

Diversity and distribution of Dorippid Crabs (Brachyura: Dorippidae) in East Coast of Lampung, Indonesia

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Abstract. Dorippid crabs (Brachyura: Dorippidae) commonly live in sand or mud substrate at shallow coastal water. These crabs are a macro-benthos, mostly found in tropic, have no economic value, but have high abundance in blue swimming crab habitat and lack information in Indonesia. This study aims to determine diversity and species distribution of dorippid crabs in East Coast of Lampung, Indonesia. This study was conducted on March-April 2017 in seven locations along coastal area (i.e. Labuhan Maringgai, Kuala Penet, Sekopong, Wako, Seputih, Sungai Burung, and Kuala Teladas). The specimen was collected from the blue swimming crab gill-net fishery as by-catch. Each location found by this family was noted at coordinate point at satellite imagery map and processed using ArcGIS. Two species have been found, there are *Dorippe quadridens* and *Dorippoides facchino*. Both species were found at every location, except *D. quadridens* at Sungai Burung as well as *D. facchino* in Sekopong. There are 74% among the sample of fishermen caught *D. quadridens* in those areas with an average number of 36 individuals and weight of 959 grams. While, 40% of fishermen caught *D. facchino* with an average number of 17 individuals and weight 152 grams.

1. Introduction

Research on the taxonomic diversity of decapod crustaceans has increased considerably during the last decades [1], whereas the diversity, distribution and abundance of marine crabs is one among the issues. Spatially or temporally distribution of a species is their distribution across its habitats, from home range to utilization distribution, and its implications for its life history [2]. An others consideration are related to fisheries, such as the unintentionally caught species or bycatch related to ecological impact of fishing.

The coastal waters of Eastern Lampung is one of distribution area of the blue swimming crab (*Portunus pelagicus*) in Indonesia, which is part of coastal waters and shallow seas of Southeast and Eastern Asia as main distribution area of this species [3]. This area is potential for blue swimming crab wild catch in Indonesia and the species is one of important fishery resources that exploited by small-scale fishery, mostly caught with bottom gill-nets and has been exploited more than two decades [4-7]. Bottom gill nets were operated as a static fishing gear in the bottom of the waters. The use of net caused abundant non target species or bycatch. In Thailand, local fishermen used a stationary gear traditionally. They believed that this gear has not much effect to bycatch, however, they still get non-target species or bycatch The bycatch consists of other crustaceans, molluscs, echinoderms, fish and soft coral [8]. According to [9], the bycatch information in the blue swimming crab (BSC) fishery is limited. A further case to consider is unintentionally caught species, so-called "bycatch", with a portion being marine crabs. Most of them are non-economic species and are usually discarded. Bycatch has been the world's most



important fisheries issue since the 1990s. As a result of bycatch issues, many species of marine crab are currently threatened. Unfortunately, there has been a limited study on the species of diversity and ecology of marine crabs for conservation purposes.

Crustaceans might the largest proportion of bycatch from the blue swimming crab net fishery and dorippid crabs (Brachyura: Family Dorippidae) were included [8], but it was excluded collapsible crab trap fishery [9]. Research on the family Dorippidae is more about the existence of species, such as species records in Madagascar [10], Australia [11,12], Thailand [13], New Caledonia, Indonesia and Philippines [14]. However, there is limited research and information on dorippid crabs in Indonesian waters, including their occurrence as bycatch in certain fishery or their biological and ecological aspects.

The IUCN status of dorippid crabs is Not Evaluated for most of them. This status reflected the species that have very little information or research that has been done in the world. Researches on biological aspects have not been done in Indonesia, even very little research in other countries. For performing of resources management, basic information was required such as biological information [15]. In addition, the East Lampung coastal waters is one of blue swimming crab fisheries (BSC) center in Indonesia. One of blue swimming crabs main food was crustacea [16,17]. As an example, 78.43% of total food was crustacea for the adult crabs in India [18]. The condition assumed that dorippid crab might one of BSC main food sources or associated species, because they were very abundant. The terms have no economic value, but the species have a large ecological role so it was important to examine. This study aims to determine the diversity and distribution of dorippid crabs in East Coast of Lampung, Indonesia.

2. Method

2.1. Data Collection

This study was conducted on March-April 2017 in the East Coast of Lampung, Indonesia. There were seven locations in coastal area from south to north of the East Coast of Lampung have selected to be sampling station, which was represent a coastal water habitat related to coastal morphology, vegetation coverage based on satellite imagery in google map. Those sampling site were Labuhan Maringgai, Kuala Penet, Sekopong, Wako, Seputih, Sungai Burung, and Kuala Teladas (figure 1). Dorippid crabs are among bycatch from the blue swimming crab bottom gill-net fishery. One fisherman has a set of bottom gill-net. Some fishermen who were fishing in certain fishing ground around sampling site have chosen purposively to be unit of sample. All catches from blue swimming crab net of fisherman sample were taken and separated between target and non-target catches. Non-targeted species were grouped into crustacean, fishes, molluscs, and others. All non-targeted species were identified, separated by genus or species, calculated in number, and weighed in total from each species. Weight was measured by digital scale to the nearest 1 gram. Identification of species from the Dorippidae family is based on the identification book [19].

2.2. Data Analysis

All non-targeted species were measured their proportion in each group and analyses diversity of Dorippid among sampling site. Each location found by this family was noted at coordinate point and processed using ArcGIS 10.2. The spatial distribution of abundance and biomass of Dorippid crabs was measured based on total number and weight of certain species at standardized net length and visualized using ODV 4. Ocean Data View 4 (ODV 4) is a computer software program that serves to display the exploration results of oceanography and geo-reference view, as well as sequence of data (grid data) interactively. One of the function is interpolation of data points into grid with weighted average gridding method.

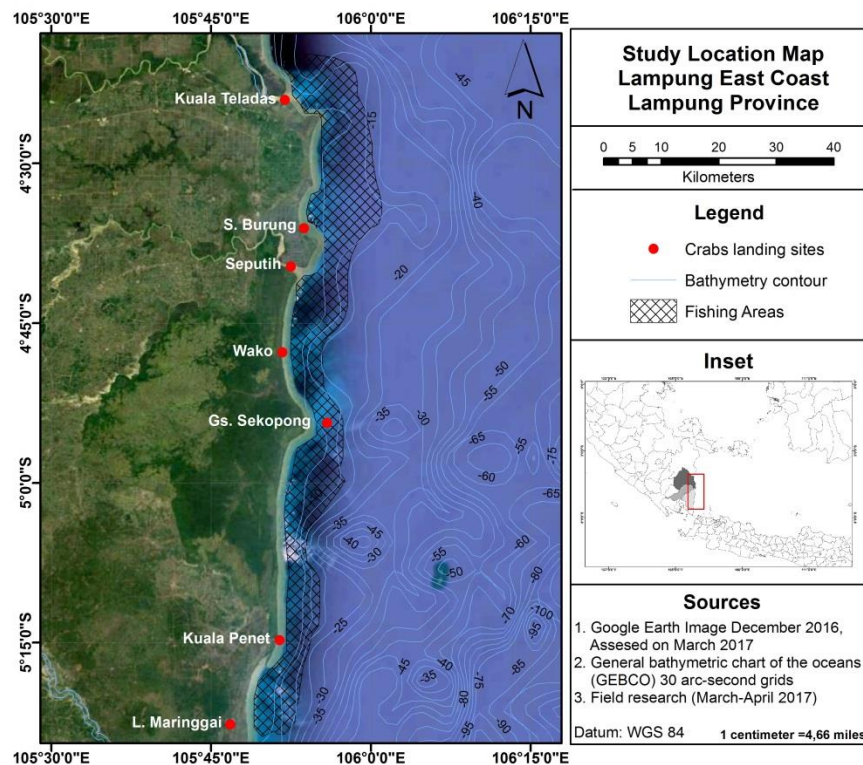


Figure 1. Study area of dorippid crab and sampling sites in East Coast of Lampung, Indonesia.

3. Result and Discussion

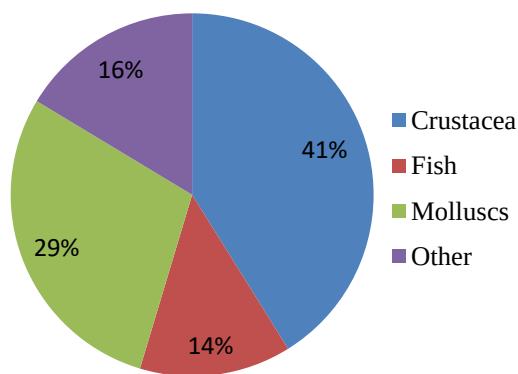
3.1 Non-Targeted Catches

Data retrieval had been done for two months and had received non-targeted catch data. The proportions of non-targeted catches based on the weight of each group were varies in each location (table 1). Crustaceans were dominant catches in volume at Kuala Penet, Wako, and Sungai Burung, while molluscs in Sekopong, Seputih, and Kuala Teladas. There was only one location (Labuhan Maringgai) found that the volume of non-target catches dominated by fishes. The average proportion of each group at all sites was also dominated by crustaceans, followed by molluscs, other species and fishes. Crustaceans occupied 41%, while molluscs 29%, other species 16%, and fish at least 14% (figure 2). This condition might influenced by diversity of habitat along coastal waters at eastern Lampung related to coastal coverage area, input from land through the river and oceanographic condition. It might also affect by gill-net mesh size used whereas the fisher in Labuhan Maringgai use larger net mesh-size (4-4.5 inch) than the other areas (3.5-4 inch).

Blue swimming crab caught by using bottom gill nets where operated as a static fishing gear in the bottom of the waters. Mollusks and most of crustaceans groups attached on aquatic substrates and sessile organism, so the two most dominant groups were caught. Several species of mollusks attach to shallow marine substrate, gastropod more commonly found on sand substrate, sand-bottom bottom and reed zones [20]. In addition, other groups also many caught from starfish and soft coral (sponge). Several species of coral sponges were found in shallow waters with mud substrate [21].

Table 1. Proportion (%) of each non-targeted catches group from 7 locations.

Group	Location						
	Labuhan Maringgai	Kuala Penet	Sekopong	Wako	Seputih	Sungai Burung	Kuala Teladas
Crustaceans	27	75	29	44	31	50	21
Fish	34	5	4	11	25	2	17
Molluscs	18	7	36	39	36	40	36
Others	21	13	31	6	8	8	26

**Figure 2.** The average proportion of each group of non-targeted catches at all locations.

3.2 Diversity

One of the dominant crustaceans is dorippid crabs from the family of Dorippidae. The specimens were called as "trash" by fisherman because the species was no economic value and broke the net. Two species have been found, there were *Dorippe quadridens* (Fabricius, 1793) and *Dorippoides facchino* (Herbst, 1785), which indicate the diversity of Dorippidae species in East Coast of Lampung. Dorippid crabs are commonly live in sand or mud substrate at shallow coastal water. These crabs are a macro-benthos, mostly found in tropic, and have no economic value and consumption. Family Dorippidae consists of nine genera, two of which are genus *Dorippe* and *Dorippoides*. There are seven species of genus *Dorippe* [11] and 2 species of genus *Dorippoides* [19] are known from the Indo-West Pacific region.

The results of morphological identification were the same as those described by [19]. Description of *Dorippe quadridens* is carapace strongly sculptured, granulated, bearing pubescence and grooves evident (figure 3a). Tubercles usually well indicated and rather high. Merus covered all over with dense short pubescence. Abdomen with 3 distinct teeth on second somite. Lower orbital margin with 5-6 spines. The fourth and fifth legs are covered with dense short pubescence and end with hooks. While description of *D. quadridens* was carapace convex laterally and posteriorly, more flattened in middle and anteriorly (figure 3b). Front consisting of 2 distinct, triangular teeth, directed forward, or of blunter teeth, directed outward. Chelipeds distinct unequal, right larger, left as in female. Second and third pereopods slender.

Both species were also found at every location, but *D. quadridens* was not found at Sungai Burung as well as *D. facchino* in Sekopong (table 2). Generally, there were seventy four percent (50/68) of fishermen caught *D. quadridens*, while almost forty percent (27/68) of fishermen caught *D. facchino* in all area. The largest number of sample was 19 fishermen at Kuala Penet, while the lowest was four fishermen at Sungai Burung. Those samples were representative among the blue swimming crab fishers who have fishing ground in adjacent of sampling areas. However, the highest percentage of fisher caught *D. facchino* and *D. quadridens* occurred at Wako and Seputih. It's seemed that those two species distributed widely around those two areas with the high probability captured by the fishermen. On the

other hand, the sea surface sediment at those two areas seems visually as muddy substrate as one of Dorippid main habitat [11].



Figure 3. (a) *Dorippe quadridens* and (b) *Dorippoides facchino* from East Coast of Lampung.

Table 2. Number of fishermen who get *Dorippe quadridens* and *Dorippoides facchino*.

Location	Number of fisherman		
	Sample	Caught <i>D. quadridens</i>	Caught <i>D. facchino</i>
Labuhan Maringgai	9	3 (33%)	2 (22%)
Kuala Penet	19	14 (74%)	5 (26%)
Sekopong	12	11 (92%)	0 (0%)
Wako	9	9 (100%)	8 (89%)
Seputih	6	6 (100%)	5 (83%)
Sungai Burung	4	0 (0%)	3 (75%)
Kuala Teladas	9	7 (78%)	4 (44%)
	68	50 (74%)	27 (40%)

The *D. quadrides* found in sublittoral, shallow water, substrate shelly sand or mud to sand bottoms and rocks [12, 19]. In addition, this species also reported in muddy-sand bottoms on the back reef lagoon, without sea-grass meadows [22]. This species was caught in depths of 7 to 39 m [12], varies from 1 to 73 m and most commonly occurs in 1 to 30 m and ever found 1 individual in 415 m [19]. In this study we found *D. quadrides* at a depth of 2 to 9 m with a substrate dominated by small grain size, and categorized as silt and silty loam sediment.

3.3 Spatial Distribution

The spatial distribution was conducted by weighted average gridding method. The method was extrapolating of closest value and weighting from distance and value of each coordinate. The spatial distribution of the abundance of *D. quadrides* and *D. facchino* was shown in figure 4. Based on the distribution of individual abundance, the most abundance of two species was found at the Kuala Penet location. It is shown with a reddish orange color. The lowest abundance at Labuhan Maringgai and Kuala Teladas location was shown in blue for *D. quadrides*, and at Kuala Teladas location was shown in purple for *D. facchino*. The average number of *D. quadridens* and *D. facchino* were 36 and 17 individuals.

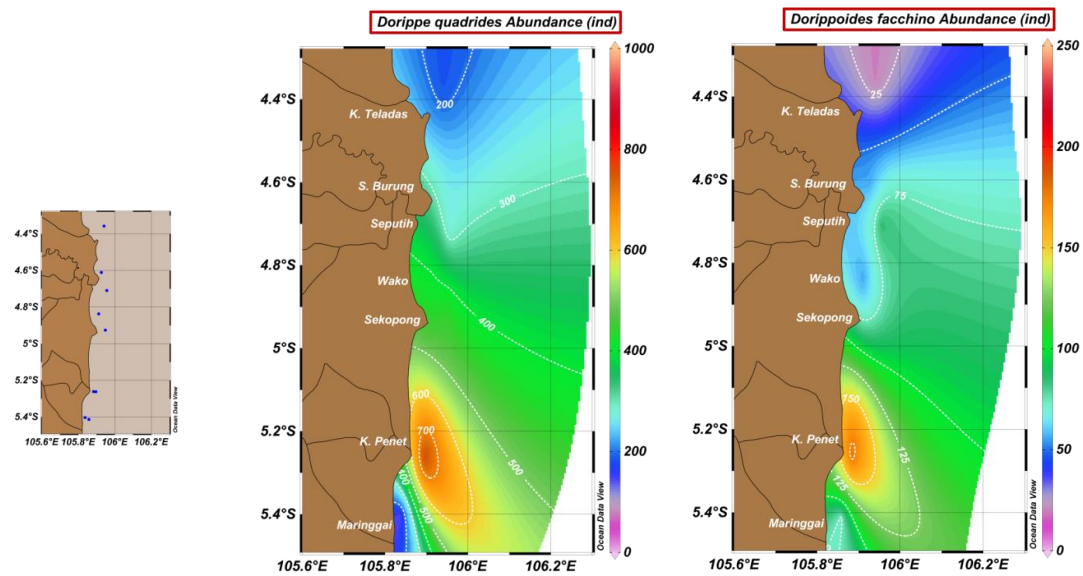


Figure 4. The abundance distribution of *Dorippe quadridens* and *Dorippoides facchino* from East Coast of Lampung.

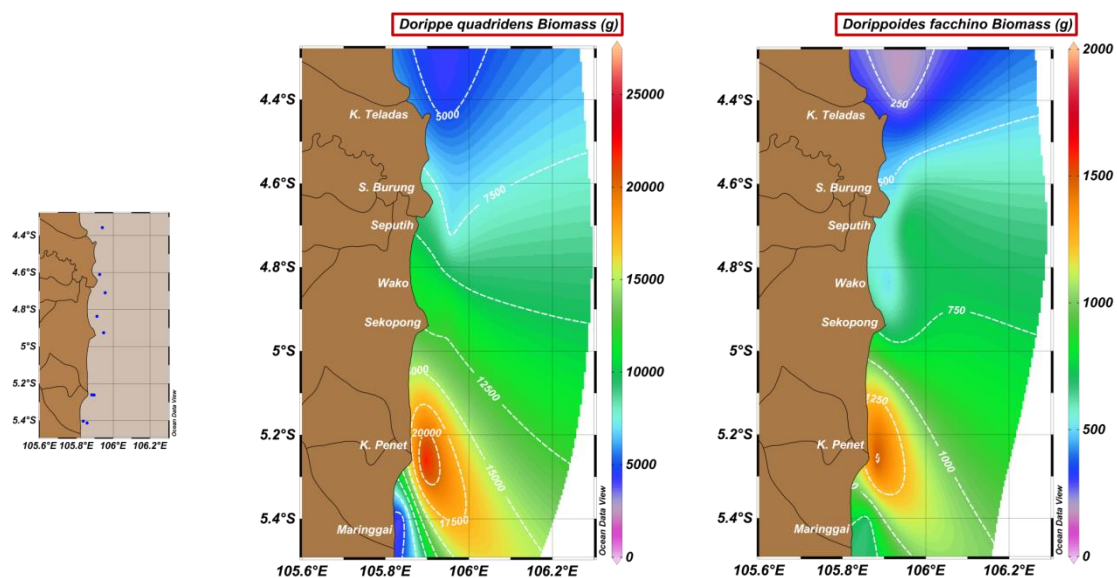


Figure 5. The biomass distribution of *Dorippe quadridens* and *Dorippoides facchino* from East Coast of Lampung.

The biomass distribution of *D. quadridens* and *D. facchino* was shown in figure 5. The highest biomass of two species was found at the Kuala Penet location. It was shown with a reddish orange color. The lowest abundance at Labuhan Maringgai and Kuala Teladas location was shown in blue for *D. quadridens*, and at Kuala Teladas location was shown in purple for *D. facchino*. The average estimated biomass of *D. quadridens* and *D. facchino* were 959 and 152 grams.

The highest abundance and estimated biomass of those two dorippid species was not coincide with the probability of captured by the fisher. This condition might be related to the behavior of those two founded dorippid species, such as schooling.

D. quadrides has a wide distribution within the Indo-West Pacific region, extending from the Suez Canal, the Red Sea and southeastern Africa to Hong Kong, the Philippines, Indonesia, and Australia [19]. This species was one of the most widely distributed species of Dorippinae and the greatest number of specimens and has the widest geographical range [19].

4. Conclusion

Two species were found at every location as represent on diversity of dorippid crabs, except *D. quadridens* at Sungai Burung as well as *D. facchino* in Sekopong. The highest probability of captured to those two species occurred in Wako and Seputih, but the highest abundance and biomass found at Kuala Penet, and might related to the schooling or patchy behavior of the species. This study provided biological information that can be used as a basis for utilization and management of blue swimming crab and dorippid crab resources. In addition, further studies should be conducted on whether there was symbiosis, competition, or predators-prey relationship between dorippid crabs and blue swimming crab as one of importantt fishery resources in Indonesia.

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