Co-existence between *Scylla serrata* and *Scylla transquebarica* in the lagoon of Segara Anakan, Cilacap, Indonesia

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Abstract In the Laguna Segara Anakan, there are two species of mangrove crab such as *Scylla serrate* and *Scylla transquebarica*. Both of these species are always in the same water conditions in the Segara Anakan Lagoon, Cilacap. The purpose of this study was to examine the co-existence both species populations (*S. serrata* and *S. transquebarica*) in the Segara Anakan Lagoon. Sampling were carried out on April and June 2019 in three locations namely Klaces, Panikel and Sapuregel. Traps were used to collect crab samples. According to the research result that in the Klaces, the number of *S. serrata* (n = 17) is greater than the number of *S. transquebarica* (n = 4). Whereas in Panikel and Sapuregel, the number of *S. transquebarica* was more than the number of *S. serrata*. The presence of *S. serrata* and *S. transquebarica* in mangrove habitat is always side by side.

1. Introduction

The Segara Anakan area is famous for its abundant mangrove crabs. Mangrove crab catchers can not recognize up to species level. They only know the genus Scylla. Mangrove crab (genus Scylla De Haan 1833; Crustacean: Decapoda: Brachyura: Portunidae) is a common inhabitant of mangrove areas, brackish or coastal waters along the shorelines and intertidal waters in the coastal regions [1].

Mangrove crabs are very popular in the community mangrove and are one of the important fisheries commodities in the Indo Pacific region because these animals have meat and eggs with a high protein content [2]. The amount of demand resulted in the capture of mangrove crabs from natural stocks in coastal waters, especially in mangrove or estuary areas. Recently, increasing the economic value of mangrove crab fisheries has led to an increase in the capture of mangrove crabs. The average growth value of mangrove crab production in several provinces that produce mangrove crabs is rather slow and tends to decrease [3]. Besides, because it is caused by an increase in the capture of mangrove crabs, another factor affecting the decline in mangrove crab stocks in nature is the destruction of the mangrove forest area, which is a mangrove crab habitat.
Efforts to restore the population of mangrove crabs have also been carried out such as the cultivation of mangrove crabs [4][5][6], ecological status of the existence of mangrove crab populations [7]. However, the presence of natural stocks of *Scylla serrata* and *Scylla transquebarica* mangrove crabs in waters and mangrove habitats support one another. *Scylla transquebarica* and *S. serrata* in the mangrove area have been over captured. Exploitation of mangrove crabs in the Segara Anakan Lagoon use a traditional artisanal activity involving traditional local fishermen. In Java, the impact of the high sediment load on the coastal area is strongly in the Segara Anakan Lagoon [8]. The purpose of this study was to examine co-existence population *S. serrata* and *S. transquebarica* in the Segara Anakan Lagoon.

2. Research Method

Mangrove crabs were taken on April and June 2019 by “bubu” trap equipment. There are 5 sampling sites such as Panikel, Klaces, Ujung Alang, Sapuregel and Majingklak. Mangrove crabs sampling were done by using a bubu trap (wadong) fishing gear that has been stocked at each sampling station. Furthermore, mangrove crabs (*Scylla* sp.) were identified. After that, electric calliper was used to measure carapace length and carapace width. Electric balance was used to measure total weight crab. Water quality checker was used to measure water quality such as temperature, salinity and DO.

3. Result and Discussion

According to research, the average salinity values were observed in April and June are almost the same for all locations except for Panikel area (2.5 and 3 ppt). The average value of dissolved oxygen content was higher on April than on June 2019 (Figure 2). The highest dissolved oxygen content was 7.3 mg/L in the Panikel area on April 2019. On April 2019, the average range value of salinity was 2.5 till 6.5 ppt (Figure 1). The highest salinity was 7 ppt which was measured on June 2019. The average salinity range on June 2019 was 3 to 7 ppt (Figure 1). The range of salinity values at the Segara Anakan sampling sites have characteristic brackish water.

![Figure 1. The value of average salinity (ppt) was measured on April and June 2019, Segara Anakan, Cilacap.](image-url)
ecosystem that can have a direct impact on the presence of mangrove crabs [9]. *S. transquebarica* population is more able to survive with a low salinity range compared with *S. serrata* [9] [6] [2]. The difference in the tides is influenced by the topography of each station which determines how large the tides which can enter and inundate. This situation affects the state of the habitat and adaptation of mangrove crabs. Except for the salinity factor in a fairy period, the effect of temperature and DO can affect the presence of mangrove crabs.

The lowest average temperature measured in April at the Sapuregel location was 26.8°C. The average temperature for April and June at the Klaces, Panikel, and Ujung Alang locations is almost the same (Figure 3). The highest average temperature was 30.4°C which was found in Ujung Alang observations on June 2019 (Figure3). Temperature is one of the important factors that affect the activity, survival, growth, and molting of Mangrove Crabs. Based on measurement temperature on April and May 2019, the temperature had range 26.7 – 30.4°C. According to result, the temperature in Segara Anakan fit with [10] showed that the optimum temperature for the growth of Mangrove Crabs was 25 – 35°C. According to [11], the optimal temperature will affect the survival of the Mangrove Crab. Opinion that higher temperatures will accelerate growth and reduce the time needed to reach maturity in Mangrove Crabs [12].

Temperature and salinity are factors that can affect the growth of mangrove crabs. Based on the results of research on April 2019 observations, the number of *S. transquebarica* most caught was 32 individuals and for *S. serrata* species was 22 individuals. In April 2019 observations, Panikel was the most common site sampling area for *S. transquebarica* and *S. serrata*. Conversely, in the June observation, in the Panikel area, only 2 *S. transquebarica* were found. Furthermore, salinity measurement results in the Panicles range from 2.5 to 3 ppt and temperatures with a range of 29.5-29.9 °C. This is also consistent with the results of research by [11] which states that the mangrove crab is euryhaline or can live with a wide range of salinity in cultivation, which is 5-40 ppt. The level of salinity required for mangrove crab for optimum growth is around 10 - 35 ppt [13].

![Figure 2. The Average of value dissolved oxygen on April and June 2019, Segara Anakan Lagoon Segara Anakan Cilacap.](image-url)
Figure 3. The average value of temperature at sampling site on April and June 2019, Segara Anakan, Cilacap.

Based on observations in April 2019. The number of *S. transquebarica* individuals is greater than that of *S. serrata* at the Panikel and Sapuregel locations. However, for June 2019, only 2 *S. transquebarica* were found in Panikel sampling site while Sapuregel was not found (Figure 4 and 5). The number of *S. transquebarica* is more than *S. serrata* in sampling site Klaces, Ujung Alang and Majingklak (Figure 6). Based on observations when *S. transquebarica* was found to be abundant, so *S. serrata* was found to be not abundant (Figure 4 and 5).

On June 2019 observations, the most mangrove crab was found in Majingklak, there were 26 individu of *S. transquebarica* and 14 individu of *S. serrata*. When associated with a measured temperature was 29.3 °C and salinity value was 7 ppt. It clearly shows that habitats in Majingklak are suitable for mangrove crab living areas which include euryhaline animals. Furthermore, based on observations on April showed that for the Klaces, Panikel, Ujung Alang and Sapuregel areas had average weight for *S. serrata* more weight than *S. transquebarica*, similarly for carapace width for *S. serrata* wider than *S. transquebarica*.

Figure 4. Amount of individu *S. transquebarica* and *S. serrata* at sampling sites on April in Segara Anakan, Cilacap.
Figure 5. Amount of individu *S. transquebarica* and *S. serrata* at sampling sites on Juni in Segara Anakan, Cilacap.

Figure 6. The average of value total weight (g) *S. transquebarica* and *S. serrata* on April 2019

Figure 7. The average of value total weight (g) *S. transquebarica* and *S. serrata* on June 2019
In April observations, the average total weight of *S. transquebarica* was smaller than *S. serrata*, on the other hand for June 2019 (Figure 6 and 7). Furthermore, based on observations in April and June for all sampling sites showed that there was no significant difference in carapace length (Figure 8 and 9).

### Figure 8. The average of value carapace length (cm) *S. transquebarica* and *S. serrata* on April 2019

### Figure 9. The average of value carapace length (cm) *S. transquebarica* and *S. serrata* on June 2019

Based on observations on April 2019 and June 2019, the carapace width of *S. transquebarica* was greater than *S. serrata* (Figure 10 and 11).
The existence of *S. transquebarica* and *S. serrata* always coexist at each sampling site (Klaces, Panikel, Ujung Alang, Sapuregel, Majingklak and Motehan). If the number of *S. transquebarica* individuals is high then the number of *S. serrata* individuals is small or vice versa. Likewise, the mangrove area of Alas Purwo National Park, that *S. transquebarica* and *S. serrata* coexist [9]. The success of an organism in living side by side in an ecosystem because there is no competition in the struggle for food, space and conditions of water quality parameters. The large number of food sources in the mangrove area of Segara Anakan has prevented competition of food.
The mangrove area has high primary and secondary productivity. Because in the mangrove area there are many mangrove leaves that fall and decomposition by bacteria, fungi, and protozoa are broken down into simpler organic components (detritus) which are a food source for many aquatic organisms such as shrimp, crab, fish, clam, and others organisms [14]. Ecological role as an energy source in the animal food chain is important detritus in the benthic ecosystem. Mangrove plants can convert sunlight and nutrients (nutrients) into plant tissue (organic matter) through the process of photosynthesis [15].

4. Conclusion

Water quality conditions at the Klaces, Ujung Alang and Majingklak locations strongly support the growth and development of *S. tranquebarica* and *S. serrata*. These was evidenced by the discovery of mangrove crabs for the observation months of April and June 2019. The presence of *S. tranquebarica* always coincides with *S. serrata*, the body size of *S. tranquebarica* is greater than *S. serrata*. Although the population of *S. tranquebarica* coexists with *S. serrata*, if the population of *S. tranquebarica* is higher than *S. serrata*. The population of mangrove crab for the Panikel and Sapuregel catching areas shows that the mangrove crab population is rarely found in that location.

5. References

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