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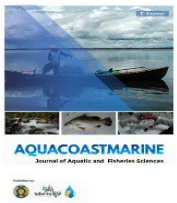

Distribution and Characteristic of Mangrove Crab (*Scylla* spp.) in the Mangrove Rehabilitation Area of Sei Tuan Indah Beach, Deli Serdang Regency

(Distribusi dan Karakteristik Kepiting Bakau (Scylla spp.) di Kawasan Rehabilitasi Mangrove Pantai Sei Tuan Indah Kabupaten Deli Serdang)

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ABSTRAK

Penelitian mengenai distribusi dan karakteristik kepiting bakau (*Scylla* spp.) di kawasan rehabilitasi mangrove Pantai Sei Tuan Indah Kecamatan Pantai Labu Kabupaten Deli Serdang telah dilakukan pada bulan Agustus - September 2021. Tujuan dari penelitian ini adalah untuk mengetahui distribusi dan karakteristik kepiting bakau di kawasan rehabilitasi mangrove Pantai Sei Tuan Indah Kecamatan Pantai Labu Kabupaten Deli Serdang Provinsi Sumatera Utara. Metode yang digunakan dalam penelitian ini adalah metode transek garis dan petak atau *Line Transect point* untuk mengukur data mangrove dan penangkapan kepiting bakau menggunakan alat tangkap tradisional yaitu bubu. Hasil penelitian mendapatkan jumlah sampel kepiting sebanyak 80 ekor yang dalam 3 jenis yaitu *Scylla olivacea, Scylla tranquebarica, Scylla paramamosain* dengan jenis kelamin yang paling dominan jantan. Hasil penelitian didapatkan pola distribusi kepiting bakau berkelompok dengan nilai Id = 2.5. Anilisis korelasi antara lingkungan, parameter perairan dan distribusi menggunakan analisa komponen utama *Principal Component Analysist* (PCA).

ABSTRACT

Research on the distribution and characteristics of mangrove crabs (Scylla spp.) in the mangrove rehabilitation area of Sei Tuan Indah Beach, Pantai Labu District, Deli Serdang Regency, has been carried out from August to September 2021. The purpose of this study was to determine the distribution and characteristics of mangrove crabs in the mangrove rehabilitation area of Sei Tuan Indah Beach, Pantai Labu District, Deli Serdang Regency, North Sumatra Province. The method used in this research is the line transect method and the Line Transect point method for measuring mangrove data and catching mangrove crabs using traditional fishing gear, namely bubu. The results of the study obtained a total sample of 80 crabs in 3 types, namely: Scylla olivacea, Scylla tranquebarica, Scylla paramamosain with the most dominant sex being male. The results of the study obtained a pattern of distribution of mangrove crabs with a value of Id = 2.5. Analysis of correlation between environment, water parameters and distribution using Principal Component Analysist (PCA).

Introduction

In addition to protecting the beach from waves and wind, the mangrove ecosystem is a place that is also filled with other life such as mammals, crabs, fish, primates, amphibians, reptiles, birds, crabs, fish, primates, and insects (Natania et al., 2017). Mangrove forest area is a very productive ecosystem and has a high potential to be utilized. It has been realized that mangrove forest areas are not only producers of forest resources, but also play a very important role in supporting fishery resources (Rosmaniar, 2008).

One of the biotas that live in mangrove ecosystems is mangrove crabs (*Scylla* spp.) (Rangkuti et al., 2017). According to Sharif et al., (2016), mangrove crabs are one of the final products of mangrove ecosystem

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services that have the potential to support community life, especially for small fishermen. Mangrove crabs that are widely consumed are generally *Scylla serrata, Scylla tranquebarica,* and *Scylla olivacea.*

Labu Beach area, is one of the mangrove rehabilitation areas that is the habitat of mangrove crabs (*Scylla* spp.) (Yahra et al., 2020). So far, the condition of the mangrove rehabilitation area at Sei Tuan Indah Beach has been used as a mangrove ecotourism area and an area for fishing, crab fishing, shrimp, fish (Samosir & Restu, 2017), and part of the mangrove forest land is disturbed due to erosion of the shoreline due to tidal tides. This causes changes in water quality conditions and affecting the life of biota, especially the distribution and characteristics of mangrove crabs in the mangrove rehabilitation area of Sei Tuan Indah Beach.

Method

Location and time

This research was carried out from August to September 2021 in the Sei Tuan Indah Beach Mangrove Rehabilitation Area, Pantai Labu District, Deli Serdang Regency, North Sumatra Province (**Figure 1**). Station 1 is in the natural mangrove area, station 2 is in the mangrove ecotourism area, and station 3 is in the mangrove rehabilitation area. Data collection was carried out as many as 3 repetitions. Physical and chemical measurements of waters were carried out directly in the field, substrate texture analysis and c-organic were carried out in the laboratory of the Palm Oil Research Center (PPKS) and the identification of mangrove crabs was carried out at the Aquatic Environment Laboratory of the Aquatic Resources Management Study Program, Faculty of Agriculture, University of North Sumatra.

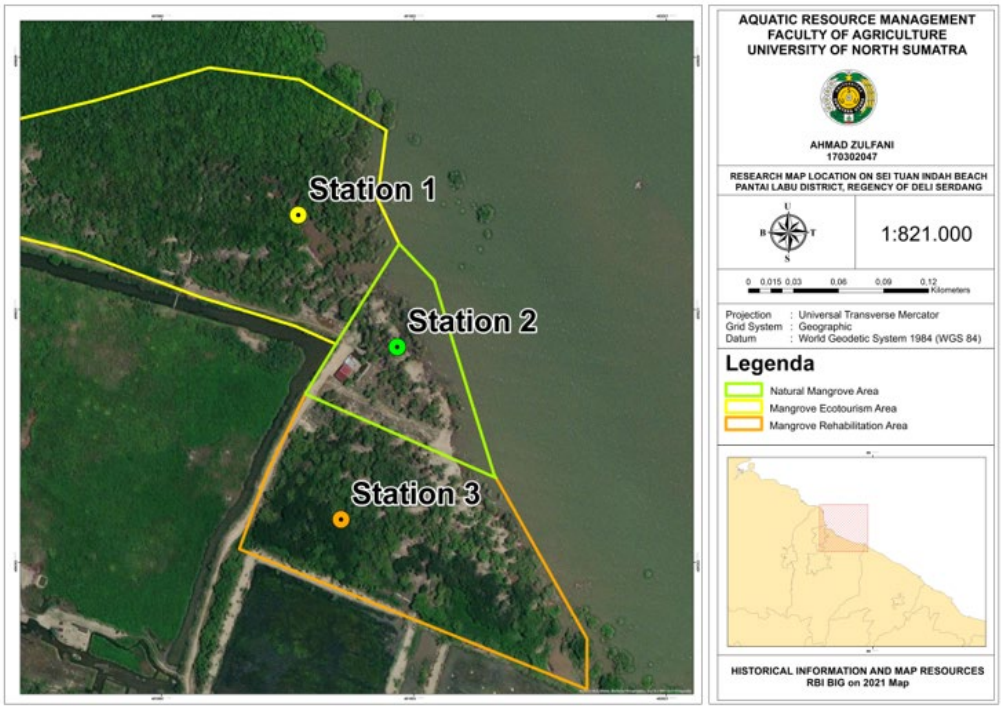

Figure 1. Research map location at Sei Tuan Indah Beach. Pantai District Labu, Deli Serdang Regency. Sumatera Utara Province

Data collectiom methods

Measurement of mangrove data is carried out by the method of transect lines and plots or Line Transect points based on the Decree of the Minister of Environment No. 201 year (2004). This crab data collection is carried out with traditional crab fishing gear at every 3 mangrove stations with 3 different stations, namely: station 1 is in the natural mangrove area, station 2 is in the mangrove ecotourism area, and station 3 is in the mangrove rehabilitation area. The parameters measured for water quality sample data collection, namely: dissolved oxygen (DO), water temperature, water pH, water salinity, and water depth are carried out *in situ,* Analysis of substrate type and organic C was carried out in the laboratory, then grouped using the method proposed by the United States Department of Agriculture (USDA) using the texture triangle. Then the relationship between mangrove density, abundance of mangrove crabs with physicochemical and substrate

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parameters was. Then the relationship between mangrove density, mangrove crab abundance with chemical and substrate physical parameters was analyzed with PCA (*Principal Component Analysis)* correlation.

Analisis data
Data analysis
Mangrove density

Mangrove density was calculated using the following (Buwono, 2017):

$$K = \frac{\text{total of individu}}{\text{transect area}}$$

Mangrove crab abundance

According to Siringoringo et al., (2017), to determine the abundance of mangrove crabs using the following formula:

$$N = \frac{\sum ni}{A}$$

Information: N = is the abundance of mangrove crab species-i (ind/ha), ∑ni = is the number of individuals of species-i, A = is the area of the samples observation (ha).

Mangrove crab distribution

$$Id = \left[\frac{(\sum_{i=1}^{n} {x_i}^2) - N_i}{N_i(N_i - 1)}\right]$$

Information: Id = Morisita distribution index, $\sum {x_i}^2$ = total number of species-i per station for total of n station, N = total number of plot, Ni = total number of individuals.

The Morisita Index results that have been obtained are grouped as follows:
Id < 1 = Individual distribution patterns tend to be random
Id = 1 = Individual distribution pattern is even
Id > 1 = Individual distribution patterns tend to be in groups

Mangrove crab sex ratio

The sex ratio analysis of mangrove crabs was determined by looking at the comparison of the frequency of male and female individuals. According to Siahainenia & Makatita (2020), to find out the sex ratio of mangrove crabs using the following formula:

$$R = \frac{nj}{nb}$$

Information: R = sex ratio, nj = number of males (ind), nb = number of females (ind)

Result and Discussion

Mangrove density

The results showed that the mangrove density has a value that varies at each station. The results showed that the highest mangrove density value was found at station I with a density value of 2366 trees/ha, followed by station III with a density value of 2033 trees/ha and station II with the lowest density value of 1000 trees/ha (**Figure 2**).

Based on the results obtained, it shows that the highest and best mangrove density was obtained at stations I and 3 of 2366 and 2033 trees/ha with very dense criteria and the lowest density value was at station II of 1000 trees/ha with moderate criteria. This is in accordance with the Decree of the Minister of the Environment No. 201 (2004) which states that the standard criteria for mangrove damage are good and very dense with a density of > 1500 trees/ha, good and moderate criteria with a density of > 1000-<1500 trees/ha and damaged criteria. and rarely with a density of <1000 trees/ha.

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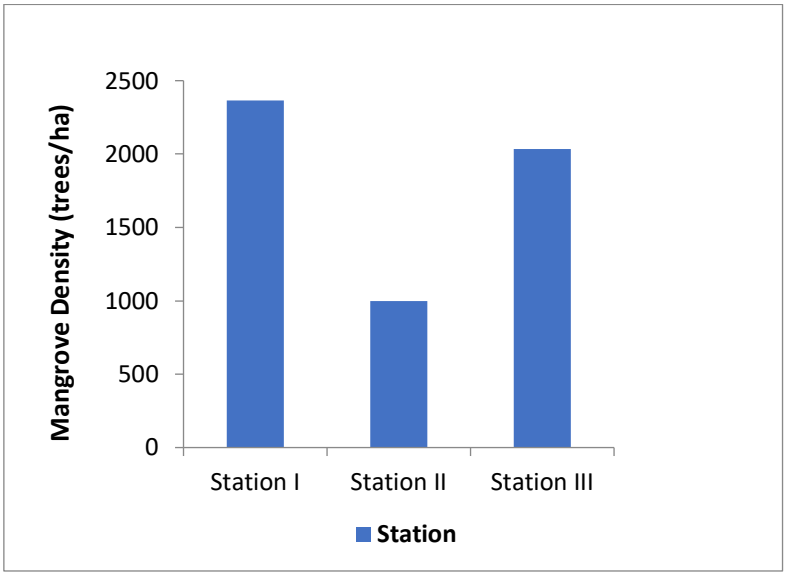

Figure 2. Mangrove density (tree/ha) each station

Mangrove crab abundance

The results showed that the highest abundance value of mud crab was found at station III with an abundance value of 45 ind/m^2, followed by station I with an abundance value of 26 ind/m^2 and station II with the lowest abundance value of 25 ind/m^2 (**Figure 3**).

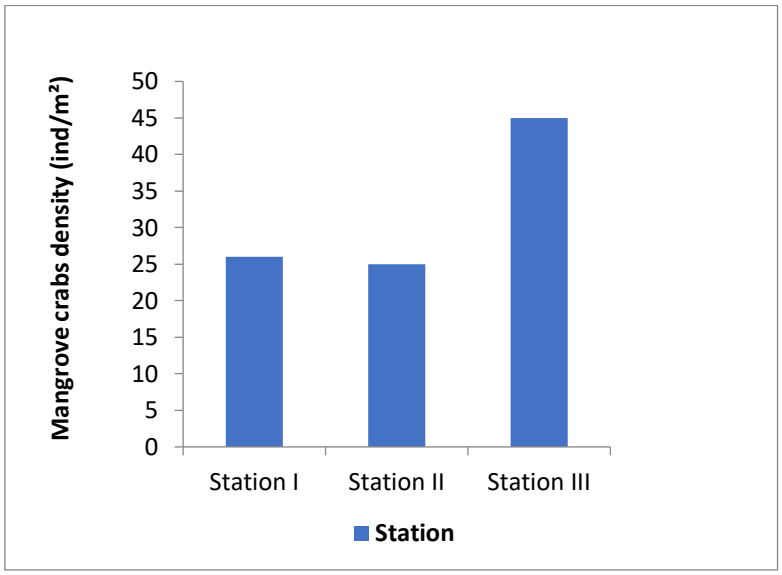

Figure 3. Abundance of mangrove crab (ind/m^2) each station

The results showed that the highest abundance of mangrove crabs was obtained at station 3 at a temperature of 45 ind / m2. The high abundance of mangrove crabs is caused by the environmental conditions of the waters at this station which are quite supportive of mangrove crab life. The highest mangrove density is obtained at stations 1 and 3 so that many mangrove leaves are weathered and decomposed into a substrate which is one of the foods and also the intake of mangrove crabs. The density of mangroves affects the amount of food available at the station. This is due to the large number of mangrove litters that are a source of food for organisms living in the water area. This is in accordance with Yulianti &Sofiana (2018) which states that the abundance of mangrove crabs in coastal areas is influenced by the density of mangrove ecosystems as their habitat. The high density allows an increase in the amount of nutrients for mangrove crabs.

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Morphology and morphometric of mangrove crab

The results of the study found 3 types of mangrove crabs in the Mangrove Rehabilitation Area of Sei Tuan Indah Beach, namely *Scylla olivacea, Scylla tranqubarica,* and *Scylla paramamosain* (**Table 1** and **Figure 4**). Based on the results of the research in the Mangrove Rehabilitation Area of Sei Tuan Indah Beach, the mangrove crab *Scylla tranquebarica* has blunt and moderate frontal lobe spines and both carpus spines are clearly visible and propodus spines are clearly visible. This is in accordance with Hia et al., (2013), which states that if the front part consists of blunt teeth and the claws have sharp spines, then the carpus also has two sharp spines. The carapace is usually dark green or blackish brown. The claws and feet are brownish purple, the pattern is irregular, so that the characteristics are *Scylla tranquebarica*.

Based on the results of research in the Mangrove Rehabilitation Area of Sei Tuan Indah Beach, mangrove crabs of the *Scylla olivacea* species which have a round and low frontal lobe spine shape and claws on the inner carpus spines are absent and the propodus spines are reduced. This is in accordance with Larosa et al., (2013), which states that *Scylla olivacea* if the front consists of blunt spines and the claws have blunt spines, and the spines on the carpus are both smaller. The carapace is usually reddish brown in almost all parts of its body. The paws and feet are brick red without a pattern.

Based on the results of research in the Mangrove Rehabilitation Area of Sei Tuan Indah Beach, the mangrove crab type *Scylla paramamosain* has a triangular frontal lobe spine shape and is quite tall and has no claws on the inner carpus spines and the propoda spines are clearly visible. This is in accordance with Hia et al., (2013), who stated that *Scylla paramamosain* has 6 spines between its eyes which are sharp triangular in shape and real spines on the propodus, while in the carpus the spines appear smaller (small). According to Wibowo (2017), which states that things that can affect the morphometrics of mud crabs are the availability of food sources that exist in nature. If the source of food needed by mangrove crabs can be increased, it will increase body size and weight of mud crabs and can affect the morphometrics contained in mud crabs.

Table 1. Morphology of mangrove crab

Species	Lobe thorn shape	Frontal height	Carpus thorn claw	Propodus thorn
S. olivacea	Rouns	Low	Inside is nothing outside reduced	Reduced
S. tranquebarica	Blunt	Medium	Both is looks clear	Looks clear
S. paramamosain	Triangle	High enough	Inside is nothing outside reduced	Looks clear

Research results (2021)

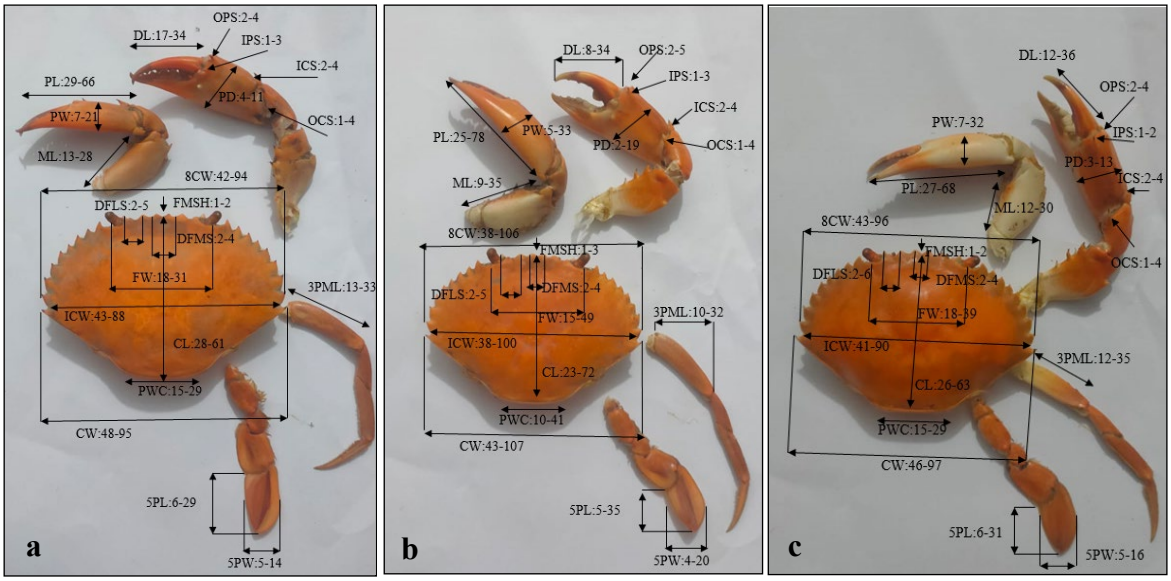

Figure 4. Morphometric of mangrove crab (a) *Scylla tranquebarica*, (b) *Scylla olivacea*, (c) *Scylla paramamosain*

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Mangrove crab distribution

The value of the mangrove crab distribution index is 2.5 at station I and III and -0.1 at station II. The values obtained at each station describe mud crabs in the group category (**Table 2**). Distribution in groups is caused because individuals have a tendency to gather and look for environmental conditions that suit their needs. Grouping is done because of the mutually beneficial interaction between these individuals. This is in accordance with Odum (1996), which states that the pattern of group distribution is the most common pattern found in natural populations because mangrove crabs tend to look for suitable habitats to forage for food to support their lives. The distribution of mangrove crabs is random, presumably due to strong competition between individuals in the population for food. This is in accordance with Irwani & Suryono (2006) and Muhtadi et al., (2022) which states that the difference in distribution patterns is thought to be caused by environmental characteristics and limited food availability, causing competition between individuals in getting the same space.

Table 2. Distribution index of mangrove crab

Species	Distribution Index	Information
S. *olivacea*	2.5357	Group
S. *tranqubarica*	-0.1007	Random
S. *paramamocain*	2.5165	Group

Research result (2021)

Sex ratio of mangrove crab

The sex ratio of mud crabs at each station was determined by looking at the comparison of the frequency of male and female individuals (Siahainenia & Makatita, 2020). Based on the results of the sex ratio of mangrove crabs, it is known that at the three stations the number of female mud crabs is less than that of male mud crabs. The ratio of male:female sex from station I is 9:4, station II is 3:1, and station III is 13:5 (**Table 3**). This Sex ratio indicates that male crabs dominate more than female crabs in the mangrove area because adult female crabs have matured gonads. migrate to the sea to spawn. This is in accordance with Satria & Syam (2009), which states that the ratio of female to male sex shows 1:3. This illustrates that the population of male crabs is more in mangrove waters.

The measurement results show that all parameters are within the range of quality standards according to the Government Regulation (PP No 2/ 2021) and supports the life of the mud crab. Based on the results of the USDA triangle analysis, it is classified that the substrate fraction at stations I and III is clay and at station II is sandy loam. Ulfah et al., (2012), stated that most of the estuary areas are dominated by silty or clay substrates. Most of the particles that settle in the estuary are organic, so this substrate is rich in organic matter, one of which is organic C-in the substrate. Station I has the lowest percentage of organic C content, presumably due to the condition of the mangroves that have been cut down a lot. This is in accordance with Hardjowigeno (2003) which states that a substrate can be said to have high fertility if its C-organic content is >3% and becomes very high if its C-organic content is >5%.

Table 3. Sex ratio of mangrove crab

Species	Station					
	1		2		3	
S. Olivacea	Male	4	Male	5	Male	15
	Female	3	Female	3	Female	6
S. Tranqubarica	Male	3	Male	1	Male	7
	Female	1	Female	0	Female	3
S. Paramamosain	Male	11	Male	6	Male	4
	Female	4	Female	3	Female	2
Total	Male	18	Male	12	Male	26
	Female	8	Female	6	Female	10
Class ratio	9:4		3:1		13:5	

Research result (2021)

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Table 4. Physical-chemical parameters of water and type of substrate

Parameters	Station			Quality Stamdard
	I	II	III	
pH	7,3 ± 0,1	7,4 ± 0,05	7 ± 0,15	6 – 7
Dissolved oxygen (mg/l)	5,4 ± 0,26	5 ± 0,13	5,1 ± 0,43	>4
Temperature ^{0}C	29,1 ± 1,4	30,1 ± 0,55	28 ± 1,44	25 – 32
Depth (cm)	41 ± 6,1	29,7 ± 5,5	27,7 ± 5,5	2 – 40
Salinity	26,3 ± 3,05	26 ± 2,64	23,3 ± 3,78	0 – 34
Type of substrate	Clay	Sandy clay	Clay	-
C-organic of substrate (%)	3,98	6,22	5,60	-

Research result (2021)

PCA Analysis Correlation

The results of the analysis of the interpretation of the correlation circle between variables can be seen from the formation of the angle formed between the formation variables. The results of PCA correlation analysis showed that the environmental factors that were positively correlated with the abundance of mangrove crabs forming an angle of < 90° were mangrove density, DO, temperature, and organic C. Meanwhile, environmental factors that are negatively correlated with abundance that form an angle > 90°, namely pH, temperature, depth, and salinity (**Figure 5**).

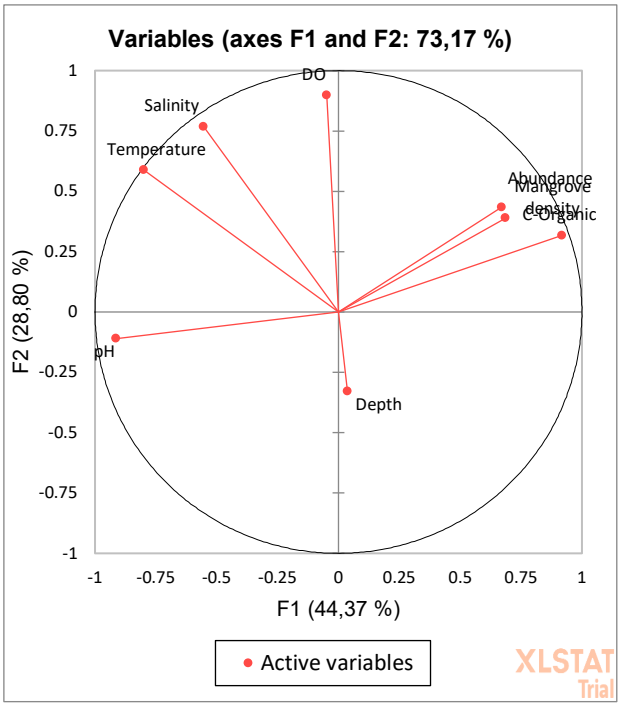

Figure 5. PCA Analysis Correlation

Based on the results of PCA analysis, it was found that the abundance of mangrove crabs was positively correlated with mangrove density, DO, and C-organic. The abundance of mangrove crabs in coastal areas is influenced by the density of the mangrove ecosystem as their habitat. The high density of mangrove vegetation allows an increase in the amount of nutrients for mud crabs. This is in accordance with the statement of Chadijah et al., (2013), which states that the lowest abundance of mangrove crabs is generally found in zones that have a low level of mangrove vegetation density, and are located around residential areas that have a lot of activity. In addition, the texture of the clay substrate on the substrate stores a high content of organic matter. This is in accordance with the statement of Taqwa et al., (2014), that the basic substrate texture is muddy sand and mud has a high organic matter content.

Furthermore, PCA analysis showed that crab abundance was negatively correlated with pH, temperature, depth, and salinity. The pH and organic matter of sediments clearly affect the growth of the mangrove ecosystem, soil pH is very important for plants in determining whether or not nutrients are easily absorbed by

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plants. Mulya (2002), stated that the presence of mangrove vegetation is closely related to the degree of acidity (pH) and the total organic matter in the sediment.

The high value of mangrove vegetation density that blocks the access of sunlight into the waters causes the temperature in these waters to be low. Low temperatures will slow down the rate of photosynthesis in individual mangroves (Petra et al., 2012).

According to Oktamalia et al., (2017), a good salinity to support the growth of mud crabs is around 15-26.25. The negative correlation of mangrove crab abundance to salinity is thought to occur because there are several types of crabs that are not very tolerant of low/high salinity. According to Avianto et al., (2013) the presence of S. serrata individuals is tolerant at high salinity >28 ppt, S.*tranquaberica* is tolerant at salinity 24->28 ppt.

Salinity is positively correlated with mangrove density. Mangrove vegetation can survive in salty waters and is often found in brackish and marine waters. In the mangrove rehabilitation area of Sei Tuan Indah Beach, 7 species of *Rizophora apiculata* and 8 ind/m^2 *Rhizophora mucronata* were found. The type of mangrove *Rhizophora* sp. live in a zone that is still inundated by the tides where the zone contains a fairly high salinity due to the influence of sea water at high tide. This is in accordance with Kusmana et al., (2005), which states that the optimum range of salinity required for mangrove growth is between 10-30 ppt.

Conclusion

The conclusion of this study is that the distribution of mangrove crabs in the Mangrove Rehabilitation Area of Sei Tuan Indah Beach, Pantai Labu District, Deli Serdang Regency is included in a group distribution pattern with a value of Id = 2.5. Based on their characteristics, there are 3 types of mangrove crabs in the Mangrove Rehabilitation Area of Sei Tuan Indah Beach, Pantai Labu District, Deli Serdang Regency, namely *Scylla olivacea, Scylla tranquebarica,* and *Scylla paramamosain*.

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