pectinata
	Leptastrea	*pruinosa*
		spec. 1
		spec. 2
		spec. 3
		transversa
	Leptoria	*phrygia*
	Montastrea	*colemani*
		curta
		spec. 1
	Oulophyllia	*bennetae*
	Platygyra	*acuta*
		daedalea
		lamellina
		pini
		ryukyensis
		sinensis
		spec. 1
	Plesiastrea	*versipora*

Family	Genus	Species
Fungiidae	*Fungia*	*concinna*
		granulosa
		gravis
		moluccensis
		paumotensis
		repanda
		somervillei
		taiwanensis
		tenuis
	Halomitra	*pileus*
	Herpolitha	*limax*
		crustacea
	Podabacia	*motuporensis*
	Sandalolitha	*robusta*
Pocilloporidae	*Pocillopora*	*verrucosa*
	Seriatopora	*hystrix*
	Stylophora	*pistillata*
Other encountered families:		
Acroporidae	*Acropora*	*palifera*
	Astreopora	spec.
Pectiniidae	*Mycedium*	*elephantotus*
		spec. 1
Poritidae	*Porites*	spec. 1
Mussidae	*Acanthastrea*	*echinata*

Marine lakes of Raja Ampat – Drs. Leontine E. Becking, Mrs. Lori J.B. Bell, Dr. Michael N. Dawson, Dr. Laura E. Martin & Ms. Sharon Patris

Marine lakes are little studied, yet fascinating ecosystems. These landlocked water bodies, which probably originated during the Holocene, have maintained a marine character through a network of submarine connections to the adjacent sea. During this expedition the 'marine lakes team' (Lisa Becking, Lori Bell, Michael Dawson, Laura Martin, and Sharon Patris) have conducted the first scientific survey of the flora and fauna of marine lakes in Raja Ampat, Papua, Indonesia. In parallel to the community survey we will use molecular analyses to assess the level of genetic connectivity between populations of sponges, scyphozoans, molluscs, and fishes in different marine lakes and the outside sea.

Most of the marine lakes in Raja Ampat are situated between submerged karstic hills and are not visible from the sea. Armed with old Dutch maps, Google Earth images and GPS's, we have been hunting for these hidden marine lakes durng the four weeks of the expedition. The first two weeks were accompanied by remarkable success where all the isolated bodies of water on the maps and images were land-locked marine lakes in the field. The third week of exploration, however, led often to freshwater lakes behind sago swamps, completely connected systems of mangroves, and open archways of karst (which looks like solid land from satellite pictures); although we did also find a few more marine lakes. Thus, in total, we worked in six lakes on the islands of Mansuar, Gam and Fam, and these have proven to be very interesting. The sponge biomass and diversity vary greatly and occasionally can be remarkably high. As a result we have had to work until late at night most days trying to process all the samples.

Ctenophore Lake on the island Gam (L.E. Becking).

The lakes range in width from ca. 50 to 450 meters and in depth from 1.5 m to 18 m. Some of the lakes were easy to get to, close to shore and with already worn trails. Others required spotting of potential trails from a boat, then hiking over ridges of razor-sharp karst that were up to 45 m high with slopes sometimes 10-degrees from vertical and covered in tangled understory. The assistance of our Papuan guides, Henki, Ismael, and James was invaluable in these instances!

The lake on the north-western side of the island Mansuar was the first marine lake we visited. Of all the lakes we have sampled, this lake is one of the least well-connected to the outside sea, and consequently harbours a distinct sponge assemblage. Notable aspects include high abundance of two sponge species that are known principally from land-locked lakes (in Berau, Palau, and/or Papua): *Suberites* sp., a species with a purple-to-green exterior and a bright yellow interior, and *Darwinella sp.*, a candy-pink sponge (see Fig. 2). Once we have returned to our respective institutions (in The Netherlands, Palau, and USA), Lisa and her supervisor at Naturalis, Nicole de Voogd, will make a point of describing these interesting species.


Mangrove root in marine lake (L.E. Becking).

On the advice of Max Ammer of Papua Diving, who also has made a number of aerial surveys in the area, we searched for a lake on the Eastern side of the island Gam. This one stands in contrast to the lake on Mansuar because it has a more diverse assemblage of species. South of the lake is a small village, Yen Besir, that is said to have housed Alfred Russel Wallace during his adventures and sickness in the 'Malay Archipelago', hence one of the working names used for this lake during the expedition: Wallace Lake. Wallace Lake together with the other lakes on Gam – with working names "Ctenophore lake" and "Lake 9", are connected to the outside sea through narrow caves or channels. The community composition and particularly the abundance of certain species still make this habitat distinct from an open lagoon.
All lakes contain sandy or muddy bottoms and are, at least in part, surrounded by mangroves. To make comparisons between similar habitats outside the lakes, we have been sampling the wide and usually undisturbed mangrove systems on Gam, just across from the island Kri, where we are staying.

Despite four weeks in the field in Papua, it is at present hard to give a full answer to the question what are typical mangrove sponge species and what are predominantly lake species. There is still much more work to do in the field and in the lab, but this first fieldtrip to Raja Ampat has provided many points of comparison: between lakes, between lakes and the sea, and between Raja Ampat and our prior work in Berau and Palau.


Cinachyrella aff. *australiensis* adapted to the high sedimentation-load in the marine lakes, by severely expanding the porocalix, which is used to filter water

Marine lakes sponge fauna – Drs. Leontine E. Becking

National Museum of Natural History – Naturalis, PO Box 9517, 2300 RA Leiden, The Netherlands.
Becking@naturalis.nl

As a member of the 'marine lakes team' of this expedition, I conducted a survey of the sponge fauna of marine lakes in Raja Ampat, Papua, Indonesia. In parallel to the assemblage survey I will use molecular analyses to assess the level of genetic connectivity between populations of the six sponge species *Cinachyrella* aff. *australiensis, Placospongia melobesioides, Tethya* aff. *coccinae*, *Suberites* sp. 1, *Darwinella* sp. 1, *Myrmekioderma* aff. *granulata* in different marine lakes and the outside sea (Table 1).

This is the first documentation of sponge assemblages in mangrove systems and marine lakes in Raja Ampat, Papua, Indonesia. 800 samples were collected from 33 locations. 455 of these samples were collected for the population genetics study and the remainder are samples that were collected for identification and species descriptions. All samples are Demospongiae and belong to 26 families within ten Orders:

- Astrophorida (family: Geodiidae)
- Chondrosida (family: Chondrillidae
- Dendroceratidae (Family: Dictyodendrillidae)
- Dictyoceratida (families: Dysideidae, Irciniidae, Phloedictyidae, Spongiidae, Thorectidae)
- Hadromerida (families: Hemiastrellidae, Placospongiidae, Polymastiidae, Spirastrellidae, Tethyidae)
- Halichondrida (families: Axinellidae, Halichondriidae, Heteroxyidae, Clionaidae)
- Haplosclerida (families: Chalinidae, Callyspongiidae, Niphatidae)
- Poecilosclerida (family: Acarnidae, Coelosphaeridae, Desmacellidae, Microcionidae)
- Spirophorida (family: Tetillidae)
- Verongida (family: Ianthellidae)

I collected at least 30 species, but more may be established after thorough identification. At present I am working the molecular laboratory shared by Naturalis and the University of Leiden to optimise primers for for *Cinachyrella* aff. *australiensis, Placospongia melobesioides, Tethya* aff. *coccinae*, and to develop primers for *Suberites* sp. 1 and *Darwinella* sp. 1, *Myrmekioderma* aff. *granulata.*

Two sponges known only from isolated marine lakes: *Darwinella* sp. (pink) and *Suberites* sp. (blue-green) (L.E.Becking).

Spirastrella sp. is present in almost all lakes (L.E. Becking).

Table 1. Number of specimens sampled per location of six target species that will be used in a population genetics study.

	Cinachyrella australiensis	*Placospongia melebesioides*	*Myrmekioderma* aff. *granulata*	*Darwinella* sp.	*Suberites* sp.	*Tethya* aff. *coccinae*	**TOTAL**
RAJ04	16			24	31	3	**74**
RAJ05	1						**1**
RAJ09	13						**13**
RAJ11	5						**5**
RAJ13	14		9				**23**
RAJ16	42						**42**
RAJ18	37		4				**41**
RAJ19	1						**1**
RAJ23	20	15	16			20	**71**
RAJ24	12						**12**
RAJ25	1						**1**
RAJ26	1						**1**
RAJ30	20		3				**23**
RAJ32	1						**1**
RAJ34	10		5				**15**
RAJ36	10						**10**
RAJ39	2	3					**5**
RAJ40	1						**1**
RAJ42	16						**16**
RAJ44	20						**20**
RAJ45	1						**1**
RAJ46	7						**7**
RAJ47	1						**1**
RAJ51	8						**8**
RAJ52	18						**18**
RAJ58	1						**1**
RAJ59							**0**
RAJ60	2						**2**
RAJ61	8					1	**9**
RAJ62	16						**16**
RAJ63							**0**
RAJ64	10	6					**16**
RAJ70							**0**
TOTAL	**315**	**24**	**37**	**24**	**31**	**24**	**455**

Marine lakes various – Dr. Michael N. Dawson*, Dr. Laura E. Martin*, Mrs. Lori J.B. Bell#, & Ms. Sharon Patris#

* School of Natural Sciences, University of California, Merced, P.O. Box 2039, Merced, CA 95344, USA
mdawson@ucmerced.edu; lmartin@ucmerced.edu

Coral Reef Research Foundation, P.O. Box 1765, Koror, PW 96940, Palau
crrf@palaunet.com; spatris@palaunet.com

Location	Habitat	Phylum	Specimens
Indonesia, West Papua, Gam, Blue Water Mangrove Channel	mangrove channels	Chordata	1
		Porifera	6
Indonesia, West Papau, Gam, Cove Ctenophore Gam	cove	Cnidaria	1
		Porifera	2
Indonesia, West Papua, Gam, Cove Lake A Gam	cove	Cnidaria	1
Indonesia, West Papua, Gam, Danau Ctenophore Gam	marine lake	Chordata	3
		Cnidaria	2
		Echinodermata	1
		Mollusca	7
		Porifera	41
Indonesia, West Papua, Gam, Danau Lake A Gam	marine lake	Chordata	8
		Cnidaria	1
		Echinodermata	2
		Mollusca	10
		Porifera	97
Indonesia, West Papau, Gam, Danau Hidden Gam	marine lake	Chordata	5
		Cnidaria	2
		Echinodermata	4
		Mollusca	13
		Porifera	56
Indonesia, West Papau, Gam, Danau Nine Gam	marine lake	Chordata	13
		Cnidaria	2
		Echinodermata	3
		Mollusca	15
		Porifera	74
Indonesia, West Papau, Gam, Saurek B Cove	cove	Porifera	4
Indonesia, West Papau, Gam, Tunnel Ctenophore Gam	tunnel	Echinodermata	1
		Porifera	2
Indonesia, West Papua, Gam, Tunnel Lake A Gam	tunnel	Chordata	2
		Porifera	3
Indonesia, West Papau, Gam, War Manuk Channel	mangrove channel	Porifera	4
Indonesia, West Papau, Gam, War Manuk Mangrove	mangrove	Chordata	1
		Porifera	6
Indonesia, West Papua, Groot Fam, Cove, outside lake entrance	cove	Cnidaria	2
Indonesia, West Papau, Groot Fam, Danau Groot Fam	marine lake	Crustacea	2
		Mollusca	3
		Porifera	4
Indonesia, West Papua, Mansoer, Channel Mansoer Laut	pelagic channel	Cnidaria	5
Indonesia, West Papua, Mansoer, Danau Mansoer Mansoer	marine lake	Chordata	1
		Crustacea	1
		Echinodermata	2
		Mollusca	4
		Porifera	27

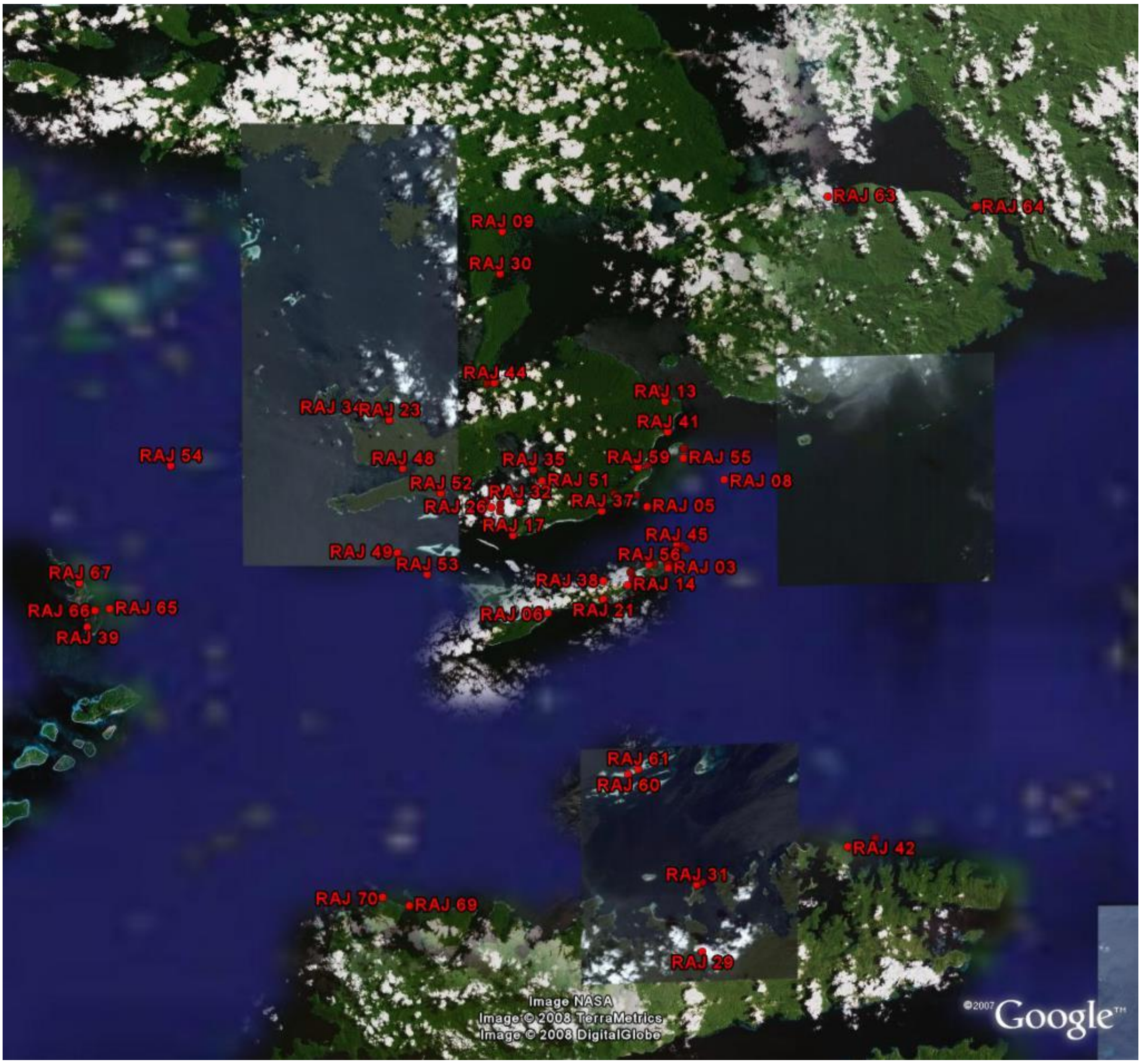
Acknowledgements

We want to thank LIPI for supporting the research application and assistance in the issue of the research permit. Dr. Suharsono (Director, RCO-LIPI) is acknowledged for his support since we came up with the idea during the previous joint-expedition in the Bay of Jakarta and the Thousand Islands (2005) to aim for Raja Ampat in 2007. Yosephine Tuti and Inayat Al-Hakim (RCO-LIPI) assisted in the procedure for getting the permits. Mark Erdmann (Conservation International) gave very useful advice and encouragement, also since an early stage in the planning. We are grateful to Max Ammer (Papua Diving) and the staff at Kri Eco Resort at Kri Island for friendship, information and logistic support.

Financial and other support came from various sources, many of which are mentioned in the sponsor section at the end of this report. Naturalis and other research institutions involved were the major contributors. Additional funding was supplied by the Van Tienhoven Stichting, the Schure Beijerinck Popping Fund (KNAW), the Leiden Universty Fund, the Jan Joost ter Pelkwijk Fund (Naturalis and Leiden University), the Alida Buitendijk Fund (Naturalis). EDIT (WP7) funded one of the preparatory trips to Jakarta in 2007 prior to the expedition. Local logistic support was supplied by Conservation International. ALW-NWO funded part of the research on marine lakes. Singapore Airlines gave extra luggage allowance to each participant departing from the Netherlands.

Many of the expedition members after the opening ceremony at RCO-LIPI, Jakarta.

Photos of most members of the research team with staff of Papua Diving at Kri Eco Resort.



Research area with sample stations: see list.

List of field stations

LOCALITY	LATITUDE	LONGITUDE
RAJ 01 Kri Island jetty Kri Resort	-0.556056	130.67788
RAJ 02 E Kri Island Sorido resort lagoon near jetty	-0.555783	130.687083
RAJ 03 Kri Island south Kri	-0.558961	130.687633
RAJ 04 Mansuar Lake	-0.5881	130.5973
RAJ 05 SE Gam Kerupiar Isl. Mike's Point	-0.51585	130.672817
RAJ 06 S. Mansuar (Sawandarik village)	-0.590467	130.603233
RAJ 07 E Kri Cape Kri	-0.556167	130.691317
RAJ 08 Mioskon Island	-0.4968	130.72705
RAJ 09 Jelly Point	-0.3227	130.5711
RAJ 10 Redshrimp Lake	-0.432841	130.680483
RAJ 11 SE Gam Friwen Wonda	-0.474983	130.69855
RAJ 12 E Kri Sorido wall	-0.553667	130.688033
RAJ 13 Wallace Lake	-0.441967	130.685567
RAJ 14 Akber Reef	-0.570883	130.65935
RAJ 15 SW Kri Kuburan	-0.561883	130.661217
RAJ 16 Outside Wallace Lake	-0.438528	130.687317
RAJ 17 Gam Saunrai jetty (bird watching)	-0.5361	130.5787
RAJ 18 Gam Mangrove creek	-0.506717	130.649767
RAJ 19 Maya's mimpi	-0.5076	130.665317
RAJ 20 Turtles Reef	-0.5431	130.697517
RAJ 21 SE Manuar Nikson new	-0.58095	130.642117
RAJ 22 Sleeping barracuda	-0.545317	130.70045
RAJ 23 Ctenophore Lake	-0.455033	130.491833
RAJ 24 Outside Ctenophore Lake	-0.4551	130.491467
RAJ 25 S. Gam E entrance Besir Bay Cape Besir	-0.514317	130.56985
RAJ 26 S. Gam E entrance Besir Bay Bun Isl.	-0.516467	130.563533
RAJ 27 lunch spot between dive's 25 & 26	-0.51895	130.569567
RAJ 28 N Batanta N pulau Yarifi	-0.77965	130.71185
RAJ 29 N Batanta W Teluk Gegenlol	-0.828483	130.711667
RAJ 30 Lake 12	-0.3523	130.5696
RAJ 31 lunch spot Batanta	-0.781233	130.707783
RAJ 32 S Gam SE Besir Bay	-0.51255	130.58335
RAJ 33 S Gam E Besir Bay	-0.488433	130.591833
RAJ 34 Fake Lake	-0.75	130.820817
RAJ 35 S. Gam Besir Bay	-0.489889	130.593
RAJ 36 Outside Sinkhole	-0.7486	130.833333
RAJ 37 S. Gam shoal near mangrove border	-0.51895	130.641117
RAJ 38 NE Mansuar	-0.56805	130.642083
RAJ 39 outside FAM Lake	-0.600417	130.279389
RAJ 40 SW Kri island	-0.566133	130.662833
RAJ 41 SE Gam Desa Besir	-0.463367	130.687383
RAJ 42 outside Lake 9	-0.754617	130.813883
RAJ 43 Passage	-0.429233	130.56035
RAJ 44 E entrance passage	-0.428983	130.565767

RAJ 45 New Reef	-0.542633	130.693567
RAJ 46 Yenweres Bay	-0.486933	130.673233
RAJ 47 Yenweres mangrove	-0.4871	130.6666
RAJ 48 W Pulau Yeben kecil	-0.489067	130.50135
RAJ 49 NW off Mansuar I. Lalosi reef	-0.5482	130.497533
RAJ 50 Yeben kecil reef flat	-0.8111	130.3383
RAJ 51 War Manak	-0.4978	130.5991
RAJ 52 Lake 5	-0.5065	130.5281
RAJ 53 Arborek kampong	-0.5634	130.5185
RAJ 54 E Yenbon kecil (jelly fish bay)	-0.487017	130.33815
RAJ 55 S Friwin Isl.	-0.481817	130.69835
RAJ 56 N Kri	-0.556517	130.674217
RAJ 57 W Mansuar	-0.5116	130.559817
RAJ 58 Bluewater mangrove (inner creek)	-0.487733	130.664117
RAJ 59 Bluewater mangrove (outer creek)	-0.488233	130.666583
RAJ 60 S Pulau Wai south reef	-0.70375	130.65955
RAJ 61 E Pulau Wai east lagoon	-0.6999	130.666583
RAJ 62 Mayalibit Bay SE Pulau Wailukup	-0.300667	130.810317
RAJ 63 Mayalibit Bay N Pulau Wailukup	-0.29795	130.8
RAJ 64 Mayalibit Bay E Manil Isl.	-0.304733	130.904333
RAJ 65 Yeffam Isl. NW Pulau Keruo	-0.5876	130.295183
RAJ 66 Yeffam Isl. E Pulau Penemu	-0.588867	130.284867
RAJ 67 Yeffam Isl. E Pulau Penemu	-0.56945	130.273883
RAJ 68 E Pulau Penuma	-0.5869	130.279117
RAJ 69 NW Batanta (three islands)	-0.79605	130.5059
RAJ 70 NW Batanta cape	-0.790133	130.48705

Two colour morphs of the hydrocoral *Distichopora violacea* (B.W. Hoeksema).

DEPARTEMEN HUKUM DAN HAM RI
DIREKTORAT JENDERAL IMIGRASI
Jl. HR. Rasuna Said Kav. 8-9
Jakarta Selatan

2/4

HALAMAN :1

Jakarta, 05/11/2007

Kepada Yth.

LIPI
JL JEND GATOT SUBROTO NO 10 JKT

PEMBERITAHUAN

Sehubungan dengan permohonan Saudara untuk mendatangkan warga negara Asing dengan nama seperti tersebut dibawah ini :

NO.	NAMA / NOMOR PENGUASAAN	L/P / TG LAHIR	KEBANGSAAN / NO. PASPOR	LAMA TINGGAL / NOMOR FILE
1	HOEKSEMA BERT WILLEM F2-IZ.01.02-6527HF.211	LK 27/12/1957	NLD BA0277779	60 HARI B/H-2288PF

maka dengan ini kami beritahukan bahwa permohonan Saudara dimaksud telah dikabulkan dengan penguasaan Direktur Jenderal Imigrasi kepada

Perwakilan R.I di : DENHAAG
Jenis Visa : VISA KUNJUNGAN
Tanggal : 05/11/2007

Demikian, agar maklum

A.N. KEPALA SUBDIREKTORAT VISA
SEKSI VKSK, EVLAP

ANDI HOJA IBRAHIM
NIP.040044677

DIREKTORAT JENDERAL IMIGRASI

* PERSETUJUAN INI BERLAKU SELAMA 2(DUA) BULAN SEJAK DITANDATANGANI
* PEMBERITAHUAN INI BUKAN UNTUK PENGAMBILAN VISA
* PENGUASAAN VISA DIKIRIM TANGGAL :

05 NOV 2007

Letter from Immigration for one of the particpants indicating that the visa can be issued.

SURAT KETERANGAN JALAN / *TRAVELLING PERMIT*

No. Pol. : SKJ / Subbid ORAS – 8667 / XI / 2007 / Baintelkam

DIBERIKAN KEPADA / *ISSUED TO*

1. N a m a / *N a m e*	:	**BERT WILLEM HOEKSEMA**
2. Tempat dan tgl. Lahir / *Place and date of birth*	:	Baarderadeel, 27 Desember 1957
3. Warga Negara / *Nationality*	:	Belanda
4. Pekerjaan / *Occupation*	:	Peneliti
5. No. Paspor, tgl dan berlaku s/d / *Pasport No. Place and date of issued valid until*	:	BA 0277779 Tgl. 07-03-2005 07-03-2010
6. Dokumen lain / *Others document*	:	VK No.: 7H/010184/2007.211B, untuk selama 60 hari Tiba tgl. 14-11-2007 Srt. TKPIP No.: 10/SU/TKPIP/2007, tgl. 24-10-2007
7. Atas perintah/persetujuan / *Applied/approved by*	:	LEMBAGA ILMU PENGETAHUAN INDONESIA
8. Tersebut dalam suratnya tgl / *Re-letter of, date*	:	14-11-2007 No.: 6558/SU.3/KS/2007
9. Maksud kunjungan / *Purpose of visit*	:	Research dalam bidang Biologi Kelautan/Oseanografi.
10. Ke / *To*	:	Prop. Papua Barat (Kep.Raja Ampat dan P.Kri).
11. Dalam rangka / *In accordance with*	:	Melakukan penelitian dengan judul "Ekspedisi Widya Nusantara (E-Win): Cryptic Marine Biodiversity of - #
12. Mulai tanggal / *From*	:	14 Nopember 2007 s/d / *till* 14 Januari 2008

PERHATIAN / *ATTENTION*

of the Raja Ampat Islands, West Papua".

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).

Dikeluarkan di / *Issued at* : J a k a r t a

Pada tanggal / *Date* : 14 Nopember 2007

A.n. KEPALA BADAN INTELIJEN KEAMANAN
KABID YANMIN
U.b
KASUBBID ORAS

SASA CIPTA ADI
AJUN KOMISARIS BESAR POLISI NRP. 54020235

Pas photo dan tanda tangan pemegang
Fotograph and Signature of bearer

Letter from the Police, one like this for each foreign participant.

LEMBAGA ILMU PENGETAHUAN INDONESIA
INDONESIAN INSTITUTE OF SCIENCES
PUSAT PENELITIAN OSEANOGRAFI
(PUSLIT OSEANOGRAFI LIPI)
RESEARCH CENTRE FOR OCEANOGRAPHY

Jl. Pasir Putih I, Ancol Timur, P.O. Box. 4801/JKTF Jakarta 11048
Telepon : (021) 64713850, Fax. (021) 64711948 Cable LONAS
Homepage : http://www.oseanografi.lipi.go.id E-mail : p2o@oseanografi.lipi.go.id

10 August, 2007

Dr. Bert W. Hoeksema
Head, Dept. of Zoology / Marine Research
National Museum of Natural History Naturalis
P.O. Box 9517, 2300 RA Leiden,
The Netherlands

Email: Hoeksema@naturalis.nnm.nl

Re: Supporting cooperation research between National Museum of Natural History Naturalis, The Netherlands- Research Center for Oceanography, Indonesian Institute of Sciences (LIPI)

Dear Dr. Hoeksema,

We are very pleased to have the cooperation research program with your institution as requested on your project proposal under the umbrella of "Ekspedisi Widya Nusantara (E-Win):Cryptic marine biodiversity of the Raja Ampat Islands, West Papua". Therefore, we agree to become your counterpart in the above research program.

Following Indonesian regulation, you should have a research permit for doing this program. Application for the permission will be taken at least 6 months. So, please make sure that you have this permission before your research commencing. You may have detail information for foreign researcher on LIPI website: www.lipi.go.id

During your research program in Indonesia, your contact person is Ms. Yosephine Tuty, MSc. Please contact her if you need more information regarding entry visa, research permit or any technical assistance.

Sincerely yours,
Director

Harsono

Dr. Suharsono

CC:
Dr. Neni Sintawardhani (Head of Bureau Cooperation S & T LIPI)
Ms. Yosephine Tuty, MSc (RCO LIPI)

Letter of support from the director of RCO-LIPI, Jakarta.

LEMBAGA ILMU PENGETAHUAN INDONESIA
(Indonesian Institute of Sciences)

LIPI

SASANA WIDYA SARWONO
Jl. Jenderal Gatot Subroto 10, Jakarta Selatan 12710
Telp. 5225711

Tromol Pos : 1250 / Jakarta 10012
4324 / Jakarta 12190

Alamat kawat : LIPI
Telex : 62554 IA
Fax : 52961370

SURAT IZIN PENELITIAN
No.: 6559 /SU/KS/2007

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).
Tempat dan Tanggal Lahir	:	Baarderadeel, The Netherlands: 27 Desember 1957.
Warga Negara	:	Belanda.
Jabatan	:	Researcher.
Alamat	:	National Museum of Natural History Naturalis, Darwinweg 2, 2333 CR Leiden, P.O. Box 9517, 2300 RA Leiden, The Netherlands.
Nomor Paspor	:	BA0277779.
Tiba Tanggal	:	14 Nopember 2007.
Judul Penelitian	:	*"Ekspedisi Widya Nusantara (E-Win): Cryptic Marine Biodiversity of the Raja Ampat Islands, West Papua".*
Tujuan Penelitian	:	Melakukan survei keanekaragaman hayati di Kepulauan Raja Ampat.
Bidang Peneliitan	:	Biologi Kelautan/Oseanografi.
Lama Penelitian	:	2 (dua) bulan, sampai bulan Januari 2008.
Daerah Penelitian	:	Prop. Papua Barat (Kep. Raja Ampat dan Pulau Kri).
Mitra Kerja	:	Pusat Penelitian Oseanografi – LIPI (Dr. Suharsono).

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 enam) 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).

Research permit issued by LIPI (page 1).

LEMBAGA ILMU PENGETAHUAN INDONESIA
(Indonesian Institute of Sciences)

LIPI

SASANA WIDYA SARWONO
Jl. Jenderal Gatot Subroto 10, Jakarta Selatan 12710
Telp. 5225711

Tromol Pos : 1250 / Jakarta 10012
4324 / Jakarta 12190

Alamat kawat : LIPI
Telex : 62554 IA
Fax : 52961370

- 2 -

5. Sebelum meninggalkan Indonesia, menyerahkan laporan terakhir (yang diketik rangkap enam), 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.: 6559/SU/KS/2007, tanggal 14 Nopember 2007 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, 14 Nopember 2007

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

Research permit issued by LIPI (page 2).

LEMBAGA ILMU PENGETAHUAN INDONESIA
(Indonesian Institute of Sciences)

LIPI

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 : 52961370

LAMPIRAN

Surat Izin Penelitian Nomor.: 6559/SU/KS/2007 tanggal 14 Nopember 2007

Daftar nama anggota tim Dr. Bert Willem Hoeksema

Nama	Warga Negara	Nomor Paspor
1. Drs. Leontine Elisabeth Becking	Belanda	NWBJBPJB5
2. Dr. Stefano G.A. Draisma	Belanda	NR9B51350
3. Mr. Jacobus Van Egmond	Belanda	NVP833BD3
4. Dr. Carolus H.J.M Fransen	Belanda	NG1636502
5. Drs. Sancia E.T. van der Meij	Belanda	NN1998CR4
6. Dr. Leendert Pieter van Ofwegen	Belanda	NH6077543
7. Drs. Bastian Theodoor Reijnen	Belanda	NN48D19D2
8. Dr. Willem Renema	Belanda	NWHHKHP21
9. Drs. Frank Robert Stokvis	Belanda	NS948J8J8
10. Ms. Eva Maria van der Veer	Belanda	NF7361935
11. Prof. Dr. Gerard van der Velde	Belanda	NG1810009
12. Dr. James Darwin Thomas	Amerika Serikat	210166015
13. Dr. Michael Dawson	Inggris	761107831
14. Dr. Laura Martin	Amerika Serikat	208118380
15. Mrs. Lori Jane Bell Colin, M.Sc	Amerika Serikat	420737870
16. Mrs. Sharon Patris	Rep. Palau	RP31910

Jakarta, 14 Nopember 2007

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

LEMBAGA ILMU PENGETAHUAN INDONESIA

Dr. Neni Sintawardani
NIP. 320004792

Research permit issued by LIPI (page 3: list of foreign participants).

LEMBAGA ILMU PENGETAHUAN INDONESIA
(Indonesian Institute of Sciences)

LIPI

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

Alamat Kawat : LIPI
Telex : 62554 IA
Fax : 5265457

Tromol Pos : 1250 / Jakarta 10012

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

1. Research conducted together with Indonesian counterpart (s) should be reported jointly.
2. Written report of research 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 metarials 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**
   - Background information
   - Scientific justification on the selection of subjects and sites to be investigated
   - 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 conditions
   - Hypotheses to be tested if any

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

   (3) **Implementation**
   - 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.
   - 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**
   - State important points that can be drawn from the results.
   - 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 Cooperation and Promotion of Science and Technology and the sponsoring agencies (in Indonesia).
5. Failure to comply with the above requirements may and up in the withdrawal of the research permit.

Research permit issued by LIPI (page 4: English translation).

Photo’s transport material

Transport in Jakarta (samples from Kri Island)

Arrival of material at Naturalis, the Netherlands


SCUBA


WHIRL-PAK

Publication in Bionieuws (Dutch magazine for biologists)

Een container vol monsters

MARIENE BIOLOGIE
Door Ellen Spierings
Foto's Michel Mees

Op dinsdag 18 maart was het eindelijk zover. Na een extra controle van de douane kon het zeeteam van Naturalis zijn zeecontainer met expeditiemateriaal dan eindelijk verwelkomen in Nederland. Het materiaal is verzameld tijdens de ruim zeshonderd duikuren die het twintigkoppige team in december maakte bij de Indonesische Raja Ampateilanden.

In februari was expeditieleider Bert Hoeksema nog in Jakarta aanwezig om het materiaal veilig in te schepen. Het duurde een maand voordat de container de haven in Rotterdam bereikte. Vol spanning stond het zeeteam klaar om de snoeppotten met opgeviste stukken koraal en geprepareerde beestjes uit te laden. Die snoeppotten waren een financieel interessante oplossing voor het opbergen van alle monsters. Een pot met snoep bleek goedkoper dan een lege opbergpot. En met het leegmaken van de potten maakten de onderzoekers ook nog vrienden. Nu kan het echte werk beginnen. DNA-onderzoek en vergelijking met de Naturaliscollectie moet uitwijzen welke soorten er nu precies zijn gevonden, en natuurlijk of er tussen al dat materiaal ook nieuwe soorten zitten.

Met Naturalis in zee

Naar de eilanden van de Raja Ampat groep

De laatste expeditie van het Naturalis Zeeteam, waarvan melding is gemaakt in Onderwatersport, heeft plaatsgevonden in 2005. Deze expeditie ging naar de Baai van Jakarta en de Duizend Eilanden. Hoewel de verwachtingen niet hoog waren, zijn er toch leuke vondsten gedaan. Al toonde een vergelijking met de Naturalis collecties ook aan dat er in de loop van zo'n 75 jaar soorten zijn verdwenen zo vlak bij Jakarta.

TEKST EN ILLUSTRATIES: BERT W. HOEKSEMA / NATURALIS

Aangezien zulke grootschalige expedities in principe elke twee jaar plaats vinden, zal de volgende dit jaar 2007 aan de beurt zijn. Als bestemming is gekozen voor de Raja Ampat eilanden en de verwachtingen zijn nu wel hoog gespannen.

REISVERSLAG Naar de eilanden van de Raja Ampat groep dus. De titel van dit verhaal is ontleend aan een reisverslag dat in 1950 verscheen in het Vakblad voor Biologen en is geschreven door algendeskundige dr. J.S. Zaneveld. Hij was daar net geweest. Het plan van het Naturalis Zeeteam daar dit jaar naar toe te gaan is ontstaan tijdens de laatste expeditie in 2005. De Indonesische collega's waren het ermee eens dat dit een goede bestemming zou kunnen zijn. Dat bleek al snel te kloppen, want in 2006 stonden er in veel kranten berichten over de rijkdom aan soorten vissen en koralen die daar in de buurt is waargenomen, bij het schiereiland Vogelkop. De nieuwe soorten waren gevonden tijdens een expeditie van de natuurbeschermingsorganisatie Conservation International, die de lokale overheid helpt bij de bescherming van het gebied.

Raja Ampat blijkt ook steeds meer populair te worden bij de sportduikers, en zeker ook

40 | ONDERWATERSPORT JUNI 2007

Een school bultkoppapegaaivissen

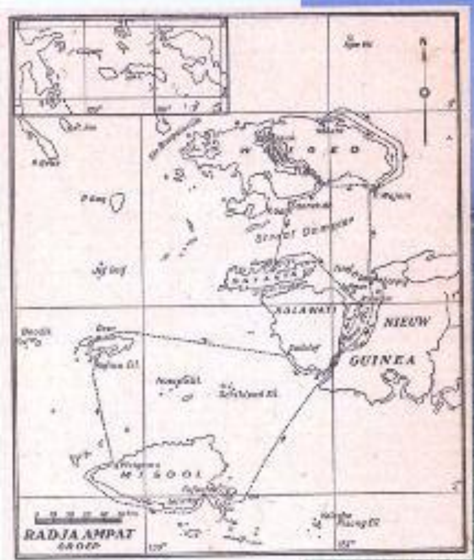
Duikers die de stroom trotseren

Een exemplaar van de hellevuurzeeanemoon: niet aaien!

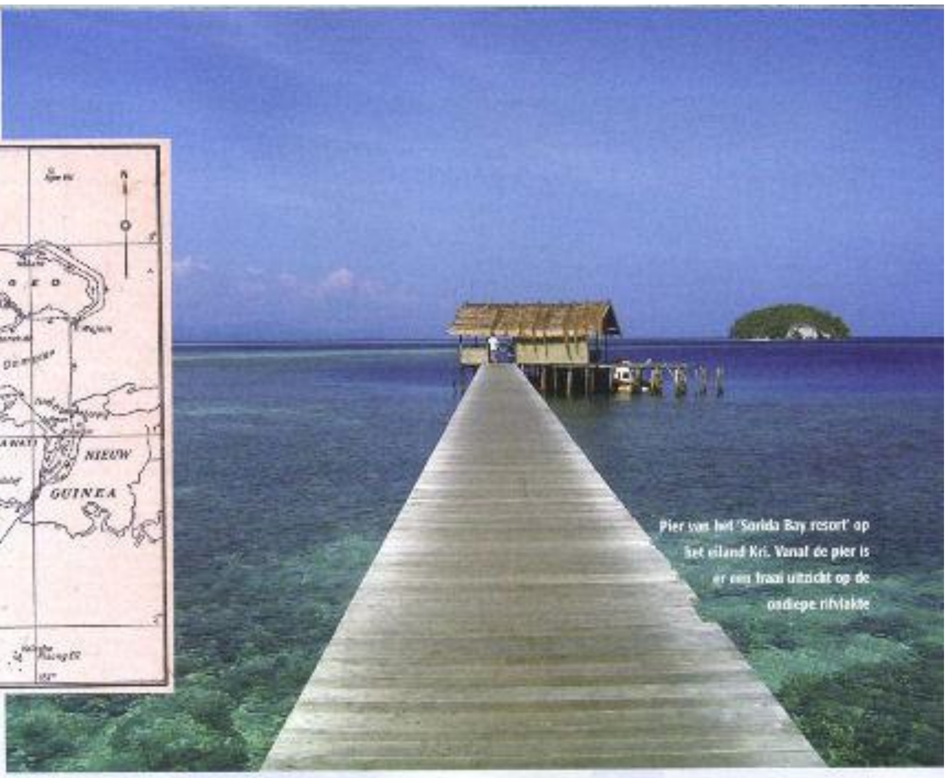
de Nederlandse. Dat is grotendeels te danken aan de aanwezigheid van twee duikcentra op het eilandje Kri. Beide centra worden beheerd door de Nederlander Max Ammer, die daar aan het pionieren is geslagen. De sfeer daar is uniek en informeel te noemen doordat er veel lokaal personeel aanwezig is.

VIER KONINGEN In november van afgelopen jaar was ik in de gelegenheid om in de

Zeeschildpadden rusten vaak tussen het koraal



Kaart van het beoogde onderzoeksgebied met oude spelling, gekopieerd uit de oorspronkelijke publicatie van Zaneveld (1950)



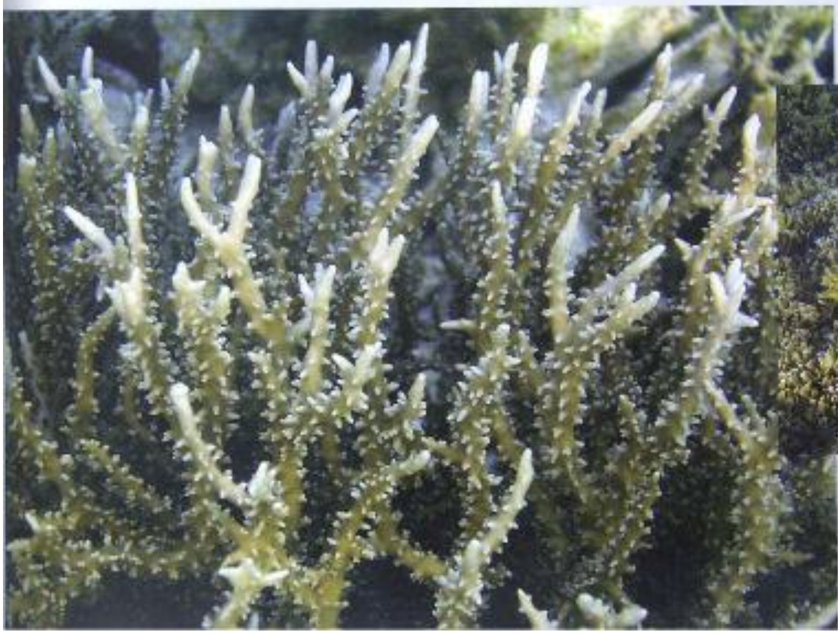
Pier van het 'Sorido Bay resort' op het eiland Kri. Vanaf de pier is er een fraai uitzicht op de ondiepe rifvlakte

voetsporen van Zaneveld te treden en het gebied te verkennen. Veel van wat hij schreef, blijkt nog steeds te kloppen: 'De eilanden voor de noordwest-punt van de Vogelkop van Nieuw-Guinea behoren tot de minst bekende delen van de Indonesische Archipel'. Deze eilandengroep bestaat uit vier grote en zo'n 300 kleine eilanden. De vier grote zijn Waigeo, Batanta, Salawati en Misool. In de koloniale tijd werd het gebied lange tijd bestuurd door vier 'radja's (koningen) en daarom werd deze eilandengroep Vier Koningen genoemd, Raja Ampat in het Indonesisch.

De eilanden kregen weinig aandacht van kooplieden en planters omdat er geen specerijen vandaan kwamen. Wel zijn er door de eeuwen heen veel wetenschappelijke expedities geweest, meestal op doorvaart. Dat waren beroemde buitenlandse expedities maar uiteindelijk ook Nederlandse, die met de onderzoeksvaartuigen Siboga en Snellius.

GRILLIG Zaneveld liet zich o.a. door een Catalina watervliegtuig vervoeren en was bijzonder onder de indruk van het landschap, dat zeer on-Nederlands is, nl. veel kalkrotsen en nergens vlak land. Dankzij de kalkrotsen is de kustlijn bijzonder grillig. Net als bij Oost-Kalimantan, dat werd onderzocht in 2003, blijken er in de Raja Ampat ook mariene meren te bestaan met zoutwaterorganismen. Die zullen zeker veel aandacht krijgen tijdens de komende veldwerkperiode.

Om thans bij Kri te kunnen komen worden duikers met een speedboot opgehaald vanaf



Links: aan het eind van de pier bevindt zich een beschutte poel met daarin fragiel koraal. De koraalbedekking op het onaangetaste rif is op sommige plaatsen bijzonder hoog (boven)

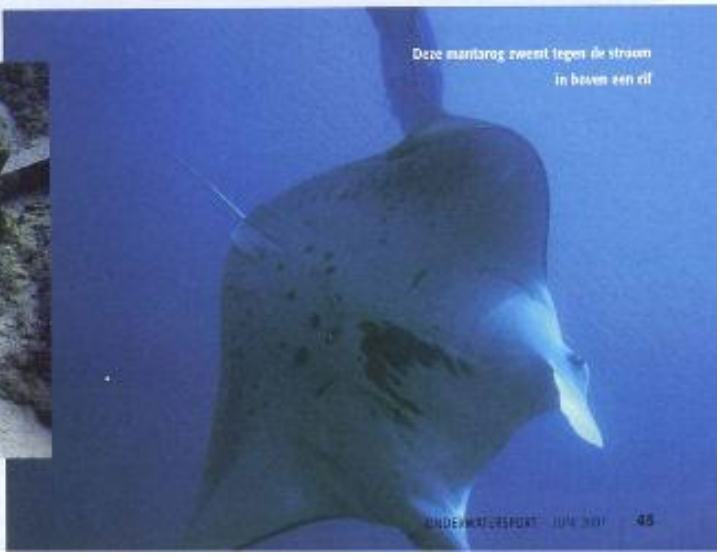
Zoekplaatje: een gorgoon met daarop een dwergzeepaardje

de plaatselijke hoofdstad Sorong. Daarvandaan is het zo'n twee uur varen. Volgens Zaneveld was Sorong nog een kampong (dorp). Het was toen wel een oliestadje en de basis van de Nederlandse Nieuw-Guinea Petroleum Maatschappij (NNGPM), die later deel ging uitmaken van een grotere, meer bekende oliemaatschappij. Sorong is ook nu nog bekend vanwege de olie-industrie. Wie vanaf Kri weer terug wil naar Sorong, kan het beste wachten totdat er minstens een week om is. In principe kunnen gasten op zondag heen en terug. Op zaterdagen wordt er niet gedoken zodat het CO2 weer kan ontsnappen uit het bloed. Enkele weken verblijven is natuurlijk wel beter, want er is veel te zien en te beleven. Daar hoef je niet ver voor te varen vanaf de duikbasis.

DWERGZEEPAARDJES Vlak bij de duikcentra kan het sterk stromen, maar er zijn ook stukken kust die uit mangroven (moerasbossen) bestaan. Daar stroomt het water door geulen die sterk wisselen in diepteverloop. Binnen die geulen groeien ook koralen, die soms vreemde formaties vormen en ook uit zeldzame soortensamenstellingen bestaan. Daar valt veel te ontdekken. In het gebied kun je grote vissen aantreffen, zoals kleine groepen mantaroggen, solitaire wobbegongs (een haaiensoort die meer bekend is van Australië) en scholen bultkoppapegaaivissen, die als kuddes grazen. Bij de

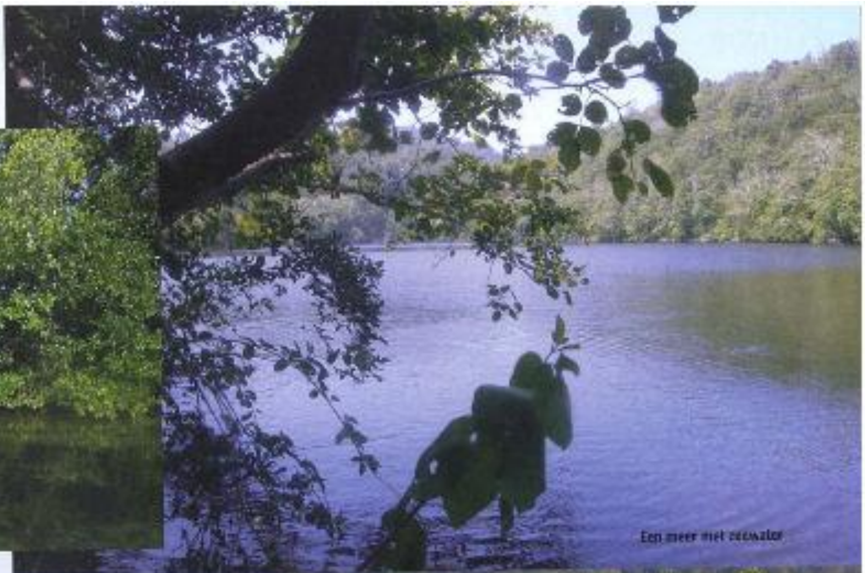
Een platworm met zijn vermoedelijke prooi (zakpijpen)

Een wobbegonghaai ligt te rusten op de zeebodem



Deze mantarog zweeft tegen de stroom in boven een rif

Ontdekkingstocht door de mangroven



Een meer met zeewater

onderwaterfotografen zijn vooral de dwergzeepaardjes populair.

De duikgidsen zijn bedreven in het vinden en het aanwijzen van deze fotogenieke visjes met ongeveer de afmeting van een centimeter. Er zijn meerdere soorten van deze zogenaamde 'pigmy seahorses'. Ze behoren tot de beschermde soorten en er mag niet mee gehandeld worden. Sommige zijn pas sinds kort geleden bekend en beschreven. Toch blijkt dat er nog weinig bekend is over deze visjes. Ze kunnen zich goed camoufleren ten opzichte van de koralen waar ze op leven maar van welke soorten koralen deze zeepaardjes afhankelijk zijn voor hun overleving is nog niet bekend.

VERBORGEN ORGANISMEN En dat is één van de thema's van de komende Naturalis expeditie, die vooral gericht wordt op het vinden van verborgen organismen die voor hun voortbestaan afhankelijk zijn van andere soorten. Dat noemen we cryptische biodiversiteit. Het is de vraag of die biodiversiteit nu hoger is in Raja Ampat dan elders. Deze informatie is van belang om de noodzaak van natuurbescherming aan te tonen. Men moet weten waar bescherming het meest urgent is. Vandaar dat het Naturalis Zeeteam niet alleen gaat samenwerken met Indonesische collega-onderzoekers maar ook met de staf van de lokale afdeling van Conservation International.

Bert W. Hoeksema, Hoofd Afdeling Zoölogie / Coördinator Zeeonderzoek, Nationaal Natuurhistorisch Museum - Naturalis, Leiden. Hoeksema@naturalis.nnm.nl

Zicht op Kri Ecoresort

Vreemde koraalformaties in een geul tussen de mangroven

Met Naturalis in Zee

Verborgen leven van Raja Ampat

Zeeanemoon die zich schuil houdt tussen algen

Geslaagd. Dat is de expeditie zeker. Van Naturalis naar de Raja Ampat eilanden. Vorig jaar al in Onderwatersport in de juni-uitgave aangekondigd en eind vorig jaar ook daadwerkelijk uitgevoerd. De verwachtingen van een rijk onderwaterleven zijn voor een groot deel uitgekomen. Het gevarieerde onderwaterlandschap bood plaats aan diverse soorten, waarvan vele in eerste instantie alleen door specialisten herkend kunnen worden.

TEKST EN ILLUSTRATIES:
BERT W. HOEKSEMA / NATURALIS

Vooraf stond ook al vast dat de leden van de Naturalis-expeditie naar de Raja Ampat eilanden zouden letten op algen en specifieke groepen dieren die weinig opvallen vanwege hun verborgen levenswijze. Het betrof onder andere dieren die in symbiose leven met andere soorten en hierbij dikwijls gebruik maken van camouflage. En er zijn er ook de nodige waargenomen.

GEVARIEERD Concluderend kan worden gesteld dat het landschap boven en onder het wateroppervlak bijzonder gevarieerd bleek. De meeste kust bestaat uit grillige kalkrotsen, die ook onderwater een onregelmatige ondergrond biedt aan koralen en andere vastzittende organismen. Tussen de vele eilanden kan de stroming sterk zijn en zelfs draaikolken vormen, wat een nieuw soort duikervaring als gevolg had. Anderzijds waren er ook veel beschutte baaien, waarvan sommige heel groot bleken te zijn. Binnen deze grote baaien boden diverse grillig gevormde rotseilanden ook weer veel variatie aan bodemomstandigheden in de vorm van steen, zand en slib.

Een bijzonder onderwatermilieu werd gevormd door nauwe kanalen tussen de mangroven, waarvan de bodem meestal ondiep was. Buitengewoon was verder de aanwezigheid van zoutwatermeren. Elk meer bleek een unieke samenstelling van soorten te be-

De hutten van Kri Ecoresort zijn voorzien van natuurlijke ventilatie

De vissen lijken te schuilen bij dit zacht koraal

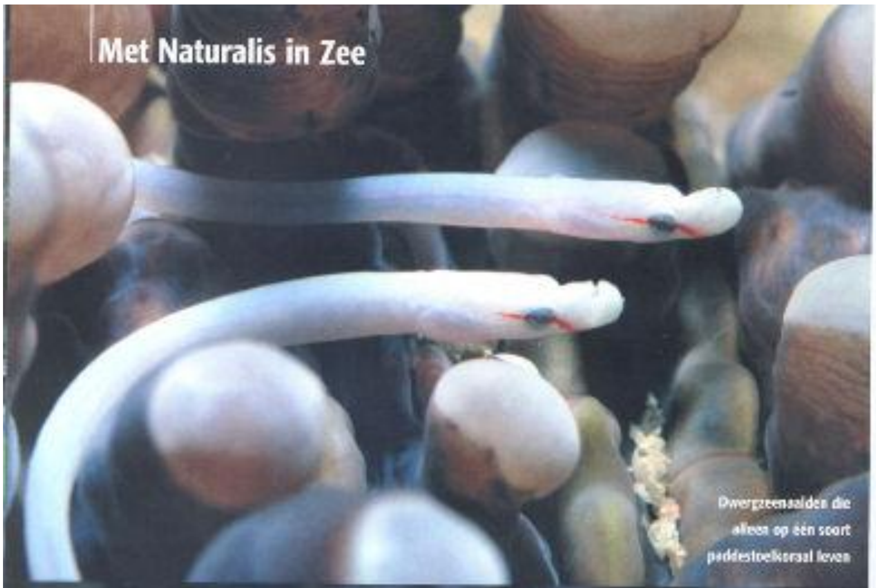
Navigeren door nauwe waterwegen

De rotsen zijn doorgaans bedekt met vegetatie

Ingekapselde zeepokken filteren voedsel met hun tentakels

Tropische zandstranden ontbreken niet in het gevarieerde landschap

Picknick op de bodem van een ravijn



Dwergzeenaalden die alleen op één soort paddestoelkoraal leven

Gerelateerd aan zeenaalden en zeepaardjes, maar lijkend op een groenwier

Dwergzeepaardjes vallen niet op dankzij hun camouflage en geringe grootte

vatten met name van sponzen, een speciaal onderzoeksthema tijdens de expeditie. Deze zoutwatermeren zijn helemaal ingesloten door kalkrots, dat echter poreus is zodat er wel ondergrondse verbindingen bestaan met de omringende zee. Tijdens de expeditie naar Oost-Kalimantan in 2003 werd ook aandacht geschonken aan zulke zoutwatermeren die weinig opvallen, doordat ze vanaf zee niet zichtbaar zijn (zie eerste nummer van Onderwatersport in 2005). Kortom, door de grote variatie aan onderwatermilieus en de sterk gespecialiseerde onderlinge afhankelijkheid van soorten bleek de soortenrijkdom van Raja Ampat bijzonder hoog te zijn. De door de expeditieleden verzamelde monsters, de foto's en de notities bieden in ieder geval stof voor vele toekomstige publicaties in wetenschappelijke vaktijdschriften.

VIJF WEKEN De expeditie naar de Raja Ampat eilanden duurde voor de meeste deelnemers ongeveer vijf weken. In totaal namen 21 zeeonderzoekers en studenten deel aan deze operatie. Ze waren verbonden aan instituten in Nederland (13), Indonesië (4), de Verenigde Staten (3) en Palau (1). De uiteindelijke bestemming was Kri Eco Resort op het eilandje Kri, dat op een afstand van ongeveer twee uur varen van de stad Sorong ligt bij het schiereiland Vogelkop op het eiland Nieuw-Guinea (provincie West-Papoea) in Indonesië. Vooraf moesten de vergunningen worden geregeld vanuit Nederland, maar ook in Jakarta, waar de expeditie officieel van start ging.

Voor de logistieke uitvoering werd de expeditie ondersteund door het Research Centre of Oceanography te Jakarta, dat hielp bij het verkrijgen van de vergunningen en bovendien het moderne onderzoekschip Baruna Jaya 8 ter beschikking stelde voor het transport van onderzoeksuitrusting van Jakarta naar Sorong en weer terug. De natuurbeschermingsorganisatie Conservation International, dat een kantoor heeft in Sorong, hielp door het verstrekken van informatie over interessante duiklocaties en het sponsoren van enkele verre vaartochten. De expeditie zou echter nooit plaats hebben kunnen vinden zonder Papua Diving van Max Ammer, dat een uitstekende uitvalbasis bood voor de expeditie.

SPECTACULAIR Lang van te voren stond al vast dat dit de meest spectaculaire Naturalis zee-expeditie zou worden sinds lange tijd. Dit vanwege de natuur ter plekke, de relatief af-

Galkrabben kunnen zich laten inkapselen door koraal

Zeepokken worden deels overgroeid door het skelet van de koraalgastheer

gelegen ligging, maar ook de reputatie dat het moeilijk zou worden voor buitenlanders om onderzoekvergunningen te krijgen voor dit verre gebied. Hierbij hielp het dat de expeditie naar Raja Ampat met overwegend Nederlandse deelname deel uitmaakte van een meerjarig Indonesisch onderzoeksprogramma van het Research Centre of Oceanography. Toch bleef iedereen in grote spanning doordat de visa pas enkele dagen voor vertrek werden vrijgegeven. Een reis via Jakarta voor alle officiële verplichtingen, Singapore, een binnenlandse vlucht naar Sorong en ten slotte een boottransport naar Kri.

OP KRI BEGON HET WERK MET EEN DAGELIJKSE ROUTINE VAN TWEE DUIKEN, WAARNA DE RESULTATEN WERDEN VERWERKT

Op Kri begon het werk met een dagelijkse routine van twee duiken, waarna de resultaten werden verwerkt. Er werd veel gevaren tussen de basis en de vele duiklocaties, waarvan veel dichtbij en andere ver weg lagen. Sommige locaties waren standaard duikplekken van Papua Diving, maar aan de hand van zeekaarten, satellietopnamen en luchtfoto's werden ook nieuwe plekken verkend. Na elke zes dagen werd er een duikloze dag ingelast om achterstallige werkzaamheden uit te voeren en het stikstofgehalte in het bloed te verlagen. De uiteindelijke onderzoektijd in Raja Ampat zelf bedroeg vier weken, een relatief lange periode die veel resultaten opleverde.

NIEUWE MELDINGEN Doordat iedere onderzoeker zijn eigen specialisatie had, bleek al

Deze platworm viel op door zijn kruipsnelheid over het zand

Naaktslakken zijn ook vaak kleurrijk

Een zeldzame soort zeekomkommer die zich niet ondiep laat zien

Veel platwormen hebben fraaie kleurpatronen

Deze soort slak leeft van zacht koraal

snel dat er veel nieuwe meldingen van soorten werden verkregen die niet eerder officieel waren waargenomen. Een groot deel van de soorten bleek afhankelijk van gastheersoorten en werden daarop consequent waargenomen. De beroemde dwergzeepaardjes (pygmy seahorses), die overwegend op waaierkoralen (gorgonen) voorkomen, waren al bekend. De identiteit van de gastheersoorten waarop ze leven en waarvan ze afhankelijk zijn, moest nog wel worden bepaald. Er werd ook specifiek naar slakken gezocht die op deze koralen leven, waarbij ook af en toe 's nachts gedoken werd. Dit bleek tijdrovend werk, maar leverde wel veel nieuwe records op. Evenzo, bleken er ook veel garnalen gevonden te worden, waarvan de diverse soorten voorkwamen op koralen, zeeanemonen, zeekomkommers, zakpijpen, tweekleppigen, enzovoort.

Veel koraalsoorten bleken als gastheer te dienen voor vele andere soorten dieren. Zelfs zeepokken die vooral bekend zijn als bedekker van steen en dood hout, blijken zich te kunnen laten vergroeien met levend koraal. Tijdens de expeditie werd ook speciaal gelet op galkrabben die zich laten inkapselen door koralen en boormossels die gangen boren in het kalkstenen skelet van de gastheersoorten. Ook sponzen en zakpijpen dienen als woning voor allerlei kleine schaaldieren en andere ongewervelde dieren. Bij alle associaties tussen de gastheersoorten en de symbionten werd gelet op hoe specifiek die relatie is. Als iedere koraalsoort of een andere gastheersoort een eigen leefgemeenschap vormt, dan wordt snel duidelijk dat de rijkdom aan soorten veel hoger is dan op het eerste gezicht lijkt.

Ook bij kleurrijke en anderzijds opvallende diersoorten blijkt dat gericht zoeken resulteert in hoge aantallen waargenomen soorten. Dit was duidelijk het geval bij naaktslakken en platwormen. Ook onbedoeld werden er bijzondere dieren gevonden die juist opvielen door een speciale camouflage of door een anderszins speciaal uiterlijk. Zo zijn er verwanten van zeepaardjes die sterk op zeewier lijken en zeenaalden die zo minuscuul zijn dat ze zich tussen de tentakels van koraal kunnen verstoppen.

Bert W. Hoeksema is Hoofd Afdeling Zoölogie / Coördinator Zeeonderzoek, Nationaal Natuurhistorisch Museum - Naturalis, Leiden. Hoeksema@naturalis.nnm.nl

Deze garnaal hoort tot een wijdverspreide algemene soort, die bij veel gastheersoorten wordt aangetroffen

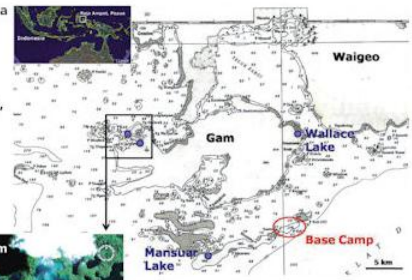
Garnaal die zich heeft verbonden met een zeeanemoon

Commensale garnalen hebben vaak een specifieke gastheer, in dit geval een paddenstoelkoraal met lange tentakels

The sponge fauna of recently located marine lakes in Raja Ampat, Papua, Indonesia - preliminary results

Leontine E. Becking, Nicole J. de Voogd, Bert W. Hoeksema

National Museum of Natural History Naturalis, Department Zoology, P.O. Box 9517, 2300 RA Leiden, The Netherlands (becking@naturalis.nnm.nl; voogd@naturalis.nnm.nl, hoeksema@naturalis.nnm.nl)



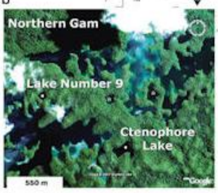


Figure 1 Map of survey area in Raja Ampat, Papua, Indonesia. a) Nautical map of the island Gam and surroundings with the surveyed marine lakes indicated with blue dots. b) Google Earth™ image of Ctenophore Lake and Lake Number 9 in Northern Gam indicated with white dots. Asterisks indicate bodies of seawater that looked isolated on Google Earth™ but in fact had open connections to the sea in the field.

Introduction

In November-December 2007 an expedition to Raja Ampat, Papua, Indonesia was organized by the National Museum of Natural History Naturalis in Leiden, the Netherlands, as part of the Exspedisi Widya Nusantara (E-Win expedition) of the Research Center for Oceanography, Indonesian Institute of Sciences (RCO-LIPI) in Java, Indonesia.

Our aim was to locate marine lakes and to survey their sponge assemblages. Marine lakes are land-locked salt water bodies that are thought to have been formed in the Holocene and have maintained a marine character ever since through submarine connections to the sea. With the aid of satellite images from Google Earth™ and old Dutch maps we were able to locate six lakes that have not been documented scientifically before (Figure 1).

Here we present the preliminary results on the sponge fauna of four of these lakes. The lakes are positioned in very sparsely populated areas and, as we were not able to obtain local names, we present our working names for now: Mansuar Lake, Wallace Lake, Ctenophore Lake, Lake Number 9. The last two are located relatively close to each other and therefore we distinguish three lake regions in the present study.

Mansuar Lake

- 0°26'31"S 130°41'08"E
- Size: 400 x 180 m
- Limited connection to lagoon
- Low diversity but high biomass of predominantly mussels, ascidians and sponges

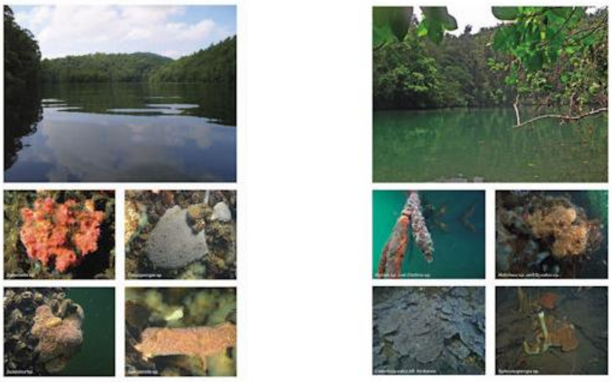


Figure 2. Overview pictures of Mansuar Lake and Wallace Lake and their typical sponge fauna.

Wallace Lake

- 0°35'17"S 130°35'50"E
- Size: 200 x 120 m
- High connection to lagoon
- Coral present and high diversity of sponges

Preliminary results

- Number of species ranged approximately from 20-40 per lake.
- Over five undescribed species and at least one undescribed genus.
- Relatively high number of hadromerid and poecilosclerid species.
- Many unusual growth forms of long fistules or extensions, and of very large oscules; presumably a result of limited exposure with high sediment load.
- Lake Mansuar was the most isolated lake with the lowest sponge diversity and harboured some of the same species that have been found in isolated marine lakes in East Kalimantan (Indonesia).
- The other three lakes contained unique sponge species as well as some coral species and a high number of sponge species that are common in reef environments.
- A preliminary comparison of the sponge assemblages based on species presence/absence shows that the sponge composition differed between the lakes from the three different regions.

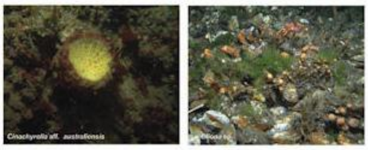


Figure 3. Examples of species present in all four marine lakes.

Figure 4. Examples of habitat types.

Acknowledgements

This project is funded by the ALW Open Programme of The Netherlands Organisation for Scientific Research, the fieldwork was further funded by the Schure-Beijerinck-Popping Fonds, Treub-Maatschappij Fonds, Lerner Grey Fund for Marine Research, Jan Joost Ter Pelkwijk Fonds, Alida B. Buitendijk Fonds. We would like to acknowledge the following people for their help in different ways: Suharsono, Yosephine Tuti, Max Ammer, Willem Renema, Belinda Alvarez, Lori Bell, Michael Dawson, Hengki, Ismael, James, Laura Martin, Sharon Patris.

Sponsors

The expedition to the Raja Ampat island group was funded by several funds and organizations, both financially and logistically:

An uncommon pontoniid shrimp, *Periclimenes* spec. nov. (Okuno & Bruce, in press), son the tentacle of a sea anomeone, *Actinostephanus haeckeli* (B.W. Hoeksema).