The Availability of Blue Swimming Crab (*Portunus pelagicus*, Linnaeus, 1758) in seaweed culture area of marine coastal waters

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Abstract. Seaweed cultures in marine coastal waters provide providing microhabitats, shelter, and food sources to fish and invertebrate. The availability of blue swimming crab (*Portunus pelagicus*) in seaweed culture area was conducted from October to December 2019 in the south coastal waters of Bulukumba Regency, South Sulawesi, Indonesia. The purpose of the study was to assess the catch, size, and sex distribution of the blue swimming crab in the area. The crabs were caught by set bottom gillnets with 4 inches of mesh sizes and 300 m of a length. The carapace width (CW) and sex for each crab individual were recorded. The results of the study show that the total catch of 21 trips during 3-month fishing operation was 539 crabs that consist of 260 males (48.24 %) and 279 females (51.76 %). The (CW) of males ranged from 53.6 to 143.6 mm, while females ranged from 58.3 to 142.8 mm. There were 38 breeding crabs or 13.62 % from the female total. The carapace width of breeding crab ranged from 92.2 to 138.6 mm. Moreover, it needed to study in the area intensively.

1. Introduction

Seaweed is one popular mariculture commodities in South Sulawesi, Indonesia. [1,2]. Most of the seaweed cultivated in this area is *Eucheuma* and *Kappaphycus*. The main method used for culturing *Eucheuma* and *Kappaphycus* is the longline method.

The presence of the seaweed farm seems to increase fish catches and could be positive for fisheries production [3] because seaweed farming provides fish assemblages [4], and it could act as a fish aggregating devices. Moreover, fish schools preferred to fish aggregating devices [5].

Floating seaweed is an important habitat for fishes and invertebrates due to the provision of food and shelter. According to Anandavelu et al., (2013), there were seven phyla, including *Arthropoda*, *Annelida*, *Mollusca*, *Echinodermata*, *Nemertea*, *Sipuncula*, and *Pycnogonida*. Associated with intertidal seaweeds of Kodiyaghat (South Andaman), India [6]. So, the presence of a seaweed farm seems to be a suitable area for fishing grounds.

The floating seaweed is an important habitat for fishes due to the provision of food and shelter. However, the presence of blue swimming crab in the seaweed culture area is still poorly investigated. In fact, blue swimming crab inhabits sandy, muddy, and seagrass habitats, from the intertidal zone to at least 50 m depth [7].

The purpose of the study was to assess (i) the availability or catch of swimming crab in the seaweed culture area, (ii) the carapace size distribution of swimming crab, (iii), and sex distribution of the blue swimming crab in the area.
2. Materials and methods
The study was carried out from October to December 2019 in the south coastal waters of Bulukumba Regency, South Sulawesi, Indonesia (Figure 1). This area is covered with a sandy beach and one of the main fishing grounds [8]. This area is mostly invaded by seaweeds culture.

![Figure 1. Location of study sites in seaweed culture area of marine coastal waters Bulukumba Regency, South Sulawesi.](image)

The collection of blue swimming crab was caught by monofilament. Bottom gillnets with 300 m length, 2 m depth and 4 inches mesh sizes. The setting of gillnets was conducted at a location around seaweed culture in the evening and the hauling in the morning the next day.

The total fishing operation conducted was 21 trips in fishing grounds around the seaweed culture area. The blue swimming crab catches were removed from the net after haul. The carapace width (CW) of blue swimming crabs were measured the nearest millimeter across the tips of the epibranchial spines while individual wet weight (W). CW was recorded at the nearest gram.

3. Result and discussion
3.1. The availability of blue swimming crab
The results of the study showed that the total catch during the 21 trips was 539 individuals blue swimming crab (Figure 2, 3, 4). The catch proportions were divided into three different months, i.e., October, November, December 2019. There were 155 blue swimming crabs captured in October, 181 in November, while in December, only 203 individuals crab.
Figure 2. Total catch of blue swimming crab in October 2019 in seaweed culture area of marine coastal waters Bulukumba, South Sulawesi.

Figure 3. Total catch of blue swimming crab in November 2019 in seaweed culture area of marine coastal waters Bulukumba, South Sulawesi.

Figure 4. Total catch of blue swimming crab in December 2019 in seaweed culture area of marine coastal waters Bulukumba, South Sulawesi.
The presence of blue swimming crab in the seaweed culture area is caused by the availability of food sources because seaweeds contain minerals and nutrients. Even though blue swimming crab is primarily carnivorous that feed on a wide variety of benthic animals, they also consume smaller quantities of marine plants and seagrass [9]. Portunid crabs are carnivores with a preference for animal food, but the study of [10]. Showed that P. pelagicus in the coast of Mandapam, Tamil Nadu, India feed crustaceans, mollusks, fish. And miscellaneous from seaweeds and seagrasses. Similar to the study of [11] in the northern coastal waters of Iran showed that blue swimming crab Portunus segnis consumes a variety of food, including seagrass and seaweed.

3.2. Carapace width distribution

The carapace width (CW) distribution of blue swimming crab (Portunus pelagicus) in seaweed culture area of marine coastal waters Bulukumba, South Sulawesi is 53.6 to 143.6 mm. The (CW) of males ranged from 53.6 to 143.6 mm while females ranged from 58.3 to 142.8 mm.

Crab carapace width in this study nearly similar in Bone Bay, South Sulawesi-Indonesia, that ranges between 32.5 and 147.5 mm, but were smaller than those in Pangkep coastal waters of South Sulawesi, Indonesia 45.5–177.5 mm CW [12]. It was also smaller than that of the CW of blue swimming crabs in Jakarta Bay Waters, Indonesia, that ranged from 62.5 mm to 152.5 mm [13]. On the other hand, crabs carapace widths in Lasongko Bay, Central Buton were 89.0-139.8 mm that is smaller than the study that [14]. The CW of adult females of P. pelagicus in the Beibu Gulf off south China ranged from 78.5 to 162.0 mm [15]. The crabs CW ranged were from 60 to 150 mm in Persian Gulf Coasts, Iran [16].

3.3. Sex distribution

The sex distribution of the blue swimming crab (Portunus pelagicus) caught around the waters of the seaweed culture area, found total sample was 539 (Table 1 and Figure 5).

| No | Month   | Sex      | Total |
|----|---------|----------|-------|
|    |         | Male     | Female|       |
| 1  | October | 75       | 80    | 155   |
| 2  | November| 89       | 92    | 181   |
| 3  | December| 96       | 107   | 203   |
| 4  | Total   | 260      | 279   | 539   |

Table 1. The sex distribution of the blue swimming crab (Portunus pelagicus) caught around the waters of the seaweed culture area.

Figure 5. Percent of male and female of the blue swimming crab (Portunus pelagicus) caught around the waters of the seaweed culture area.
Sex ratio of males and females of the blue swimming crab (*Portunus pelagicus*) caught around the waters of the seaweed culture area was 260:279 (1:1.07). Sex ratio of male and female crabs in this study was balanced conditions that similar to the sex ratio of male females of blue swimming crab caught by crab gillnet in Java Sea, Cirebon Regency has sex ratio 1:1 [17]. It was also the resulting study of [18] showed that the sex ratio of blue swimming crab caught in mangrove ecosystems, coral reefs, and seagrass in Salemo Island balanced between males and females in 1:1. On the other hand, the sex ratio of males and females of blue swimming crab (*Portunus pelagicus*) from Lamongan, Tuban, Pasuruan, and Rembang, Java, is in unbalanced conditions in which females are larger than males [19], and there were more females than males in Lamongan, (1:1.6) [20]. Percent of a female with egg and female without egg of the blue swimming crab (*Portunus pelagicus*) caught was presented in figure 6.

![Percent of Female with and without egg](image)

**Figure 6.** Percent of a female with egg and female without the blue swimming crab (*Portunus pelagicus*) caught around the waters of the seaweed culture area.

The result of the study shows that the 279 female of the blue swimming crab (*Portunus pelagicus*) caught around the waters of the seaweed culture area that consist of 13.62% female with egg.

The percent of the mature gonad of female crabs in Lasongko Bay, Southeast Sulawesi-Indonesia ranged from 31.5 to 75.0%, with the highest in June and the lowest in September [21]. The resulting study of Kumar et al., (2003) showed that there were 40 (23.2%) berried females from 172 female samples of the blue swimmer crab, *Portunus pelagicus*, off southern Australia [22].

The carapace width of breeding blue swimming crab in this study ranged from 92.2 to 138.6 mm. Sexual maturity crabs varied between locations waters, and it may affect by the availability of food, predation, and density of crabs. The CW of female blue swimming crab at first maturity in Lasongko Bay, Southeast Sulawesi-Indonesia ranged from 71.6 to 113.0 mm [20] in the mangrove, seagrass and coral reefs at Salemo Island South Sulawesi was 94.54 mm, 83.35 mm, 98.31 mm in width [18], and in East Lampung waters were in the 111–155.9 mm [23].

Spawning season in this area took place during the study; it is characterized by the occurrence of females with matured gonad. However, it is needed to intensively study to know the peak of spawning season. It is also important to study about spawning season of blue swimming crab correlate temperature, salinity, food availability, rainfall, and photoperiod.
4. Conclusion
The results of study show that total catch of 21 trips during 3 month fishing operation was 539 crabs that consist of 260 males (48.24 %) and 279 females (51.76 %). The (CW) of males ranged from 53.6 to 143.6 mm, while females ranged from 58.3 to 142.8 mm. There were 38 breeding crabs or 13.62 % from the female total. The carapace width of breeding crab ranged from 92.2 to 138.6 mm. Moreover, it needed to study in the area for sustainable use of the crab in the area intensively.

Acknowledgment
We sincerely thank fishermen in the southern coastal of Bulukumba Regency, South Sulawesi for the facilities, and their help during work in the field. We also thank some graduate bachelor students for their assistance during field and laboratory work.

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