Meristics and morphometrikcs characters of *Scylla serrata* in Youtefa and Kalimaro, Papua mangrove ecosystem

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Abstract. Observations of the meristic and morphometric characteristics of *S.serrata* will be carried out in Youtefa Bay, Jayapura, and Kalimaro, Merauke. The research objective was to determine the morphometric and meristic characteristics and their relationship with the mangrove ecosystem. Homogeneity test results showed homogenous results with a correlation (r) 0.80 and (r) 0.85. The results obtained were 96.05% which was not significantly different in meristic and morphometric characteristics. The substrate fraction of Kalimaro is dominated by clay (26.53%) and fine sand (16.84%) which means that the type of substrate is sandy loam, while Youtefa is dominated by coarse sand (27.00%) clay (15.45%), or muddy sand type. For the C-organic deposits on Youtefa (4.92%) and Kalimaro (9.58%) substrates in the good category, but the correlation results showed Kalimaro (r) 95% while Youtefa (r) -95% with a confidence interval (p> 0.05) is directly proportional to the abundance of Kalimaro (39 individuals/m²) and Youtefa (11 individuals/m²). Mangrove density in Youtefa (4,800-7,800 individuals/ha) is dominated by *Rhizophora* 73.1% and Kalimaro (2,600-3,700 individuals/ ha) is dominated by Avicennia 75%. Mangrove ecosystem has a close relationship on meristic and morphometric characteristics compared to Youtefa Bay.

1. Introduction
Mangrove crabs (*Scylla serrata* Forskal, 1775) are estuary biota that is typically associated with mangrove ecosystems [1]. Since the early 1980s, mangrove crab has become an important fishery commodity in Indonesia [2]. Mangrove crabs in Indonesia are obtained from capturing natural stocks in coastal waters, especially in mangrove areas. The increasing level of crab seafood consumption indirectly increases the demand and increases the economic value of fisheries, especially crabs, so that the exploitation of mangrove crabs is increasing. According to [3] the mangrove crab with the type of (*Scylla serrata* Forskal, 1775) is one of the species that has an important economic value which dominates the catch in mangrove areas, resulting in growth, mortality, and the exploitation of *Scylla serrata* can be used as indicators to determine how the optimum and knows the relationship between working with the character meristics morphometrics with mangrove crab (*Scylla serrata* forskal 1775), For the purpose of restricting catch which should also be the basis in mangrove catching crabs management policies [4].

The mangrove ecosystem is the main ecosystem for small and large islands which is very important for various types of biota including *S.serrata* in the area. As one of the coastal ecosystems, mangroves are unique but vulnerable. This ecosystem has ecological and economic functions [5] In Youtefa Bay, Jayapura City and Merauke Regency, which are located on the northern and southern coasts of Papua, have mangrove ecosystems of 1,650 hectares and 343,766 hectares. [6] Based on data from the
Environmental Management Agency. According to [7], mangroves are fertile areas because of the transportation of nutrients from river flows and tides and are an important component in coastal areas because they have an indirect impact on providing descriptive information about the relationship between the meristic and morphometric characters of *S. serrata* in the two locations with environmental conditions or mangrove ecosystems, this can be used to conserve and monitor mangrove ecosystems because it is related to the meristic and morphometric characters of the *Scylla serrata* [8].

2. Methods

2.1. Study Site

This research was conducted from October to November 2017 in Papua Island, represented by Youtefa Bay Jayapura and Kalimaro Merauke (figure 1).

![Figure 1. Location research in Youtefa Bay Jayapura (North), and Kalimaro Merauke (South), Papua Province.](image)

2.2. Material

The materials used in research include: water, a substrate in the research, alcohol 70 % specimen to preserve sample mangrove crab (*Scylla serrata*) digital camera: GPS (global positioning system), bucket, meter, roll meters 50 m, a thermometer stems, a thermometer land, refractometer, rope, ph meters, rope 100 m, and 50 m, a ruler, paper label and bubu (a crab trap).

2.3. Method

The collection of *S. serrata* was carried out randomly with traps [9], as well as mangrove and meristic crab morphometry then analyzed according to [10] [11] key identification/determination of mangrove crabs. Then for mangrove collection using line transects and spread to 10x10m quadrant tree sampling 10x10 m high, 5x5 m stakes, see mangrove composition and density [12] [13].
2.4. Data analysis
An association and relation meristics and morphometric *S.serrata* with mangrove seen using data consisting of matrix meristics and morphometric *S. serrata* on lines and mangrove in columns than Subsequent data analyzed using linear regression analysis [13].

3. Results and discussion
3.1. *Scylla serrata* abundance in Youtefa and Kalimaro
Mangrove crab obtained data on the overall site can be viewed at table 1:

**Tabel 1.** The average abundance of *S.serrata* ind/ha.
**Scylla serrata** abundance relating to mangrove ecosystem condition, in good condition is proportional with *Scylla serrata* abundance in nature. Based on data from the mud crab *Scylla serrata* species caught are as many as 50 individuals from across the study sites. The number of mangrove crab from each location is 39 individuals/ha on the location Kalimaro and 11 individuals/ha in Youtefa. *S. serrata* have an abundant amount of natural stocks if the small amount means a very high rate of exploitation [14] [25] [28].

3.2. The results of Principal Component Analysis (PCA) environmental quality
One of the determining aspects in the development of meristic and morphometric *S.serrata* is influenced by the quality of the physical and chemical parameters of the waters.

The results showed the two major components with its diversity of total reached 70.20 %. The f1 (positive) with three main variables, namely salinity (0.94), DO (0.90) and nitrate (0.50) high on the Kalimaro station 2 and 3 Merauke district, but on the same axis f1 (negative) by 2 variable COD (-0.50), phosphate (-0.51) high on the Kalimaro station 1. On an axis f2 (positive) with the temperature 3 variable (0.86) nitrate (0.82) and pH (0.59) high on the Kalimaro station 2 while on an axis f2 (negative) with three variable namely DO (-0.30), BOD (-0.24), and salinity (-0.18) on the station Kalimaro 3 and Youtefa bay 3. In the gulf of Youtefa 1 and 2 invisible because the parameters are in the range of very low.

This has an impact on the meristic and morphometric measurements of *S. serrata*. The Kalimaro observation site has favorable environmental conditions for *S. serrata*, with a growth rate of greater than 150 mm, while in Youtefa it is only 138 mm. Apart from the mangrove ecosystem, water conditions also contribute to stabilizing the environment, such as nitrate, temperature, salinity, and pH. This is directly proportional to the rate of development of the meristic and morphometric characteristics of *S. serrata* (15) (16) (27) (30).

3.3. Substrate fraction
The results of the C-organic content contained in the substrate in the two locations were quite good. The table above shows that at the location of Youtefa Bay, Jayapura, the dominant substrate is a slightly coarse sand with a percentage of 27.00% very coarse sand 15.16%, coarse sand 11.65% and clay 15.45 which means the substrate type is clay sand, while Kalimaro Merauke, the dominant substrate percentage is clay. Sandy with the characteristic fraction: 26.53% clay, 16.84% fine sand, and 14.05% coarse sand. So if the sand coarse substrate is more dominant, the C-organic content cannot be stored, because the pores in the sand are large so that it cannot bind carbon well. According to [16] [29], mangrove crab or *S. serrata* cannot be separated from mangrove base vegetation because there is a very close relationship between them.

The relationship between substrate proportion and *S.serrata* abundance at both locations was obtained by positive and negative correlations. The Kalimaro correlation value is \((r) 0.95\), which means that 95% of the substrate has an effect on the abundance of *S.serrata*. At the Youtefa location, the correlation results showed \((r) -0.97\) or \((p <0.05)\). There is a strong negative relationship between the sand substrate and the abundance, it is inversely proportional, if the value of the proportion of sand is high, the abundance of *S. serrata* will decrease in the area. Vegetation and mangrove substrate have an important role as a place to deposit a source of nutrients for *S. serrata*. Because of the natural nature of burrowing at the bottom of mangrove waters where the use of topsoil by *S. serrata* is only up to a depth of 30 cm, so it is directly proportional to meristic and morphometric conditions.

**Table 2. Substrate fraction at both locations.**

| Location                  | Very coarse sand | Rough sands | Rather coarse sand | Fine sand | Sand a little fine | Coarse dust | Rather coarse dust | Clay | C-organik |
|---------------------------|------------------|-------------|--------------------|-----------|-------------------|-------------|--------------------|------|-----------|
| Teluk Youtefa, Jayapura   | 15.16            | 11.65       | 27.00              | 7.61      | 9.33              | 6.28        | 7.52               | 15.45| 4.92      |
| Kalimaro Kab. Merauke     | 13.88            | 14.05       | 11.52              | 16.84     | 9.46              | 4.12        | 3.60               | 26.53| 9.58      |

However, *S. serrata* has the ability to survive in various habitats, so it has many opportunities to develop. According to [17] a good basic substrate for mangrove ecosystems and mangrove crabs is sandy loam and sandy loam because the substrate functions to hold water and nutrients agrees to [18] who states C-organic is a determinant of how much litter. and nutrients in the mangrove substrate. [19], crustaceans are benthic animals that feed on suspended material (filter feeders) and are generally very dominant in sandy and muddy substrates.

3.4. Mangrove density composition

Based on the results of the calculation of mangrove density at two locations, namely the Youtefa mangrove density range between 4,800-7,800 trees/ha. With a tree diameter ranging from 14.3-183.1 cm. In Kalimaro Merauke the range is 2,600-3,700 trees/ha, with a diameter range of 55.1-167.2 cm, so according to Law no. 201 of 2004 is categorized as good and very solid. When compared the results from the two locations are very different.

**Table 2. Mangrove species density a both location.**

| Location | Density (ind/ha) | Criteria  | Diameter (cm) |
|----------|------------------|-----------|---------------|
| KM       |                  |           |               |
| 1        | 2,600            | Very tight| 55.1-3.5      |
| 2        | 4,500            | Very tight| 111.8-11.5    |
Ty 4 4,800 Very tight 14.3-140.8
5 7,400 Very tight 17.2-179.2
6 7,800 Very tight 32.8-183.1

Note: Very tight (>1,500), Medium tight (<1,000 - >1,500), Low tight (<1,000)

3.5. Correlation meristic and morphometric S. serrata with mangrove

The result of the regression equation $Y = 4.0995 + 1181.3x$, meaning that each increase in mangrove density of one hectare of mangrove increases the growth of 11.8 individuals. The correlation coefficient of termination (R²) which is obtained is 0.3997, which means that the relationship between mangroves and meristics and morphometrics $s.serrata$ is very low, namely 39.97% characterized by negative allometric, meaning that the relationship between mangrove ecosystems and $S.serrata$ is very small because the range is 60.03% and not directly proportional to high mangrove density. This is influenced
by the high level of exploitation, anthropogenic activities with increasingly dense residential areas, the discharge routes of several large rivers which have an impact on unfavorable water conditions and in the upstream rivers. Youtefa Bay is a semi-closed bay where the deposition of household and industrial waste and low flow movements can affect mangrove waters and ecosystems. According to [16] research, mangrove tree density tends to be high and has low abundance, as [21] and [22] state that environmental quality conditions such as salinity, oxygen, temperature, and nutrients affect the composition, distribution, and growth of plants. biota, either directly or indirectly

At the second location, the regression equation $Y = 1.8614 + 4358.6x$, meaning that each addition of 1 hectare of mangrove area increases the abundance of $S. serrata$ by 435.8 individuals. The correlation coefficient of determination ($R^2$) obtained is 0.5991, which means that the relationship between mangrove and $S. serrata$ is very good with a value of 59.91% close to 60%. Therefore, in addition to the mangrove ecosystem, other factors such as water conditions, substrate, and patterns of current movements also contribute. Flow as a conductor of nutrients has a very large function with positive allometric characteristics, where the growth in the area of the mangrove ecosystem is directly proportional to the maximum growth rate of $S. serrata$. Because the Kalimaro area is located in the south of the island of Papua and faces offshore areas, the current movement pattern plays an important role in the mangrove ecosystem, because it can help stabilize salinity, help channel important nutrients for $S. serrata$. So that indirectly the mangrove ecosystem and environmental conditions contribute to $S. serrata$, by increasing environmental conditions and mangrove ecosystems, the growth rate of mangrove crabs will be higher. $S. serrata$ tends to occupy habitats with characteristics of low salinity, high turbidity, dense mangrove vegetation, muddy substrate, and flat tidal areas [22,23]. The distribution of mangrove crabs in the mangrove ecosystem is closely related to the characteristics of suitable habitat that can support the growth and development of $S. serrata$ [24]. The results of the study which stated that the highest abundance was found in sparse density, then decreased along with the increase in mangrove density [4]. The increase in mangrove density causes an increase in the area of mangrove root cover to the bottom of the waters so that the abundance of mangrove crabs is decreasing due to the reduced area. The distribution of mangrove crabs in the mangrove ecosystem is closely related to the characteristics of the suitable habitat that can support the growth and development of $S. serrata$ [23,26]. The results of the study stated that the highest abundance was at the sparse density, then decreased with the increase in mangrove density [4]. The increase in mangrove density causes an increase in the area of mangrove root cover at the bottom of the waters so that the abundance of mangrove crabs decreases due to the reduced area.

4. Conclusion

The relationship of mangrove ecosystems to meristic and morphometry $S. serrata$ in the Youtefa Bay, Jayapura, and Kalimaro Merauke areas shows that the Kalimaro mangrove ecosystem is closely related or a positive allometric relationship to individual abundance and serrata characteristics because the mangrove ecosystem and parameters of the aquatic environment and substrate are directly proportional to $S. serrata$ development. Meanwhile, the Youtefa mangrove ecosystem has a small or negative allometric relationship, even though the mangrove density is higher than Kalimaro, the carrying capacity of the aquatic environment and substrate parameters is very low which impacts not directly proportional to individual development or average characteristics due to deposition of waste in the bay area the high rate of exploitation of $S. serrata$.

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