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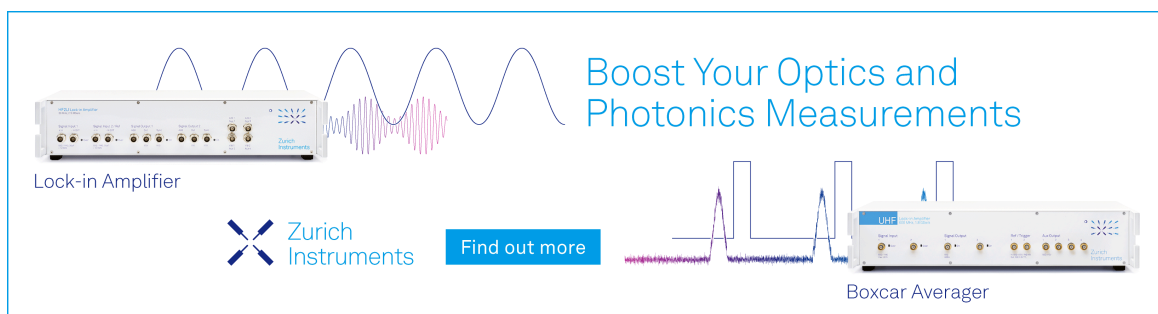
Diversity of decapod crustaceans on intertidal zone of Sombu Beach, Wangi-Wangi Island, Wakatobi, Southeast Sulawesi

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Diversity of Decapod Crustaceans on Intertidal Zone of Sombu Beach, Wangi-wangi Island, Wakatobi, Southeast Sulawesi

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Abstract. Marine decapod crustaceans are members of tropical benthic communities and play an important role in ecological function in the coastal area. Nowadays, human activity has increased in coastal area and may cause quality changes in aquatic ecosystems and substrates that will affect the species composition and diversity of crustaceans and another biota. Sombu Beach is one of the favorable sites for diving in Wangi-wangi Island, Wakatobi, Southeast Sulawesi. This study aimed to provide systematics list of decapod Crustaceans fauna in Sombu Beach. The study was conducted in the intertidal zone. Samples were collected with purposive random sampling method on Jan 4th, 2017. The result showed that 17 species from 10 families of Crustaceans that is Eriphidae, Majidae, Portunidae, Grapsidae, Gecarcinidae, Pilumnidae, Xanthidae, Diogenidae, Coenobitidae, and Plagusidae. The most diverse family was Grapsidae with four species which are *Grapsus albolineatus*, *Varuna litterata*, *Grapsus tenuicrustatus*, and *Percnon planissimum*. Based on this result, the present study indicated that intertidal zone of Sombu Beach in Wangi-wangi Island is a relatively high diversity of decapod crustacean fauna. This study would be a preliminary study for further research and would be a base document of marine area.

Keywords: decapod crustaceans, diversity, intertidal zone, Sombu Beach, Wakatobi

INTRODUCTION

Wakatobi is an underwater national park that in demand with foreign or within the country. The magnificence of the underwater view with coral reefs as a living place for many organisms including Crustaceans. In addition to being tourism object, Wakatobi islands presenting underwater natural wealth with some beaches mainstay that to be a life source of the local community, one of them is Sombu Beach. Sombu Beach is one of the beaches that located in Sombu Village. Located in Northeast of Wangi-Wangi Island, Wakatobi. This beach has white muddy sand substrate, corals and overgrown by seaweed and seagrass. In the North of the beach, there are high coral cliffs. In addition to being anchored on the fishing boat, this beach has also become areas for locals in search of fishes or other marine animals for consumption or sale.

Crustaceans are invertebrate animals that more than 50 000 members have an important role in the sustainability of coastal ecosystems. Ecologically, the existence of Crustaceans has a big effect on the sustainability of food chain, because, in addition to being a predator, the crustacean is also a source of food for fish and other predators. Economically, crustaceans have potential to improve communities living because nutritional content that can be utilized and markets demand. Crustaceans have the ability to associate with corals, seagrass, seaweeds, mollusks,

fishes, and echinoderms, that make diversity and abundance of crustaceans spread in habitat with a wide range, from the intertidal zone to deep sea zone [1].

The magnificence of the coral reefs in Wakatobi including Sombu Beach threatened due to water temperature change, catching fish by a fisher with did not the environmentally friendly way, infrastructure development in coast area and tourism development that did not notice to environmental aspects. The damaged of coral reef means damaged habitats for marine organisms including Crustaceans, which can threat living and reduce the population of Crustacean in that area [2]. The reduction of population disrupted the ecosystem. The aim of this research is as a preliminary study to know about diversity members of subphylum Crustacea in Sombu Beach.

MATERIALS AND METHODS

This study was conducted in the intertidal zone of Sombu Beach, Wangi-Wangi island, Wakatobi, Southeast Sulawesi with coordinate 05°16'12.2" S latitude and 123°31'08.8" E longitude. This area was characterized by sandy, and muddy substrate consist of species of seagrasses and seaweed covered the bottom surface area. Massive dead corals and soft corals are also found in this location.

The Research was carried out on Jan 4, 2017 during the day. Samples of Crustacea were collected with purposive random sampling method along the coastline and approximately 200 m × 50 m wide from the shore. The environmental parameters were also monitored in this study area such as air temperature, water temperature, pH, salinity, and substrate type.

The materials and equipment used in the research included GPS, fishnet mesh size 15 mm, tweezer, bucket, ziplock, camera, sample bottles, pH meter, thermometer, refractometer, formalin, alcohol 96 %, and guidelines for Crustacea identification i.e "*A guide to decapod crustaceans of the South Pacific*" [1] and "*The Living Marine Resources of The Western Central Pacific VOLUME 2 Cephalopods, crustaceans, holothurians and sharks*" [12].

The samples are identified by morphological characters of the carapace, type of chelae and type of walking legs (pereopods), dorsal and ventral regions. The taxonomical classification key was used as a guide for species identification after [1] and [12]. Identified specimens then were documented using a digital camera. The specimens were preserved in alcohol 96 % and formalin after documented and identified.

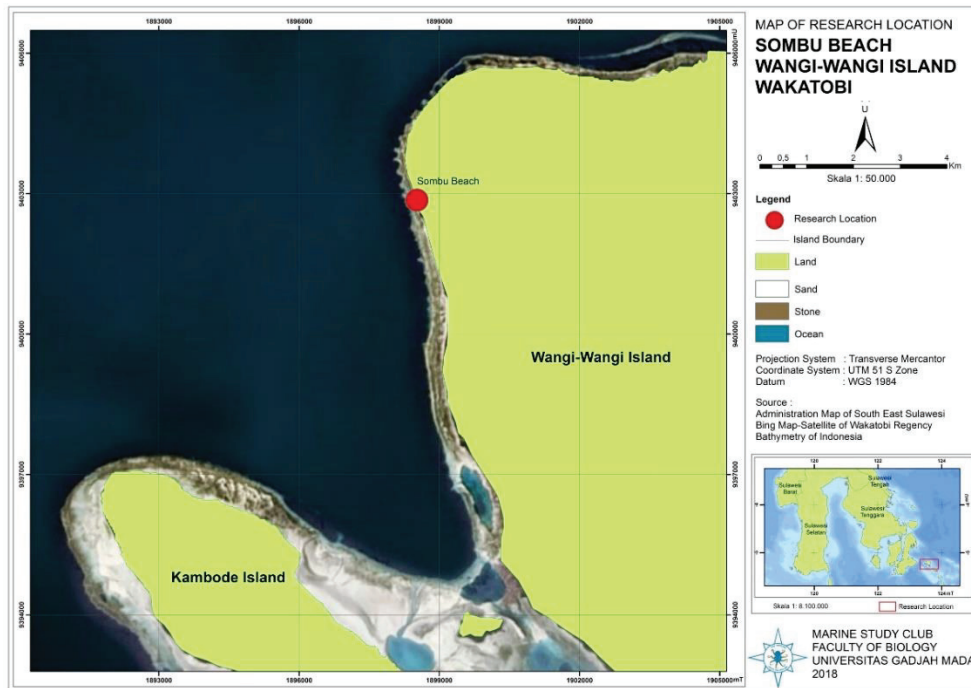


FIGURE 1. Map of Research Location: Sombu Beach, Wangi-wangi Island, Wakatobi, Southeast Sulawesi

RESULTS AND DISCUSSION

The intertidal zone has the greatest variation in diversity of life. The intertidal zone is an extension of the marine environment and inhabited almost exclusively by marine organisms. Tremendous range of environmental factors is found in the intertidal zone because it is exposed to the air for a certain amount of time during the day and most show a wider range in the air than in water [3]. The data presented in Table 1 are the environmental factors in the intertidal zone of Sombu Beach, Wangi-wangi Island, Wakatobi.

TABLE 1. Environmental Factor of Sombu Beach, Wangi-wangi Island, Wakatobi.

No.	Environmental Factor	Measurement
1.	Air Temperature	27.5 °C
2.	Water Temperature	29.5 °C
3.	Salinity	31 PSU
4.	pH	7

The marine crab species diversity in Sombu Beach can be classified into 17 species from 10 Families of Crustaceans (Table 2). Each species has specific characters that distinguished from one with another species. Species Crustaceans on Sombu Beach was found in the terrestrial and intertidal zone from the shallow shelf in tropical areas. The most species that found in Sombu Beach were Family Grapsidae which consist of *Grapsus albolineatus*, *Grapsus tenuicrustatus*, *Varuna litterata*, and *Percnon planissimum*, followed by Eriphiidae, Majidae, Pilumnidae, and Diogenidae with two species, Portunidae, Gecarcinidae, Xanthidae, Coenobitidae, and Plagusidae with one species.

The Grapsidae are a large family of principally intertidal crabs, the crabs most commonly met with by fossicker on the seashore. Most of the crabs that flee when disturbed by turning stones on rocky coasts are grapsids. The most distinctive feature characterizing a member of the family is the wide front between short eyestalk and the rhomboidal gap between the third maxillipeds [4]. Most species of Grapsidae in Sombu Beach are active species of rocky shores or burrow in muddy environments intertidally.

TABLE 2. Species Diversity of Crustaceans Found in Sombu Beach, Wangi-wangi island, Wakatobi.

No.	Family	Species
1.	Eriphiidae	<i>Eriphia sebana</i> (Shaw & Nodder, 1803) <i>Eriphia scabricula</i> (Dana, 1852)
2.	Majidae	<i>Micippa phylira</i> (Herbst, 1803) <i>Tiarinia cornigera</i> (Latreille, 1825)
3.	Grapsidae	<i>Grapsus albolineatus</i> (Lamarck, 1818) <i>Grapsus tenuicrustatus</i> (Herbst, 1783) <i>Varuna litterata</i> (Fabricius, 1798) <i>Percnon planissimum</i> (Herbst, 1804)
4.	Portunidae	<i>Thalamita prymna</i> (Herbst, 1803)
5.	Gecarcinidae	<i>Gecarcoidea lalandii</i> (H. Milne Edwards, 1837)
6.	Pilumnidae	<i>Pilumnus vespertilio</i> (Fabricius, 1793) <i>Pilumnus</i> sp.
7.	Xanthidae	<i>Leptodius sanguineus</i> (H. Milne Edwards, 1834)
8.	Diogenidae	<i>Clibanarius eurysternus</i> (Hilgendorf, 1879) <i>Calsinus laevimanus</i> (Randall, 1840)
9.	Coenobitidae	<i>Coenobita rugosus</i> (H. Milne Edwards, 1837)
10.	Plagusidae	<i>Plagusia squamosal</i> (Herbst, 1790)

The crustaceans that found in Sombu Beach mostly have a low species number because only one or two species of every family is found. In most cases, it is caused by the degradation or destruction of aquatic habitats through pollution, deforestation and silting, among other impacts. In this study, the human activities such as turning intertidal zone into a tourist attraction, illegal fishing, coral mining, and dynamites fishing caused massive damage to coral reefs, fish, and invertebrate biota. This condition can cause quality changes of aquatic ecosystems and substrates that will affect the species composition and diversity of crustaceans and another biota. Based on a study, some decapod species have been assigned to IUCN categories ranging from vulnerable to critically endangered [19].

Sombu Beach has a diversity of substrates, such as white muddy sand substrate, corals and overgrown by seaweed and seagrass. A number of substrates are the most important factor in determining the number of species present, probably because each species can make differential use of each substrate [17]. Crustaceans within the epibiotic community interact with its environment, with consequences for the relative fitness of the host organism and its interactors, and ultimately, the structure and functioning of the assemblage [5]. The Crustaceans are also more active at night than at day [6]. The abundance decapods among habitats varied, especially by season, but general habitat-specific patterns, based on trawl collections in deeper waters. Decapods were generally more abundant in the summer [18]. The tenth families of crustaceans that found on the Sombu Beach are distributed in various habitats and suitable for the adaptation to its environment. Many decapods found on cobble beaches were also found on rock platforms and cleft [7]. An organism's ability to utilize resources and reduces predation risk are related to body size and habitat, and as a consequence, many decapods shift their distribution during their development as a function of varying predation risk and potential growth [8].

Grapsidae is very commonly distributed at rocky shores. They were found in several habitat types, such as the brackish waters on muddy bottoms, also near the waterline on rocks. They are more active at night and seldom seen during daylight. They will disappear instantly into crevices at the slightest sign of danger [9]. Portunidae crabs are often found on the basic substrate of coarse sand and fine sand [10]. This corresponds to the habitat in the Sombu Beach where there is a sand substrate with seagrass beds. Portunidae crabs have the characteristics of a pair of swimming legs. Type of *Thalamita* sp. generally has 4–5 anterior edge borders [11]. Species belonging to families like Grapsidae, Portunidae, and Plagusidae were observed in the algae zone because they utilize specific kind of microhabitats like rock crevices and deep tide pools, which are available in the algae zone only. Shallow tide pool with algae assemblage was utilized maximally by different crab species as compared to other microhabitats.

Majidae crabs are called “spider crabs” because they have long, slender legs like spiders [12]. This crabs are often found among algae and have the ability to camouflage by allowing its body to be overgrown by algae [9]. The habitat of Majidae crabs is behind the fragments of rock [12] and intertidal to a depth of at least 50 m, on the sand, shell rubble, rock, and coral bottoms [13].

Pilumnidae crabs have a common name, “hairy crabs,” but many pilumnids are not very setose (or “hairy”) [11]. *Pilumnus vespertilio* and *Pilumnus* sp. that found in Sombu Beach generally live along rocky shores and within the coral rubble. They are covered with “furry hair” (actually setae), which helps to break up their outline in the water and helps them to camouflage amongst the silt and rocks of their chosen habitat. They are generally shy creatures and will scuttle into the nearest hole or crevice should it detect any sign of danger around it. *P. vespertilio* is more active at night - during the daytime, they tend to hide in holes in the rocks, only coming out at nighttime to feed. This, combined with their furry camouflage, makes them a difficult species to spot at times [14].

Xanthidae, the pebble crabs, these secretive individuals are common, but seldom seen, members of the lower intertidal zone fauna, found along the protected rocky coasts. Their superficial resemblance to beach pebbles along with their ability to hide and “play dead” [14]. *Leptodius sanguineus* was observed in microhabitats like under rock crevices and under rock habitat which provides them better protection against the predators [15]. Eriphiidae occupies a variety of habitat from rocky intertidal shores and mangrove swamps, to coral reefs and the continental slope to depths of over 800 m [16]. Eriphiids can easily be confused with the Xanthidae (likewise called “stone and mud crabs”). In this study, *Eriphia sebana* referred to as the red-eyed rock crab, and *Eriphia scabricula* are common species of Eriphiidae crab, found on reef flats and intertidal reef shorelines. Gecarcinidae and Coenobitidae are terrestrial crustaceans. Although gecarcinids and coenobitids can be found many kilometers inland, they must return to the sea to spawn and release their planktonic larvae [11].

This result was largely expected, as the type of microhabitat immediately represents a more appropriate niche for crabs, which are heavily dependent on land or water for survival. There is an interaction between crab species composition and the substrate characteristics. Both defining characters of the substrate, the microtopography of the rock and the level of cracks/hiding places. The results of the present study indicated that coastal waters of Sombu Beach are endowed with rich decapod crustaceans fauna. The taxonomically verified checklist of the decapod crustaceans recorded along the coastal waters of Sombu Beach would be a base document for further studies.

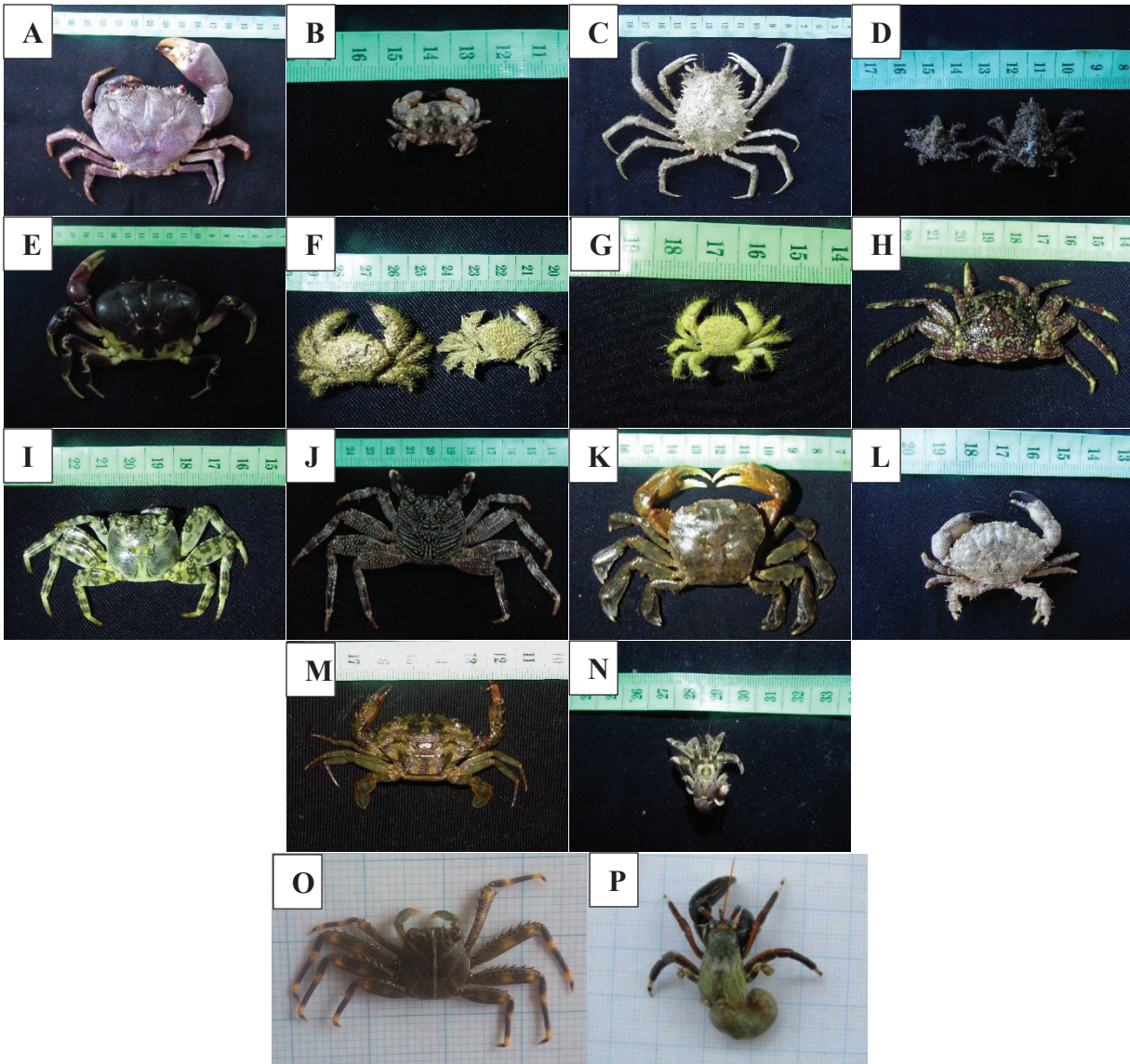


FIGURE 2. Dorsal view of Crustacea samples in Sombu beach. A–P, respectively: *E. sebana*, *E. scabricula*, *M. phylira*, *T. cornigera*, *G. lalandii*, *P. vespertilio*, *Pilumnus* sp., *P. squamosal*, *G. albolineatus*, *G. tenuicrustatus*, *V. litterata*, *L. sanguineus*, *T. prymna*, *C. rugosus*, *P. planissimum*, *C. laevimanus*, and *C. eurysternus* (not documented)

CONCLUSION

Based on this study, the diversity of Crustaceans are relatively high. There are 17 species and 10 Families of Crustaceans found in Sombu Beach. The highest Family is Grapsidae consist of *G. albolineatus*, *V. litterata*, *G. tenuicrustatus*, *P. planissimum*.

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