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Diversity Of Crustacean Isopod In Bangka Island Of North Sulawesi

(Keanekaragaman Krustase Isopoda Di Pulau Bangka, Sulawesi Utara)

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Abstract

Information about marine isopods in Indonesian water is scarce. This research aimed to inventory isopods in nearshore habitats of Northern Sulawesi using a morphological approach to identify the species. Sampling was done in several spots in Bangka Island considering three different habitats: coral rubble, mangrove roots, and seagrass beds. These habitats are known to be suitable for isopods to feed, reproduce, and hide from bigger predators. There are 7 group of Isopod found in total, such as Anthuridea, Asellota, Bopyridae, Cirolanidae, Gnathiidae, Limnoriidea, and Sphaeromatidea. In family of Anthuridae, there are 2 suspected new species and required further identification.
Keywords**:** *Marine Isopod, Ecology, Bangka Island, North Sulawesi.*

Abstrak

Informasi mengenai isopoda laut di perairan Indonesia masih sangat sedikit. Penelitian ini bertujuan untuk menginventarisasi isopoda di habitat dekat pantai Sulawesi Utara menggunakan pendekatan morfologi untuk mengidentifikasi spesies. Pengambilan sampel dilakukan di beberapa titik di Pulau Bangka dengan pertimbangan tiga jenis habitat berbeda: serpihan karang, akar mangrove, dan padang lamun. Habitat tersebut merupakan tempat isopoda mencari makan, bereproduksi, dan bersembunyi dari predator. Dari hasil identifikasi ditemukan 7 kelompok isopoda, yakni Anthuridea, Asellota, Bopyridae, Cirolanidae, Gnathiidae, Limnoriidea, dan Sphaeromatidea. Diduga ada 2 species yang baru di kelompok Anthuridae yang masih perlu penelitian lebih lanjut.
Kata kunci: *Isopoda Laut, Ekologi, Pulau Bangka, Sulawesi Utara.*

INTRODUCTION

Indonesia, located at the equator with the confluence of two plates and two oceans, has a high marine diversity (Aswandy, 2007). The Coral Triangle is the richest assemblage of tropical shallow water habitats on earth, with a very high diversity of species and a very wide area for coral reefs, mangroves, sea grass beds, estuaries and soft-sediment habitats. The outermost northern part of Indonesia in Sulawesi is in the heart of the Coral Triangle (Huffard *et al.*, 2012). Biogeographically this area is a contact zone between regions with the globally highest diversity (Sanciangco *et al*., 2013).

Crustacea is the second most abundant group with high diversity in littoral habitats. The most common benthic crustaceans are Amphipoda, Isopoda, Tanaidacea, and Decapoda. Isopoda is one of the groups that cannot be separated from food chain: acting as active predators, filter feeders, scavengers, and some act as parasites (Geetha & Nandan, 2014). In the marine energy flow, some isopods have the ability to process decaying organic matters that become available to other trophic levels (Hendrickx & Perez, 2000)

The lack of exploratory research causes a lack of records of the diversity of species occurring in Indonesian waters, especially for marine invertebrate taxa. The availability of information about the diversity of species that exist in Indonesia is still poor except for corals and fishes (Mangubhai *et al.,* 2012). One of the invertebrate taxa with a minimum of information from the Coral Triangle is marine crustaceans. So far, the information for crustacean diversity has only been studied in two groups, namely Stomatopoda and Decapoda (Hutomo & Moosa, 2004). A recent list of the isopod species found in Indonesian waters was published by Sidabalok (2013).

Considering the lack of information about the Indonesian diversity of Isopoda especially on near-shore habitats in Northern Sulawesi, it is necessary to review the diversity and taxonomy of this taxon as the basic information required to learn more about the diversity and function of Indonesian marine ecosystems. The research was conducted in Bangka Island of North Sulawesi on September 2019.

MATERIALS AND METHODS

The specimens were collected from two different sites in Coral Eye Resort of Bangka Island (Fig. 1 & 2). The first station was in front of Coral Eye, representing coral rubble (1”45’01°N 125”08’01°E), and the second station was in seagrass and mangrove habitats (1”45’26°N 125”07’59°E). The research was carried out at the Coral Eye Resort Laboratory, the Morphology Laboratory of Sam Ratulangi University, and the Leibniz Institute for Animal Biodiversity (Museum Koenig) in Bonn.

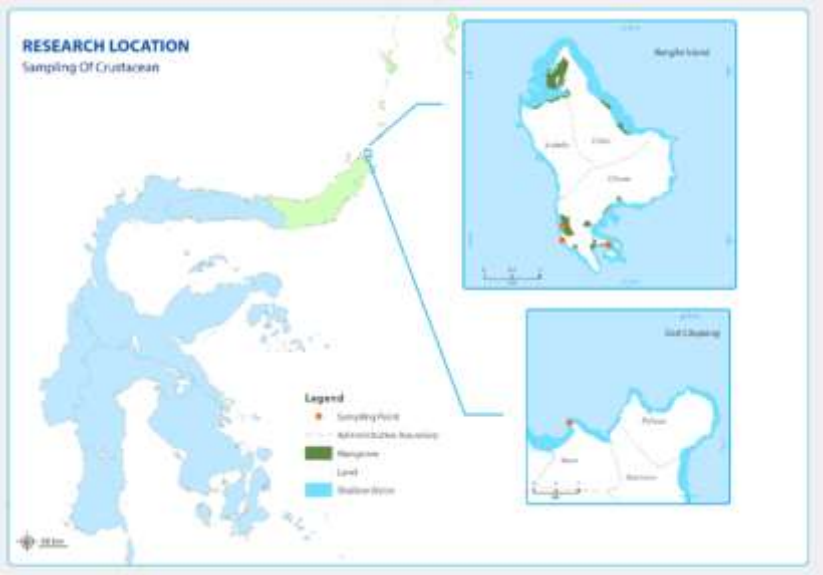

Figure 1. Map of Sulawesi Island, Indonesia (A), sampling sites in Bangka Island (B)

Collecting samples from sea grass and coral rubble: The sites were first observed by snorkeling to decide where to collect samples in sea grass and coral rubble. For the collection of larger amounts of substrates, the dredge that had been attached to the ship was dropped down on seagrass bed and the boat driver was instructed to adjust the speed and direction. The dredge was pulled slowly for 50 m or until the net was full with sediment. The dredge was then pulled back on board with the collected sediment and the obtained contents were placed in a bucket filled with sea water to soak the sediment.

Collecting samples from mangroves: Selected mangrove roots hanging in the water were stretched and cut into smaller pieces, and immediately placed in cotton bags while still in the water to prevent the small animals escaped. The mangrove roots were then placed in a bucket and

soaked in sea water for 3-4 hours. The roots were then washed in the bucket and sieved.

Portions of the collected sediment were carefully washed with fresh sea water in large buckets (gently to avoid that animals are destroyed) and the water with dispersed particles was then sieved one time with 0.5 mm to separate big objects (leaves, fish, etc.), after that it was sieved with 1 mm and 0.1 mm to get smaller specimen.

RESULTS AND DISCUSSION

In this study, there are 7 groups of Isopods found from 3 different habitats in Bangka Island as indicated in Figure 2. The isopod taxa that occurred in coral rubble are Anthuridea, Asellota, Cirolanidae, Gnathiidae, and Sphaeromatidea. Asellota, Bopyridae, Gnathiidae, Sphaeromatidea, and Anthuridea were found in seagrass beds, while Sphaeromatidea, Limnoriidea, and Anthuridea are present on mangrove roots (Fig. 3). There are 2 suspected new species in Anthuridae which required a further identification.

According to the World Register of Marine Species (WoRMS, 2019) the classification of Isopoda is as follows :

Kingdom : Animalia
Phylum : Arthropoda
Subphylum : Crustacea
Class : Malacostraca
Subclass : Eumalacostraca
Superorder : Peracarida
Order : Isopoda

Brandt and Poore (2003) explained that the word Isopoda comes from 'iso' (same) and 'podus' (legs) meaning that animals which have legs with the same shape along the pereon. The isopod suborders are Asellota, Cymothoida, Limnoriidea, Phoratopidea, Sphaeromatidea, Valvifera, and Anthuridea.

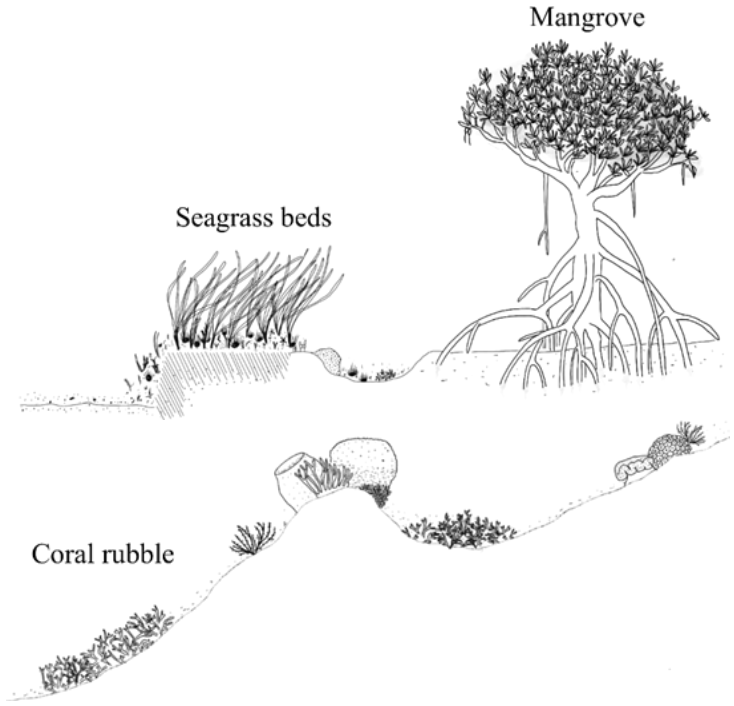

Fig 2. Habitats of isopod sampled for this study

There are 10.000 species of Isopoda that live in marine or fresh water, some are terrestrial, with sizes from 0.5 – 500 mm. Isopods have a wide distribution. Marine species can be found in intertidal, littoral, sublittoral, and abyssal habitats. Most Isopods are herbivores or scavengers, but some are living as detritivores, filter-feeders or predator (Brusca & Brusca, 2003).

Dominance of different families are not the same in different geographic regions. Valviferans dominate in North and

South polar seas, with Arcturidae and Idoteidae dominating in arctic and Antarcturidae in antartic seas, while all of them are almost not found in tropical areas except in tropical Atlantic. Families that dominate in tropical areas are Cirolanidae, Cymothoidae, Anthuridae, Expanathuridae, and Leptanthuridae, which all of them are predators or associate with fish. On the other hand, areas with temperate climate are inhabited by Idoteidae and Sphaeromatidae (Poore & Bruce, 2012).

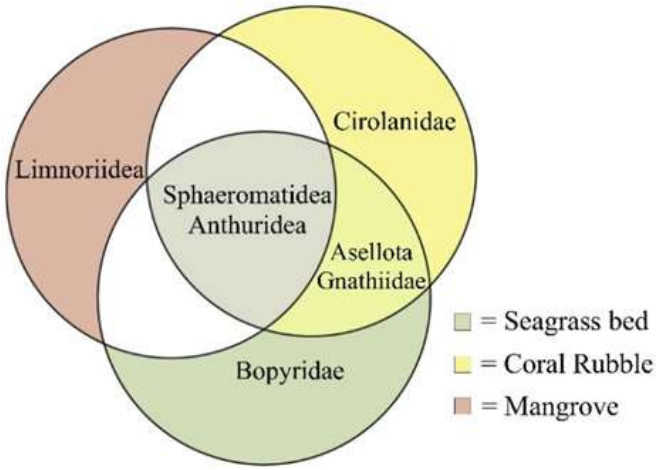

Fig 3. The occurrence of Isopod in three different habitats

Isopods from shallow waters have been explored and examined in several areas, and data were summarized for West Afrika (Kensley, 1978), the Caribbean (Kensley & Schotte, 1989), Antartica (Wägele, 1991), North America (Richardson, 1905) and Europe (Naylor, 1972). Meanwhile, some areas that have a high diversity of species have not been received sustained taxonomic attention, for example the Indian Ocean (Kensley, 2001; Kensley & Schotte, 2002; Schotte & Kensley, 2005; Kensley *et.al.,* 2007; Kensley *et.al.,* 2009), the Pacific Ocean (Mueller, 1991a; Mueller, 1991b; Mueller, 1993a), and Indo-Pacific Waters (Mueller, 1993b; Bruce & Wong, 2015; Sidabalok, 2013).

Isopoda **Asellota**: Most hitherto described species live in the deep sea. Some genera occur in freshwater and in shallow marine habitats (Naylor & Haahtela, 1966; Naylor *et al.,* 1961), usually living on stones, algae, in crevices (Sjoeberg, 1967), on sponges, some are associated with Sphaeromatidae (Prunus & Pantoustier, 1977). They are present in Sulawesi reefs. The biology of these species are unknown.

Isopoda **Cymothoidea**: Cirolanidae are scavengers and predators which often hide burrowing in sand (Brown, 1973; de Alava & Defeo, 1991; DeRuyck e*t al.*, 1992; Dexter, 1983, 1987; Donn & Cockcroft, 1989; Glynn *et al.,* 1975; Jaramillo & Fuentealba, 1993; Jones, 1971, 1976, 1979; Nickell & Moore, 1991). Eurydice species probably feed on zooplankton (Fish, 1970; Quart-Moulin, 1992), larger species feed on dead fish. One species has been reported in association with turtles (Williams *et al.,* 1996). Species of Aegidae temporarily suck blood from the skin of fishes (Wägele, 1990). Aegidae have not been described from Sulawesi. Cymothoidae are ectoparasites on fishes. Many species have been described from tropical waters around the world, but there are few studies on their biology (Brusca, 1978). Bopyridae are ectoparasites of crustaceans (Goudeau, 1972). No species are described from Sulawesi, but they can be seen on shrimps and other Decapoda. Gnathiidae are important ectoparasites of fishes. They are common in Sulawesi, but the species are yet undescribed. Gnathiidae have three larval stages that suck blood on fishes, adults live in crevices

and do not feed (Smit *et al.,* 2003; Tanaka, 2007; Tanaka & Sanriku, 2006; Tinsley & Reilly, 2002; Wägele, 1988). In coral reefs they are an important food for cleaner fishes (Grutter, 1996; Grutter, 1994, 1999; Heupel & Bennett, 1999; McKiernan *et al.,* 2005; Rokicki *et al.,* 1992). To digest blood, they have symbiontic bacteria in their gut (Juilfs & Wägele, 1987)

Isopoda **Anthuridea**: Nearly all the literatures are on taxonomy and geographic distributions. There are probably many species in Sulawesi. Anthuridea live in crevices, Paranthuridae have been found climbing on algae (Stephenson & Riley, 1995), Eisothistos species feed on serpulid worms and can be found in worm tubes (Wägele, 1979, 1981, 1984). Some *Cyathura* species tolerate brackish water, they have been observed feeding on Polychaeta (Marques *et al.,* 1994).

Isopoda **Sphaeromatidea**: Some undetermined species have been found in samples from Bangka Island. Their biology are unknown. Sphaeromatidae can occur in association with algae (Arrontes & Anadón, 1990) or sea grass (Cinar *et al.*, 1998; Ledoyer, 1964), some burrow in wood including mangroves (Cragg & Levy, 1979; John, 1968; Kühne, 1973; Rehm, 1976; Ribi, 1982; Talley *et al.,* 2001), many live in crevices or in dead barnacles of rocky habitats in the intertidal and sublittoral zone (Dumay, 1971; Jansen, 1971; Kensler, 1965; Tsuchiya & Bellan-Santini, 1989; Wieser, 1963), there is a species found associated with Polyplacophora (Brattegard, 1968), some live in brackish water (Charmantier & Thuet, 1969; Harvey *et al.,* 1973; Hass & Knott, 1998; Jansen, 1970). Limnoriidae have been found drilling holes seagrass (Brearley & Walker, 1993; Gambi *et al.,* 2005; Tussenbrock & Brearley, 1998) but are typically burrowing in wood (Ellison & Farnsworth, 1990; Eltringham, 1965; Olafsson, 1998) and probably feeding on fouling wood and associated microorganisms (El-Shanshoury *et al.,* 1994). Limnorids have been found in mangrove wood on Bangka Island. The distribution of Serolidae is restricted with few exceptions to polar and cold waters in the Southern Hemisphere, they do not occur in Indonesia. Serolidae often live on soft sediments, they are predators (Luxmoore, 1981; Moreira, 1974; Wägele, 1987; Wägele & Brito, 1990).

The biology of Isopoda is unknown for the majority of species. Most published observations referred to species occurring in European marine habitats. The reason for this lack of information is the difficulty in finding these animals. Sorted out from samples specimens are usually dead. For example, to study feeding habits of tropical species, it is necessary to keep living specimens in aquaria for feeding experiments or to study their gut contents. This has not been done until now.

CONCLUSION

All the taxa of Isopod found in three different habitats are Anthuridea, Asellota, Cirolanidae, Gnathiidae, Sphaeromatidea, Bopyridae, and Limnoriidea. Taxa in coral rubble habitats: Anthuridea, Asellota, Cirolanidae, Gnathiidae, and Sphaeromatidea; in seagrass beds habitats: Asellota, Bopyridae, Gnathiidae, Sphaeromatidea, and Anthuridea; on mangrove root habitats: Sphaeromatidea, Limnoriidea, and Anthuridea.

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