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Abundance of Mangrove Crab (Scylla Serrata) Its Linkage With The Bio-Physical Karasteristics Of Mangrove Forest In Karangsong Sub-District Indramayu District.

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ABSTRACT

Mangrove ecosystem is a habitat of mangrove crab (Scylla serrata). This research was conducted in mangrove ecosystem area of Karangsong Village, Karangsong Sub-district, Indramayu District. The purpose of this research is to know the abundance of mangrove crab, mangrove ecosystem condition and mangrove ecosystem relationship with mangrove crab in Karangsong mangrove ecosystem. The method used is descriptive explorative and station determination is done by stratified random sampling method. The results of the study found two types of mangroves namely Rhizopora mucronata and Avicennia marina. The mangrove conditions at the observed stations were classified as rare (broken). Mangrove density at station 1 has a value of 360 ind / ha, station 2 is 380 ind / ha, station 3 of 860 ind / ha and station 4 has a value of 480 ind / ha. Abundance of mangrove crabs at station 1 amounted to 280 ind / ha, station 2 as many as 340 ind / ha, station 3 valued 0 ind / ha and station 4 of 60 ind / ha. The relation between mangrove density with abundance Scylla serrata level of tree has value of coefficient of determination (R2) 0,10529 mean that between density of mangrove trees with abundance of mangrove no relation.

Keywords: Mangroves, Mangrove Crabs, Density, Abundance

Preliminary

Mangrove forest is a renewable resource. Vegetation of forest composition consists of more than 60 species of trees and shrubs, and more than 20 species of plants that are mangrove associations. In addition to the vegetation found in mangrove forest there are more than 2000 water biota that depend on the existence of these forests, such as fish, invertebrates, and epiphytic plants (Dahuri 2003). Mud crab is an animal that is often found in all coastal enclosures are overgrown with mangroves. These animals have special features of having a fine convex carapace, a carapace width of one and a half of body length, there are three pairs of road legs, perfection of paddle feet (swimming legs), and cheliped drinks (Siahainenia 2008).

Mangrove crabs have levels in the phase of their lives, because they have an effect on their natural eating habits. At the larval level of mangrove crabs include the eating of various planktonic organisms such as diatoms, molluscs and worms. At the level of young crabs, the type of natural food of mangrove crabs are small fish, shrimp and molluscs, whereas in mature mangrove crab is scavenger organism (Kasry 1996 and Queensland Department of Primary Industries 1989b in Siahainenia 2008) Arriola (1940) in Siahainenia (2008), states that mangrove crabs are omnivorous-scavengers, eaters of all kinds (cannibals, algae eaters, woody remains and other decomposing objects).

Materials and metedology

Time and place.

Observation of samples was conducted in the laboratory of Marine Science and Technology Faculty of Fisheries and Marine Sciences Padjadjaran University. This research was conducted in July - October 2017**.**

Tool and materials

The tool used in this research is roll meter, mangrove identification book, GPS, raffia rope, sewing meter, stationery, bucket, shovel, 1x1 transect, crab identification book, camera, pH meter, thermometer, refractometer, DO meter, plastic ziplock , shieve shaker, piston core and analytic scales. The material used is for the measurement of physical-chemical parameters performed directly (in situ) and substrate analysis done in the laboratory (ex situ).

Method

Mangrove crabs were caught using fish traps and bubbles from three sampling points, sampling of mangrove crabs was done in the afternoon, bubu in pairs and catches were taken. Repetition is done three times, each plot at each point is installed 2 pieces of bubu. The caught mangrove crabs are separated according to each station, then counted the number of individuals per-type, measured by the length of the crack, and weighs the body weight to know the relationship of the krapas with the weight of its body.

Mangrove data collection is done by counting the number, type, and measuring the diameter of trees, seedlings, and seedlings, taking mangrove data using quadratic transects with 10x10 m2 each for tree, 5x5 m2 for tillers and 1x1 m2 for seedlings. Taking of mangrove data is done once at the beginning of the research to identify.

Data analysis

Abundance of Mangrove Crab, As Well As Density Type Mangrove.

Abundance of mangrove crabs can be measured using the formula:

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

Information

N = Abundance of mangrove species crab i

$\sum ni$ = Number of Individual types i

A = Extensive plots of sampling

Analyze data on density of mangrove species (Siahainenia 2008):

K = $\frac{N}{A}$

Information :

K = density type i

N = the number of type i stands

A = Unit area station measured

Mangrove

a. Density and Relative Density

Density (D_1) is the number of type I stands in a unit area (English et al., 1994):

$$D_i = \frac{ni}{A}$$

Information :

D_i = Density of type i

N_i = Total number of individuals of the type

A = The total area of the sampling

Relationship between Density of Mangrove Crab with Mangrove Density

The relationship between two or more variables is seen by using regression analysis. The relationship between two variables can be linear when studied in short intervals, but will show curvature when the interval studied is quite large (Steel and Torrie, 1980). Regression analysis yields regression coefficients and correlation coefficients. The correlation coefficient (R) expresses the closeness of the relationship between two independent and free variables

(Y). To see the correlation between density of biota molluscs with density and mangrove INP used Non Linear analysis. This regression analysis takes the model with the largest correlation coefficient with the aim of obtaining a more precise curve and also for eliminating or minimizing errors. The formula used by Steel and Torrie (1980) are:

$$\mathbf{Y}=\boldsymbol{\beta}_0+\boldsymbol{\beta}_1\mathbf{X}+\ldots+\boldsymbol{\beta}_n\boldsymbol{X}^n$$

Information :

Y = Biota Density

ß = Regression coefficient

X = mangrove density (trees, stakes, and seedlings)

N = order (n: 1,2,3 ... ..n)

Results and Discussion

Condition of Water Quality and Substrate

Water quality and substrate measurement results obtained values of each parameter presented in table 2 below:

Table 1. Physical and Chemical Parameter Measurement Results

St	Temperature (°C)	Salinity (ppt)	DO (mg/L)	pH	Type Substrate
1	30,33	28	6,4	7,5	Sand, muddy
2	29,5	27	5,2	7,4	Sand,muddy
3	30,5	29	5,8	7,33	Sand
4	30	28	5,3	7,5	Sand,muddy

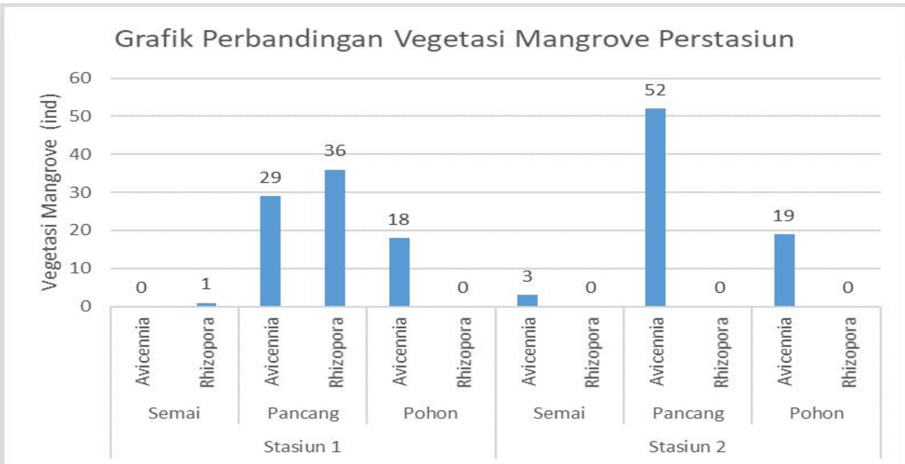
Based on the measurement results, the water temperature is 29.5-30.33°C. Station 1 of 29.5°C and the highest temperature of 30.33°C found in station 2. This is caused when the temperature is taken in the afternoon and done in the area that is slightly open or around the mangrove less tightly, so the waters are still feels hot and absorbs more sun. According to the quality standard of the decree of State Minister of environment number 51 year 2004 for good mangrove ecosystem is 28ºC - 33ºC. According to FAO (2011) standards, mangrove crabs can tolerate and live [in waters with a temperature range of 25 ºC - 35ºC. From these statements can be expressed temperature in mangrove forest waters Karangsong still in good condition and in accordance with for growth of mangrove crab. The temperature range is also in accordance with the conditions required by mangroves. Irwanto (2006) states that mangroves are found along tropical and subtropical zones, with temperatures of 19 ° -40 ° C.

The measurement of pH of Karangsong mangrove area ranged from 7.33 - 7.55. Differences pH in each station is not too drastic, pH average on each station has the same relative value. Each station has a pH approaching neutral pH (7) with an average pH of 7.3. Mangrove crabs can survive at a pH with a range of values of 7.2 - 7.8. This means that the mangrove crab at the sampling site is still in good pH condition for its growth, because at the location of the mangrove crab data collection, pH 7 is the most measurable. Based on KEPMEN LH no 51/2004 about seawater quality standards for marine biota in mangrove ecosystems a good pH ranges from 7 to 8.5. According to FAO (2011) the pH suitable for the growth of mangrove crab is 7 - 9. It shows that ph in karangsong waters is good and suitable for the growth of mangrove crab. The pH also indicates that the location is particularly suitable for mangrove growth. Widiastuti (1999) who suggested that the water pH range between 6 to 8.5, is suitable for mangrove growth. Salinity of Karangsong mangrove forest ranges from 27-29 ppt. Station I has the lowest salinity value because its waters are more mixed with fresh water brought by the river. Station III is the one that has the highest salinity because at the mouth of the river allows high salinity sea water still dominate when mixed. Average water salinity overall is 28 ppt. Based on KEPMEN LH no 51/2004 about sea water quality standard for marine biota in mangrove ecosystem salinity good maximal range 34 ppt. Mangrove crabs survive on salinity of 10 ppt - 35 ppt, but mangrove crabs can grow and thrive in a temperature range of 15 ppt - 35 ppt. Water salinity data at the sampling location in the range of 27 ppt - 29 ppt is the salinity condition that is still in optimal condition for the growth of mangrove crab. According to FAO (2011) the salinity suitable for the growth of mangrove crab is 20 -35. This shows that salinity in the waters of karangsong is good and suitable for the growth of mangrove crab. Based on the analysis of salinity measurement of each station is suitable for mangrove growth. This is supported by the opinion of Suryadi, (2004) which states that the mangrove ecosystem can grow in the salinity range of 10-30 ppt.

The results of the measurement of the DO parameters show the difference in values on each measuring station. Station II is the highest DO site with an average value of 6.4 mg / L and Station I is the location with the lowest DO with an average measurement of 5.2 mg / L. Station II has the highest DO caused because it is in the area near the estuary that often occurs mixing the water period so as to increase the oxygen division in the waters. Based on KEPMEN LH no 51/2004 about sea water quality standard for marine biota in good mangrove ecosystem DO is around 5mg / ml. The appropriate FAO (2011) DO for the growth of mangrove crab is 5mg / L. It shows that the DO in the waters of karangsong is good and suitable for the growth of mangrove crab. The substrate characteristics of each station are similar to the muddy sand found in stations 1, 2 and 4, the stations are close to rivers and ponds, so that the percentage of mud fraction is higher than in station 3. The 3 substrate type stations are sand, at station 3 location is close to the coastline. The condition is in line with Pratiwi's (2009) statement that mangrove crabs (Scylla sp) live in sandy and muddy habitats, so that the substrate located at the study site is suitable and good for the life of mangrove crab (*Scyla* sp.). The muddy sand substrate is perfect for the life of *Rhizophora mucronata* and *Avicenia marina*. Amin et al (2015) cites that *Rhizophora mucronata* is particularly suitable for life on muddy sand substrate. *Avicenia marina* species are compatible with muddy sand substrate, especially at the forefront of the beach (Bengen 2004). *Avicenia marina* can also live on sandy substrates. According to Indah et al (2008) Substrates are dominant sandy is indeed a substrate that is very suitable for the type *Avicennia* sp. This is caused by the effective form of chicken roots as a sand trap.

Mangrove Vegetation

There are two types of mangroves found in the conservation area of mangrove karangsong namely Avicennia sp and Rizhophora sp. The four stations were overgrown by Avicennia sp types while Rizhophora sp grew only in stations 1 and 4 (Figure 1)



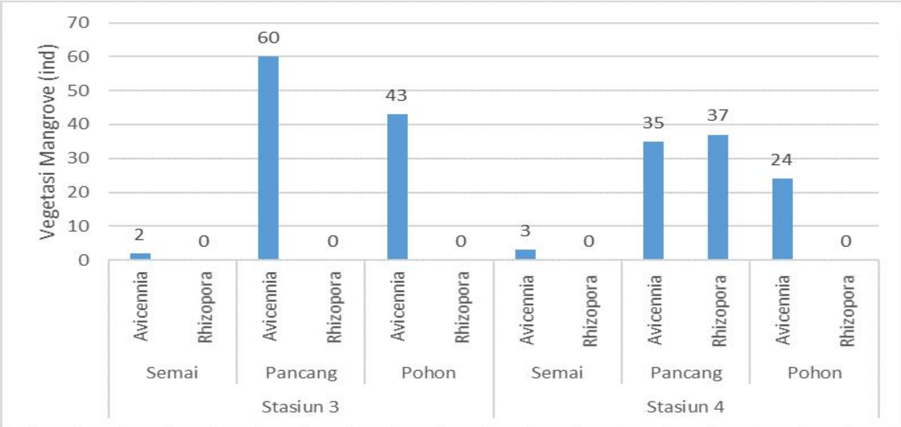
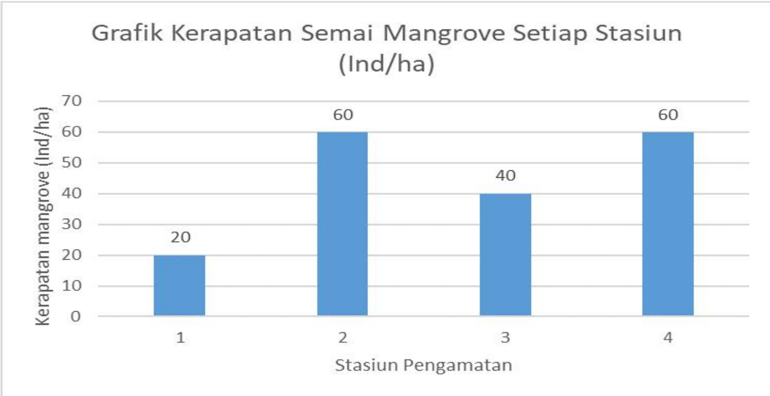


Figure 1. Graphic Comparison of Mangrove Vegetation of the station

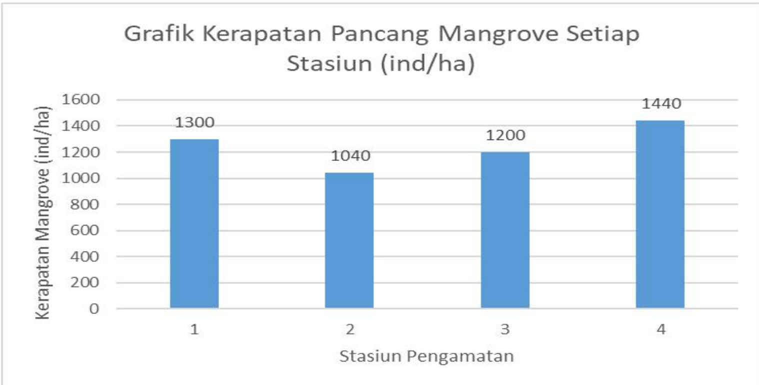
Station 1 is in the tourist dock area and is overgrown by *Avicennia marina* and *Rizhophora mucronata* species. This location is found *Avicennia marina* species with the number of seedlings 0 stands, stakes 29 stands and trees 18 stands. Meanwhile, *Rizhophora mucronata* species in the seedling category were found with 1 stump, 36 sticks and 0 trees. Station 2 is located in the riverside area, this location is only overgrown *Avicennia marina* species with the number of seedlings 3 stands, stakes 52 stands and 19 trees stands. Station 3 is located in an area close to the sea, this location is only in grow *Avicennia marina* species with the number of seedlings 2 stands, stakes 60 stands and 43 trees stand. Station 4 is located in an area that cultivates a pond and is covered by *Avicennia marina* and *Rizhophora mucronata* species. This location is found *Avicennia marina* species with the number of seedlings 3 stands, stake 35 trees and 24 trees stands. Meanwhile, Rizhophora mucronata species in the seedling category were found with the number of seedlings 0 stands, stakes 37 trees and 0 trees stands. *Avicennia marina* is an indigenous species of mangroves in the village of Karangsong (Harahap 2001) so that it is more able to adapt to the environment, but according to Hutchings and Saenger (1987) *A. marina* is a species with wide ecological distribution, has a high temperature and salinity tolerance range, where it is and is often the dominant species. In the seedling stage R. mucronata density is more dominant than the density of *A. marina*, even in station 1 R. mucronata is 200, which means there is only one species occupying the area. This is because station 1 is an upstream area that receives more fresh water so that the salinity is lower. Hutchings and Saenger (1987) stated that R. mucronata found in areas with low salinity.

Mangrove Density

The total density (stage of the tiller and tree of each species) can be seen in Figure 2.



A



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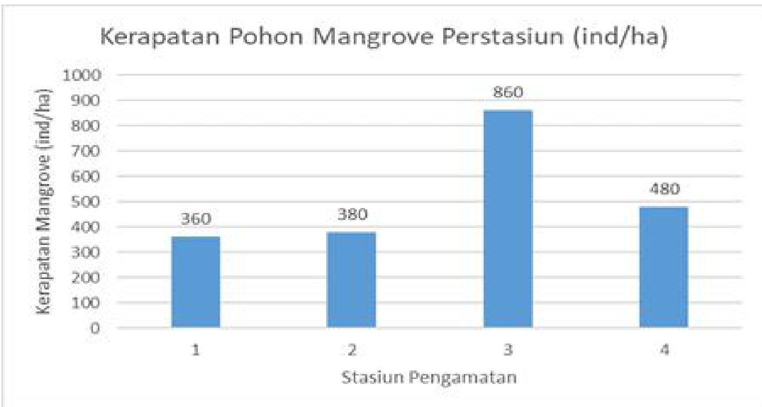

C

Figure 2. Graph of Mangrove Density

Description: a) seedlings, b) stake, and c) trees

Tree mangrove density ranges from 360-480 ind / ha (Figure 2). Station 1 found *Rhizopora mucronata* and *Avicenia marina* with a total tree of 360 ind / ha. This shows that the keratatan in this location is rare (broken). The mangrove damage at station 1 is due to the contamination of residual fuel from the ship because the station is located near the boat dock. While the number of stake on this station reached 1300 ind / ha and seedlings 20 ind / ha. The high number of stakes is the result of the rehabilitation process of karangsong mangrove forest. Station 2 has a density of 380 ind / ha and is classified as rare mangrove (damaged). The location of the station 2 is characteristic and its density value is not much different from station 1 because of its adjacent location. This station also suffered damage due to pollution of ship's fuel. The density at this station is 1040 ind / ha and the seedlings are 60 ind / ha. The number of stakes caused by the reforestation process of karangsong mangrove forest. While seedlings are natural seeds of mangrove reproduction that has been there before. The value of mangrove station 3 density is 860 trees / ha. This station is only found mangrove type *Avicennia marina*. Sandy substrate is a substrate that is very suitable for the growth of *Avicennia marina*. The sandy substrate is less suitable for *Rizophora* sp growth because this type of sediment has a solid and hard surface. According to Noor (1999) *Rizhophora* sp. because this species is not able to grow in areas with hard substrate. Mangrove on the location is rare (broken). Station 3 has the highest density value compared to other stations due to its location adjacent to the coast but is not exposed to the tides so that this location is rarely accessed. The number of stake in station 3 is 1040 ind / ha which is rehabilitation and seeding vegetation as much as 40 ind / ha. The value of mangrove density at station 4 is 480 trees / ha, and found two types of mangroves namely *Rhizopora mucronata* and *Avicennia marina*. The mangrove density at this station is categorized as rare (broken). The number of stake on the station is 1200 ind / ha and seedlings 60 ind / ha. The large number of stake in this location is also caused by the rehabilitation of mangrove forest.

Type *A. marina* and *R. Mucronata* highest at station 3 that is equal to 860 ind / ha. The density of A. marina tree species in each station is greater than the density of *R. mucronata* trees. The highest density of *A. marina* and *R. mucronata* tillers was at station 2 and 4 with density of 60 ind / ha. At station 1 found A. Marina with a density of 20 ind / ha. Mangrove density of *A. marina* and *R. mucronata* highest stage at station 4 with density 1440 ind / ha.

Based on the result of research known that Karangsong mangrove forest damaged. This is caused by pollution and at this location had occurred the function of mangrove ecosystem into pond land.

Abundance of Mangrove Crabs

Each station has an abundance of varying mangrove crabs (Table 2).

Stasiun	Individu/ha
1	280
2	340
3	0
4	60

Station 1 has an abundance of 280 ind / ha while station 2 is 340 ind / ha. This location supports the life of mangrove crabs because it has a muddy sand substrate and is often inundated by water. The mangrove ecosystem provides a good habitat for mangrove crabs in the presence of a sheltered base substrate, a tree as a place to stick and an important abundance of organic detritus as a food source (Hamidy, 2010). Station 3 has an abundance of mangrove crabs of 0 ind / ha. This location is not found mangrove crab caused by the type of sandy substrates are quite hard because it is not inundated by water so that mangrove crab can not dig a hole to stay. Mud or muddy sludge substrate is a suitable substrate for the life of mangrove crabs and the presence of tides indicates that waterlogging in the ecosystem can directly affect the presence of mangrove crab (Gita 2016). Prianto (2007) said that the substrate around the mangrove forest strongly supports the life of mangrove crab, especially for marrying and doing a change of skin in the waters. Station 4 has *Scylla serrata* abundance of 60 ind / ha. This amount is much lower compared to stations 1 and 2 whereas the mangrove tree level at this location is higher. Taqwa (2010) which states that the highest abundance is in rare density, then decreases with increasing mangrove density. Increased mangrove density causes an increase in mangrove root cover to the bottom of the waters, resulting in abundance of mangrove crabs (Scylla sp.) Decreasing due to reduced area.

Mangrove Crab Connection With Mangrove Vegetation

Mangrove Crab With Mangrove Tree Level

The relationship between abundance of mangrove crabs and the density of trees in the relation y = 0,5837x + 473,55 The correlation coefficient value is -0.10529 (Figure 9). This correlation value is small to see the relationship between the two. This shows that the results obtained are not significantly different, meaning that between the density of mangrove trees with abundance of mangroves no relationship

Figure 9. Graph of Mangrove Crab Correlation (*Scylla serrata*) With Tree

From the graph above can be seen, when the density is low the abundance of mangrove crab is high (station 1 and 2), whereas when the kerapatanya high abundance of mangrove crab is very low even none (station 3 and 4).

Mangrove crab with mangrove piling level

For the relation of density of pile level with abundance of mangrove crab obtained relation y = -0,5006x + 793,23. The correlation coefficient value of -0.50996 is a small value. this means that the results obtained are not significant, meaning that there is no relationship between mangrove crabs and mangrove vegetation density (Figure 10).

Figure 10. Graph of Mangrove Crab Correlation (*Scylla serrata*) With Pancang

Mangrove crab with mangrove seedling level

Mangrove crabs with mangrove seedlings As Figure 13 illustrates the relationship between seedling vegetation density and abundance of mangrove crabs obtained by the relation y = -0,9091x + 210,91. Correlation coefficient value obtained -0.10529 (Figure 11). This means that the results obtained are not significant, which means there is no relationship between mangrove crabs with the density of mangrove vegetation level of stake.

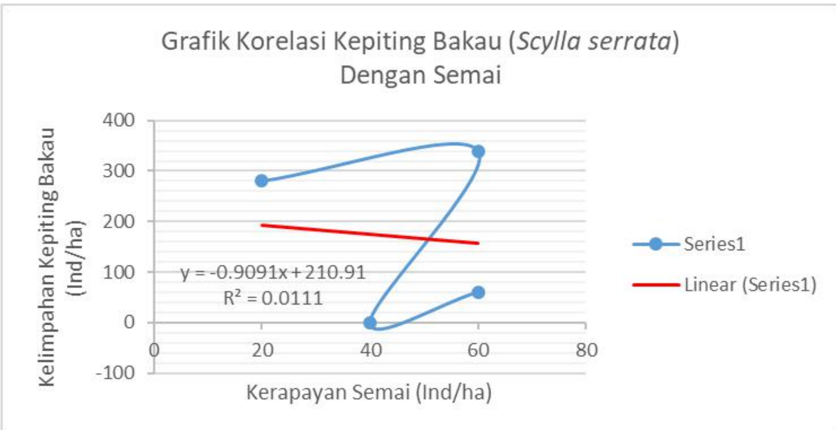

Figure 11. Graph of Mangrove Crab Correlation (*Scylla serrata*) With Seed

The three relationships obtained can be said that the relationship of mangrove density to the level of trees and tillers with abundance of mangrove crabs is not real or tend to be unrelated, while for the mangrove density relationship of seedling level with abundance of true mangrove crab. The mangrove density especially for tree level is closely related to the abundance of mangrove crabs when compared to mangrove seedling density, but seen from the graph the existing relationship becomes inconsistent. At the time of high tree density is actually relatively fewer abundance and vice versa when tree density is relatively low, the abundance of mangrove crab is high. This indicates that mangrove crab has adaptability to high environmental pressures so that the biota can survive in changing circumstances. The high density of seedlings is not an indicator of the abundance of mangrove crabs, because the more affecting the biota of the mangrove forest is the suitability of mangrove forest habitat and the supply of natural foods. Polynomial regression analysis gives different results, which affect the abundance of mangrove crabs in the vegetation level of seedling. This is probably caused by the growth of the seedling level not far from the tree or under the shade of the tree so that the leaves around the seedlings growing into many. The existence of human activities such as logging can also reduce the abundance of mangrove crabs because the environment will experience pressure and physical changes. Changes to the substrate occurs only the components and the content in the substrate does not change drastically. The research conducted by Nadia (2002) in Mangrove Habitat Karangsong Indramayu, West Java shows the same condition, when high mangrove biota density is small due to logging activity at the location causing biota that live in substrate disturbed.

Conclusion

Based on the result of the research, it can be concluded that the highest abundance is in the second station with the number 340 ind / ha, then the station one 280 ind / ha and station four 60 ind / ha while the station three abundance 0 ind / ha. Mangrove conditions at all stations in karangsong are rare / damaged. The relationship of mangrove density to tree level and tillers with abundance of mangrove crabs was not real or likely to be unrelated, while for mangrove density relationship of seedling level with abundance of true mangrove crab.

Suggestion

Based on the research result, it is suggested that the number of observation stations need to be added to increase the data representation level. Further research on Scylla serrata in karangsong mangrove forest area on distribution, distribution pattern, diversity and uniformity is needed to improve data accuracy.

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