Identification of Caridae Cryptic organism (Crustacea) on the Pocillopora dead coral in Sabang, Aceh

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Abstract. Research on the composition of Caridea cryptic organisms (crustacea) on dead corals of pocillopora in Sabang waters has been conducted on January 2017. The purpose of this study was to identify the composition of Caridea cryptic organisms - found in dead coral Pocillopora. The location of research was decided by purposive sampling methods. The results showed that they were three families (Alpheidae, Hippolythidae, and Palaemonidae) were found at each station. Total number of individuals found as many as 109 individuals scattered into 3 stations. The most abundant families were from Alpheidae family with a total of 79 individuals while the fewest families found were Palaemonidae with a total of 11 individuals.

The largest value of dead coral volume was found at Seulako island station which was 3.2 liter as the highest abundance of Caridea organisms (41 individuals). On the other hand, the station of Sumur Tiga was found the smallest coral volume of the two other stations of 1.2 liter with the lowest abundance of Caridea organisms 33 individuals.

1. Introduction
Cryptic fauna is one of the inhabitants of coral reef ecosystem that have a hiding habit. Cryptic fauna is macroinvertebrates and some types of fish that use cavities in the coral substrate either temporarily or permanently. Some can create their own cavities on coral reefs, while others are opportunistic invaders of existing space [1,2,3]. Cryptic fauna includes organisms that make boreholes in the substrate, sessile organisms that attach or live in crevices, and bioeroders in coral tissue. Examples of cryptic fauna such as sponges (Porifera), worms Polychaeta and Sipunkulus, Echinoderms, Molluscs, Bryozoa, Tunicate, and Crustaceans. Cryptic fauna is associated with various kinds of coral found in live coral and in dead coral. In one dead coral colony, hundreds of cryptic fauna species from various taxa can be found. This animal group is one of the main components of the coral reef community [4].
Coral reef ecosystems are the most biologically productive ecosystems but they are also very sensitive to stress [5]. Commonly, coral reef ecosystems can be found in shallow waters only slightly in deep waters. In addition, coral reefs have the main role as habitat, feeding grounds, nursery ground and spawning ground for various biota that live around or directly associate with coral reefs [6].

The existence of invertebrates is closely related to the condition of the surrounding coral reefs, in areas with healthy coral reef conditions that will indicate the presence of invertebrates in the ecosystem [7]. Coral death head is a dead coral colony where the colony is physically not inhabited by coral polyps. Usually, many cryptic biotas inhabit crevices of corals, especially coral Pocillopora sp., as a place to live and find food even for breeding grounds.

Caridea is one of the crustaceans that inhabit the dead coral of many other organisms. Caridea is an infraordo of the arthropod phylum, the crustacean subphylum, the Malacostraca class, and the decapod order. Caridea is one of the inhabitants of coral reef ecosystems that have the habit of hiding with other small biotas such as Ophiuroidea, small crabs, mollusks, and several other echinoderms [5]. Often found living associated with live corals, dead corals, coral fragments even in sponge colonies [8]. Caridea has an important role in maintaining the balance of the ecosystem, especially functions as food for larger aquatic animals (fish), and is also often used as a bio-indicator because it has low mobilization and also functions as a carcass eater and detritus in the marine ecosystem. Sabang has a fairly good coral reef ecosystem with a very attractive potential of marine life [9, 10] and conditions that have not been polluted and naturally will support the diversity of biota in it including the existence of invertebrates that live, one of which Caridea can be used as a bio-indicator of the health of coral reef ecosystems and the condition of the water.

2. Material and Methods

A sampling of dead coral was carried out in the Sabang Waters from August 2016 to January 2017 at three different stations namely in Seulako island, Rubiah island, and Sumur Tiga Sabang. Furthermore, the preservation and identification of the biota were located in Sabang and the Integrated Laboratory of the Faculty of Marine and Fisheries Unsiah.

The determination of research area based on the purposive sampling method. Determination of the location of this study sampling is in accordance with the consideration of the presence of dead coral species of Pocillopora in the area of Seulako island, Rubiah island and Sumur Tiga Sabang. Method of collecting dead corals at each station used explore method by searching for dead coral samples at a predetermined station.

A sampling of dead coral in nature using the method referred to [11]. The dead corals from the waters taken by the SCUBA equipment. The collection of dead coral samples taken to consist of the genus dead coral Pocillopora, dead corals found wrapped in large plastic and then broken at the base of the coral using chisels and hammerheads, chunks of coral taken into buckets and removed land after being taken ashore must be immediately watered to prevent the death of the biota contained in the dead coral. The next step is to measure the volume of dead coral. The volume of dead coral is measured using a bucket and measuring cup, where the volume of dead coral is equal to the volume of water that spills when the coral is inserted. The next step is to break up dead coral samples to make it easier to extract biota which is then sorted using individual plastic cups and labeled.

The sorted biota would be identified up to the family taxa by using the Crustacean Guide of the World identification book [12]. After anesthetizing the biota using clove oil, they have been sorted and filled with water and based on black cloth in order to get photos with contrasting color quality. The final stage is the collection of biota where at this stage biota that has passed the documentation stage will be entered into a tube or bottle sample containing 96% ethanol, which is stored in the Laboratory collection

3. Results and Discussion

3.1. The Family Composition and Individuals Number of Caridae Cryptic
Based on the results of the study, Caridea cryptic organisms found in the waters of Sabang at three research stations namely P. Selako, P. Rubiah, and Sumur Tiga. There are a total of 109 individuals consisted of 3 families namely the Alpheidae, Hippolythidae, and Palaemonidae families. The volume of dead coral samples ranged from 1.2 to 3.2 liters and Seulako island station as the highest abundance compared to other research areas. On the other hand, the number of the individual at P. Selako, P. Rubiah, and Sumur Tiga stations were found 41, 35, and 33 individuals, respectively.

The number of families Alpheidae, Hippolythidae, and Palaemonidae found at Seulako island station were 28, 8, and 5 ind, respectively, with an average coral volume area of 3.2 liters. On the other hand, the number of families Alpheidae, Hippolythidae, and Palaemonidae found at Rubiah island station were 23, 8, and 4 ind with an area of the coral volume of 1.5 liters. Moreover, the individuals number of families Alpheidae, Hippolythidae, and Palaemonidae found at Sumur Tiga station were 28, 3, and 2 ind - with an average coral volume area of 1.2 liters, where this coral volume was the smallest coral volume found when compared to coral volume at other stations.

3.2. Identification of Caridea on Dead Coral
Caridea, commonly known as caridean shrimp, is a shrimp infraorder in the order Decapoda. They are found widely throughout the world in freshwater and seawater. Caridea shrimp are found in every type of aquatic habitat, with most species being marine. A quarter of the species described were found in freshwater, but most of the scattered freshwater species are family members of the family Atyidae and Palaemonidae subfamily Palaemoninae. Grave et al. [13] explained that they included several commercially important species, such as Macrobrachium rosenbergii. In addition to a variety of habitats, Caridea vary greatly in shape, with species only a few millimeters in long when growing up, [14]. Chace and Abbott [15] also stated that Caridea can also grow to more than 1 foot. Caridea biota types found on dead corals in Sabang waters consist of three families namely, Alpheidae, Hippolythidae, and Palaemonidae where all three families are found at all research stations.

3.2.1. Family Alpheidae
Alpheidae is a family of caridea infraorder characterized by having asymmetrical claws, larger claws are usually capable of producing loud snapping sounds. The common name known for this shrimp is pistol shrimp or alpheid shrimp. This shrimp is small to the medium-sized, cylindrical carapace. Usually, the carapace in this family covers the eyeball where the eyeball does not protrude but is protected inside the carapace when viewed from the dorsal so the eyeball is not visible and tends to be flat, the rostrum is very small with no teeth on the rostrum, sometimes there is absolutely no rostrum.
The pleura (exoskeleton of the chitin substance) of the second stomach of the somites (segment abdomens) and covers both the first and third somites, widened in telson shape. The first pereopod is very heavy, its claws are usually not the same or asymmetrical as swelling on one side. The second leg is very slim and rather short, symmetrical, and also with the brace. Carpus (thoracopod wrist segment 5) is divided into several segments. Third to fifth pereopods have simple shapes or bifid dactyls without clamps. There are no exopods on one foot, males without petasma, and females without thelycum [16].

3.2.2. Family Hippolythidae

Hippolytidae is a family of cleaning shrimp, also known as broken-back shrimp or anemone shrimp, and it is consisted of 36 genera [13]. As in other families included in the Caridea family, the Hippolythidae family is characterized by having a large pleura in the second abdominal segment so that it overlaps with the first and third segments. The pereopods in segments 3-5 there is no brace but there are bifid dactyls that are also not found on several genera.

The rostrum is generally longer than the eye and usually with several rostrum teeth in the dorsal and ventral parts. The eyes are free, not covered by carapace when viewed from above the eyes appear protruding, the first pair of Pereopods have a clear brace at the end of the segment and wider than the second pair of arms, but not too enlarged, carpus on the second arm is divided into several articles (additional segments which are joint, or a place where a rigid object can bend with other segments) [16].

![Figure 2. Caridea family found in Sabang](image)
3.2.3. *Family Palaemonidae*

Palaemonidae is a family of shrimps in the decapoda infraordo Caridea sequence which generally eats detritus, although there are some carnivores and hunt small animals. In this family, there are more than 950 species consisted 137 genera [15]. Fransen and Grave [17] stated that the Palaemonidae family is divided into two subfamilies. This family is small to medium-sized and several species are large.

The carapace part is cylindrical with a protruding body, the left to the right side is narrower than from the dorsal to the ventral side, rostrum has teeth on the dorsal and ventral parts. On the anterior front of the carapace of this family, there are antennal spines and branchiostegal spines, sometimes branchiostegal spines are replaced with hepatic spines according to the type of the genus, rarely there are no branchiostegals or hepatic spines.

The pleura of the wide second somites covers both the first and third somites, with 2 pairs of back spines and 2 or 3 pairs of posterior spines. On the first pair of arms and the second arm, there are claws, the first pair of pereopods are shorter and slimmer than the second pereopod. The claws develop properly and normally.

In the second pair of pereopods, they have stronger claws than the first, often very long and strong. Especially in adult males, the claws grow normally and symmetrically, in this family carpus and merus are not divided, in 3 pairs pereopod sequence 3-5 have the shape simple without tongs and there are no exopods on each thoracopod. Males without petasma, females without thelycum. The males have appendix masculine and internal appendix to endopods, masculine appendix to endopod dipleopods. All species are in the juvenile stage and many also when adults have translucent or clear colors, often with dark chromatophores or spots. Large specimens are sometimes more opaque and dark in color [16].

3.3. *The Correlation of Caridea and Dead Reefs*

The correlation between Caridea with dead coral have a difference in each sample of dead coral which found, as for the value generated from this relationship can be seen in the figure 4.5.

![Figure 3. Relationship between Caridea and dead corals](image)

The correlation between Caridea and dead corals obtained at 3 stations (Seulako island, Rubiah island, and Sumur Tiga) had different characteristics in each study areas particularly deadcoral sizes was ranged - from 1.2 to 3.2 Liter. In addition, the number of Caridea individuals at Seulako island, Rubiah island, and Sumur Tiga station were obtained 41, 35, and 33 individuals with a size of dead coral 3.2, 1.5, and 1.2 liters, respectively.
The highest number of Caridea individuals was found at Seulako island station which 41 individuals with the largest dead coral size were 3.2 liters. These results suggest that the greater the size of the coral equal to the higher the number of biota. According to [18] the number of individuals are significantly correlated with the size of coral reefs and individual abundance. In accordance with the value of the relationship of dead coral with individuals found at the Sumur Tiga station, the lowest number of individuals was 33 individuals with the lowest dead coral size of 1.2 liters.

4. Conclusion
In this study, 3 families of Caridea cryptic organisms were identified in Sabang waters, namely Alpheidae, Hippolythidae, and Palaemonidae. The averages volume of dead corals were obtained from the three areas ranged from 1.2 to 3.2 liter. Caridea is most commonly found at the Seulako island station with 41 individuals. The lowest Caridea was found at Sumur Tiga station with 33 individuals.

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