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CRYPTIC MARINE BIODIVERSITY OF RAJA AMPAT ISLANDS

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ABSTRACT

During a marine field survey in Raja Ampat as part of Ekspedisi Widya Nusantara (E-win), 21 scientists, studied the area's cryptic biota on coral reefs and in marine lakes. Cryptic species lead hidden lives due to their small size, successful camouflage or mimicry, or because they live in habitats that are easily overlooked or hard to access. Hundreds of species were sampled, many of which still have to be identified. The species richness of Raja Ampat appears to be very high, even among other areas within the centre of maximum marine biodiversity, the so-called Coral Triangle.

Keywords: biodiversity, Raja ampat islands, coral triangle

INTRODUCTION

RCO-LIPI and Naturalis organized a marine survey at the Raja Ampat islands (17 November – 17 December 2007) in which 21 scientists participated (from Indonesia, the Netherlands, Palau, and the USA) as part of Ekspedisi Widya Nusantara (E-Win). The Raja Ampat islands are located northwest of the Bird's Head peninsula in Papua (Fig. 1), Indonesia, which is located in the middle of the centre of maximum marine biodiversity, the so-called Coral Triangle (Hoeksema, 2007). This area includes the Philippines, Sabah (eastern Malaysia), eastern Indonesia, Timor-Leste, northern Papua New Guinea, and the Solomon islands (Green and Mous, 2008).

Figure 1. The Raja Ampat island group, northwest of Bird's Head peninsula, as studied by Zaneveld (1950).

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The Raja Ampat island group has a long history of research (Zaneveld, 1950). During a rapid assessment by Conservation International, which focused mostly on prominent animal species, specialists concluded: "This region supports the worlds' richest marine biodiversity, mostly concentrated in extensive coral reef, mangrove and sea grass habitats" (McKenna *et al.*, 2002). During the 2007 marine survey, emphasis was more on the cryptic marine biota. Such cryptic species may be difficult to find because of their small size, their successful camouflage or mimicry, or because they live in habitats that are easily overlooked or nearly inaccessible (marine lakes). Use of camouflage is seen in many animals that live in close association with host species. In case of such interspecific associations, the hosts were included in the study. In addition, species sometimes resemble phylogenetically related species, called sibling species. In this case the cryptic species can be detected with the help of molecular (DNA) analyses.

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. The present marine (anchialine) lakes are relative small, land-locked brackish water bodies that have been formed after the last glacial maximum. They have maintained their marine character through a network of submarine connections (crevices and tunnels) to the sea. As a result of their relative isolation from the surrounding seas, such 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). This expedition was the first to document in detail the flora and fauna of the marine lakes of Raja Ampat.

RESULTS

During the expedition 70 localities were studied (RAJ stations 1-70), which included marine lakes (Fig. 2). The preliminary results of the expedition have been published in a progress report (Hoeksema & Meij, 2008). They are summarized below.

Research on stony corals (Scleractinia) was concentrated on the distribution of mushroom corals (Fungiidae) as a pilot group (Hoeksema, 2008). A very high number of species (39) was encountered. An additional record from an earlier expedition brings the total for Raja Ampat to 40, a maximum shared with the Berau Archipelago in East Kalimantan and Madang in the Bismarck Sea (Fig. 3). In total 76 species of stony corals appeared to host boring mussels and gall crabs, which still need to be investigated (Meij and Hoeksema,

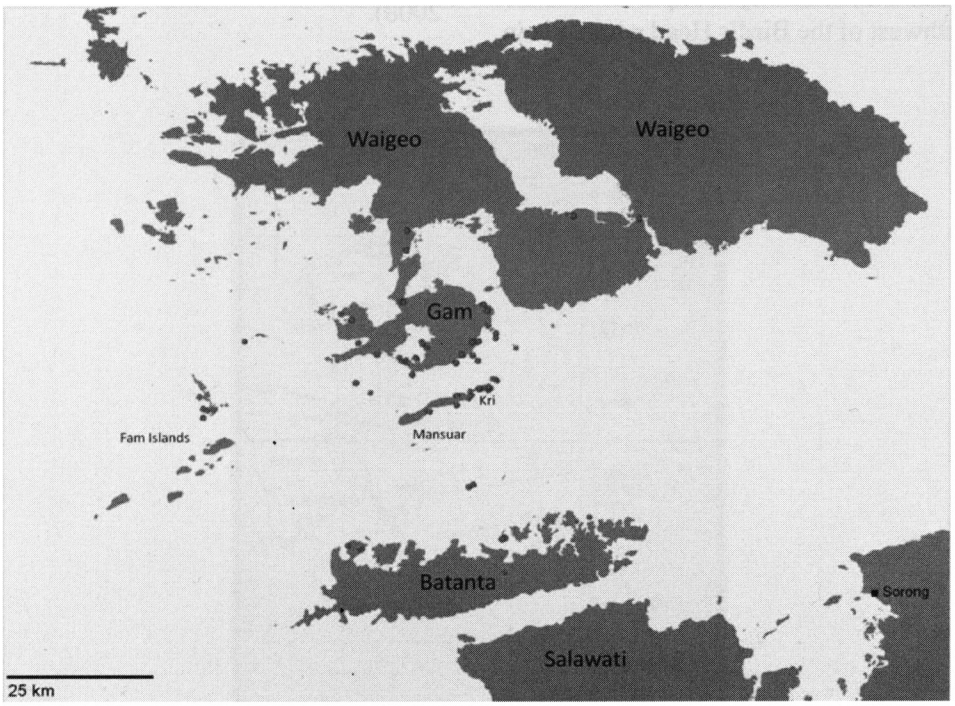

Figure 2. RAJ-stations visited during the expedition (*red dots*). The field base was located at Kri island.

2008). Five or six species of the commensal shrimps genus *Vir* were reported from 14 species of bubble corals (Euphylliidae) (Veer and Fransen, 2008). Altogether, stony corals not only added to the biodiversity by themselves but also through their associated cryptic fauna. The soft coral fauna (Octocorallia) also appeared very rich compared to other areas (Ofwegen *et al.*, 2008). In the order of Alcyonacea 18 families of were sampled, comprising 55 genera, some of which are rare, such as the uncommon genus *Chromonephthea.* All octocorals together acted as host of four species of pygmy seahorses (Stokvis and Ofwegen, 2008), whereas a possible fifth species was not found (Winkel, 2007). A total of 23 octocoral species was recorded as host for 21 species of ovulid snails (Reijnen and Ofwegen, 2008).

In addition to shrimps of the genus *Vir* and coral gall crabs, other commensal crustaceans were investigated. Preliminary identification of pontoniine shrimps yielded about 77 species, a number that is comparable with the diversity recorded in other Coral Triangle localities (Fransen, 2008). The research on commensal amphipods resulted in a record of 21 new species in the genera *Anamixis*, *Leucothoe* and *Paranamixis,* together with many species already known (Thomas, 2008).

The bottom-dwelling Polychaete worms encountered belonged to 25 families, of which the Syllidae were studied in more detail (Al-Hakim, 2008). A survey on flatworms yielded 14 species of polyclads and 2 acoel turbellarians (Velde, 2008). The species number of large benthic Foraminifera is estimated to be 23 (Renema, 2008). The species richness of macro algae is comparable to that of other areas investigated in Indonesia, i.e. 160 species belonging to over 95 genera (Draisma, 2008). The sponge species inventories concentrated on marine lakes, which resulted in representatives of 26 families within ten Orders of Demospongiae (Becking, 2008). In addition, various groups of other organisms were collected in the marine lakes, which will be studied by their respective taxonomists (Bell *et al.*, 2008). Thanks to a survey of the reef flats of Mansuar island and Kri island, a map could be produced, which shows the cover of sea grass beds, sand patches, and corals (Winardi, 2008).

Overall, the results show that Raja Ampat is very rich in species, also in comparison with other areas in the Coral Triangle. When our results on specific target taxa (e.g. Scleractinia: Fungiidae, Gastropoda: Ovulidae) are compared with earlier results (McKenna *et al.*, 2002), we can conclude that species richness is higher than previously

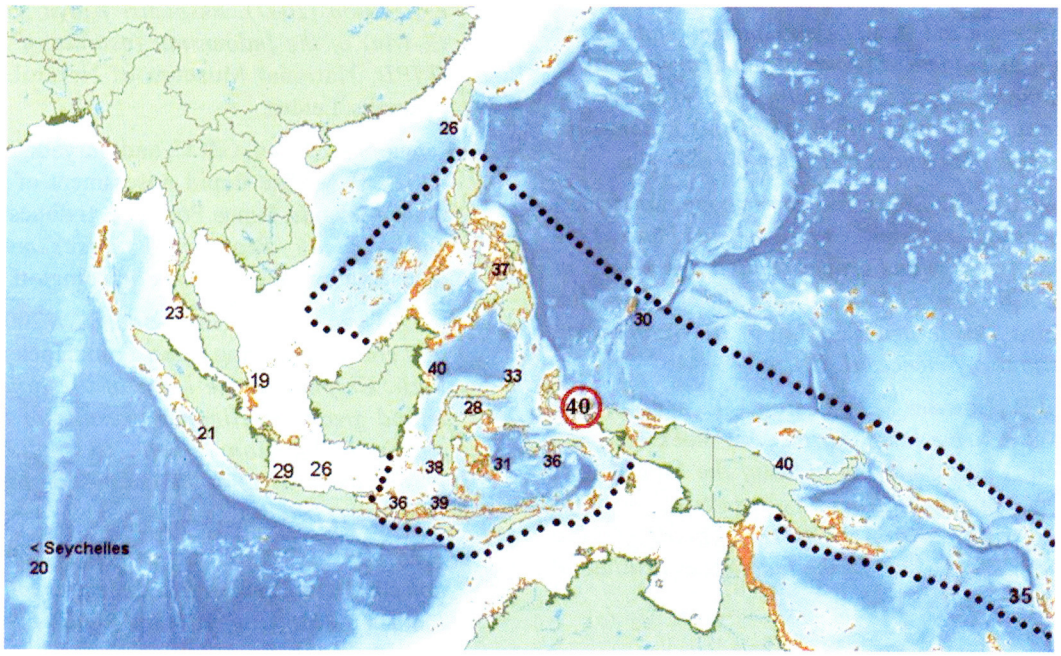

Figure 3. A hypothetical coral triangle based on mushroom coral species numbers obtained during field surveys (presence/absence data) and the contours of continental shelves. Raja Ampat is indicated by the red circle.

recorded. To indicate biodiversity, a large additional cryptic fauna of associated species needs to be taken into account together with their host species, such as corals. The present research, together with existing collections in Indonesia and the Netherlands, can be used to document changes in Indonesian marine biodiversity over time.

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