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Study Population Of Freshwater Shellfish *CorbiculaSumatrana* In Singkarak Lake West Sumatra Indonesia.

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ABSTRACT

In Indonesian waters diverse types of Pelecypoda life. Shellfish always live in fresh water and sea with wide deployment and abundant. Generally hide in the ground which is sandy and muddy. There are live in fresh water such as rivers and lakes. The use of animal protein sources have begun to be demand by some communities in Indonesia, especially the types of Pelecypoda that have economic value. Around the Singkarak Lake a lot of activities which are done such as agriculture activity, fish farming, bathing and washing activities and tourism activities. As a result of these activities is feared that would disrupt the presence of aquatic biota, one of which is *Corbiculasumatrana.* The purpose of this study to analyze the density of population and environmental factors related to the population density of *Corbicula sumatrana.* This research was conducted using the descriptive survey method and the sampling technique is purposive sampling in September 2012 to December 2013 in Singkarak Lake West Sumatra. Data analysis was performed to calculate the density of population and environmental factors relations with the population density with multiple regression analysis. The results are obtained in this study is the average of density of shellfish populations *C.sumatrana*, the highest found in stasiun1 in the amount of 44.63 ind / m ^{2}, followed by 26.19 ind./m^{2}in stations 4, stations 3 amounted to 17.75 ind./m ^{2} and the lowest at station 2 is 7.81 ind./m^2. Organic compound of substrate and pH levels affect the population density *C.sumatrana* while calcium levels and temperature do not affect it.
Keywords:*Corbicula sumatrana*, population density

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INTRODUCTION

Molluscs as one of the Indonesian biota, which until now its use has not received the attention it deserves. Pelecypoda utilization is still limited in certain areas which is done by locals traditionally. Mollusca that many people are captured and used as a food ingredient. Groups of molluscs, among other types of shellfish and belongs to Lamellibranchiata class (Pelecypoda).

Pelecypoda is the second largest class of the Mollusca Phylum which is widely used by the community as a source of animal protein or as industrial raw materials [8,12]. In the waters of Indonesia live diverse types of Pelecypoda. There are live in fresh water such as rivers and lakes. Usually known as mussels, scallops seashell and 'pensi' as well as those who live in the ocean. The use of animal protein sources have begun to be demand by some communities in Indonesia, especially the types of Pelecypoda that have economic value.

Shell of *Corbicula* in general was very small, almost symmetrical, from rounded triangle to irregular oval form. It was in general hard, little or not transparent, andumboisconvectin several species. The outer part was hard, little fibrous, concentric side, and outer ligament was hard [7]. Shell of shellfish consists of three layers: periostracum, prismatic and nakreus. Outer surface of shell is usually smooth but some show growth and radial lines or combination of both [4].

Shellfish always live in fresh water and sea with wide deployment and abundant. Generally hide in the sandy and muddy ground. In some freshwater habitats, the species of mussels can be found in large quantities [11]. Types of *C.sumatrana* is one of the benthic animals that inhabit the bottom waters which are muddy and sandy. The mussels are harvested by people in large numbers, because it is one of the types of foods that taste good. In West Sumatra, there are two types of *Corbicula* namely *C.moltkiana* which are found in Maninjau Lake and *C.sumatrana* which are contained in Singkarak Lake, 'Diatas' Lake and several rivers around the lake. *C.moltkiana* initially is very famous and has economic potential to support communities around the Maninjau Lake, but recent field observations, the community is no longer willing to take these shells because not much else that is found. Community get initiative to provide these shells as souvenirs of the Maninjau lake by seeking and getting out of Singkarak Lake.

Around the Singkarak Lake a lot of activities which are done such as farming activities, aquaculture, bathing and washing activities and tourism activities. As a result of these activities is feared that would disrupt the presence of aquatic biota, one of which is *Corbiculasumatrana.* Moreover, the nature of life at the base of suspected shellfish waters will be impaired population. Based on these descriptions, do a research with the aim to analyze the density of population, and environmental factors that affect population density *C.sumatrana.*

MATERIALS AND METHODS

This research was conducted in September 2012 until December 2013 which is held at Singkarak Lake district. X Koto Singkarak and Junjung Sirieh Solok district. Sampling was carried out in the field and analyzed at the Basic Laboratory, Laboratory of Zoology and Botany Laboratoarium Biology Education Studies Program STKIP PGRI West Sumatra and the Laboratory of Animal Ecology Biological Department of the University of Andalas Padang.

Description Location Research

Singkarak Lake is located at the geographic location coordinates 0 ^{0} 36 'south latitude and 100 ^{0} 3' east longitude with a height of 363.5 meters above sea level (masl). Singkarak Lake water surface area reaches 11,200 hectares with a maximum length of 20 kilometers and a width of 6.5 kilometers and a depth of 268 meters. Singkarak Lake has watersheds along 1,076 kilometers with rainfall 82 to 252 millimeters per month.

Singkarak Lake is a lake with a water catchment area covering an area of 76 586 hectares (ha), which consists of six sub-watersheds that Sumani an area of 24 041 ha, Paninggahan covering an area of 11 279 ha, Kuok covering an area of 6269 ha, Imang Tower is an area of 5,397 ha, Lembang area of 15 672 ha and Aripan area is 11 613 ha.

Around the lake there are many residential, tourism and hydroelectric power in the Sumpur area. Singkarak Lake are used by people in everyday life, from the source of drinking water, fishing or floating nets, irrigation for agriculture, hydropower and tourism.

Sampling sites was set at four places, namely two villages in the X Koto Singkarak district. The selected region in the X Koto Singkarak District are Tikalak, and Nagari Singkarak while it was also selected two villages in JunjungSirieh District namely Nagari Saning Bakar, and Nagari Paninggahan.

Research methods

This research was conducted using the descriptive survey method and the sampling technique is *purposive sampling.* Samples are taken once a month for 16 months of observation at four locations set at two different depths. Each location is taken by using *eckmandrage* for measuring the density of the population by setting three replications.

Sampling *C.sumatrana* Shellfishes based on objective observation. Samples were taken at four stations, namely station I in the area Tikalak, station II in the area Singkarak , stations III in the area Saningbakar III and stasion IV in area Paninggahan. Observations for population density use eckmandrage. Each sampling sites get 3 replication. Ekcmandrage decision which to do on the boat samples were taken with ekcmandrage filtered through a sieve storied and *C.sumatrana* shellfish samples obtained which were collected and put in a plastic samples that have been labeled. Measurements were made every sampling shellfish. Factors measured water chemistry physics are as follows:

- The water temperature is measured using a thermometer Hg
- pH water using a pH meter
- Brightness using secchidisk
- The composition of the particle size of the substrate using a mechanical separation method by means of testsieve shaker.The substrate water at each location are taken and put into in bags samples. The execution is then performed in the laboratory
- Dissolved oxygen levels using titration methods. This work is conducted directly in the field as much as three replications each location
- Calcium compound measurements using titation methods. Water samples were taken as much as 2 liters each location and workmanship performed in the laboratory.
- Levels of organic substrates by gravimetric method [10].

Data analyzes were performed to calculate the density of population and population density relationships with environmental factors using multiple regression analysis.

RESULTS AND DISCUSSION

Ecological aspects which are obtained in this study include population density, distribution patterns and environmental factors. The population density can be seen in Figure 1 which describes a population density of four observation stations during the 16 months from September 2012 to December 2013. The obtained data are presented in Table 1. Factors scalable environment can be seen in Figure 2. Environmental measured factors were also observed during the study (16 months).

Population density

Total obtained population are vary each station. The Lowest density which were obtained at Singkarak area, they are 125 individual, followed bySaning Bakararea are 284, Paninggahanarea are 419 and the highest was found in Tikalak area, they are 714 individual. The population density is analyzed, it can be seen in Figure 1.

In Figure 1 we can see that the average population density of mussels were discovered during observations which are not the same between the first station and other stations. Tikalakarea which is found shellfish average number of population of 44.63 ind./m ^{2} (n = 714 ind., Sd ± 6.08), Singkarakarea at 7.81 ind./m

^{2} (n = 125 ind., sd ± 2.86), Saning Bakar area at 17.75 ind./m ^{2} (n = 284 ind., sd ± 3.75) and Paninggahanarea at 26.19 ind./m ^{2} (n = 419 ind., sd ± 6.72). The existence of a population of organism in nature is strongly influenced by environmental factors. For that during the observation of shellfish populations, also performed measurements of environmental factors, namely physical and chemical environmental factors. The results of measurements of environmental factors can be seen in Figure 2. According to Abbott (1979)[1] depth factors is influencing the population density of *C.fluminea* because it is related to the temperature factor.

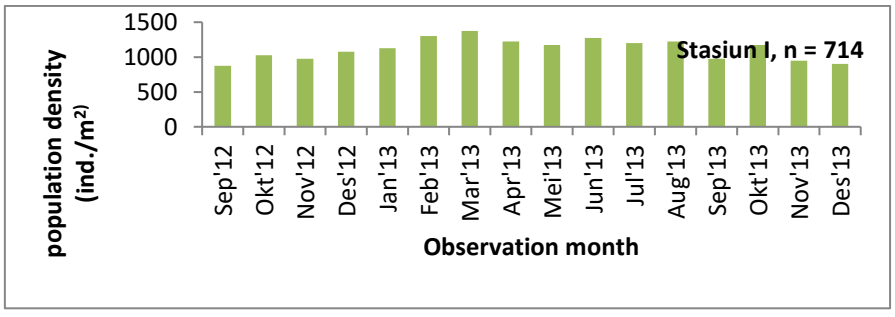
In Figure 1 above can also be seen that the density of the population of freshwater mussels *C.sumatrana* in Singkarak Lake during the 16 months of observation tend to be the same from month to month on Tikalak area. However at other stations in certain months decreased and in the months that others were likely to increase. At Saning Bakar area which was seen in January 2013 the population density was lower than in other months. It could be connected to the content of dissolved oxygen (DO) in January 2013. In the DO measured was very low compared with the DO measured in other months. In accordance opinions Belanger (1991) [2] found that low DO content will affect the growth of *C.fluminea* in Mexico. While on station 2 scallops the highest population density which was found in July 2013, the population density which was the highest at station 3 was found in November 2012 and the fourth highest station was found in September 2013 [2].

In Figure 2 shows the results of measurements of chemical physics environmental factors. Of all the measurable factors, factors of different levels of organic substrates every four observation stations. At Singkarak area and Saning Bakar area's organic content measured lower than the two other stations (Tikalak aera and Paninggahan area). This is in accordance opinions of McCabe *et.al.*(1997) which states that the density of *C.fluminea* is greatly influenced by the characteristics of the sediment. Meanwhile, according to Belanger *et.al.* (1986) that *C.fluminea* will appear in sediments which is rich in organic materials. Sediments which is rich in organic matter will provide a source eat that much anyway for *C.fluminea.* Mc Cabe *et. al*.(1997) stated that the substrate with a fine particle size organic matter is higher than the substrate with a coarse particle size [9].

Environmental factors

The results of measurements of environmental factors value during the study at four sampling locations are obtained as shown in Figure 2 below. The obtained measurement results are relatively the same except at Singkarak area and Saning Bakar area where the organic content of the substrate at the two stations is different from the Tikalak area and Paninggahan area The relationship between population density with some environmental factors are listed in Table 1 below.

Based on regression analysis which is showed that factors of Organic substrate and pH levels provide a positive value, which means that both of these factors are affecting the availability of shellfish in the habitat. According Dermott, (1985) that the molluscs would be sensitive to a pH of less than 5. While the temperature factor and calcium did not affect the existence of a population of *C.sumatrana.* It is characterized by a negative sign[5]. In contrast to studies of Abbott (1979) reported that the population density and the size of *C.fluminea* is greatly influenced by the temperature gradient. In the area of long-shell epilimnion are more than 3.3 mm of shell length *C.fluminea* the hypolimnion region[1].



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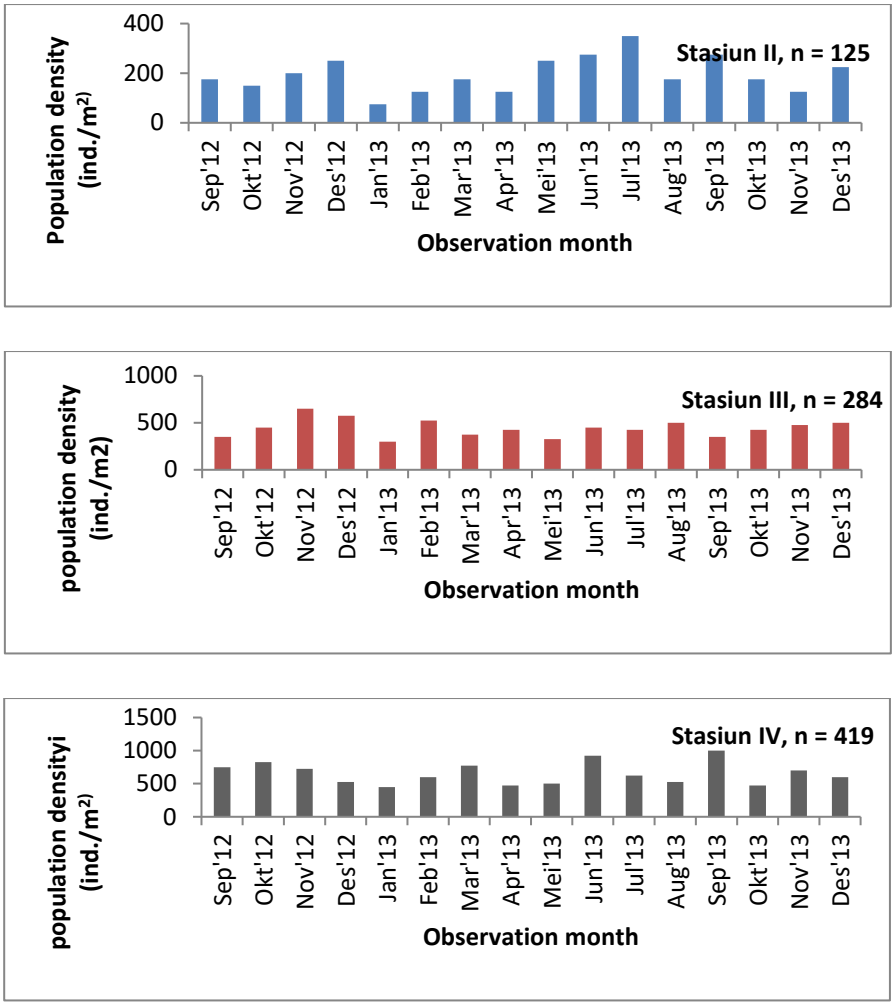
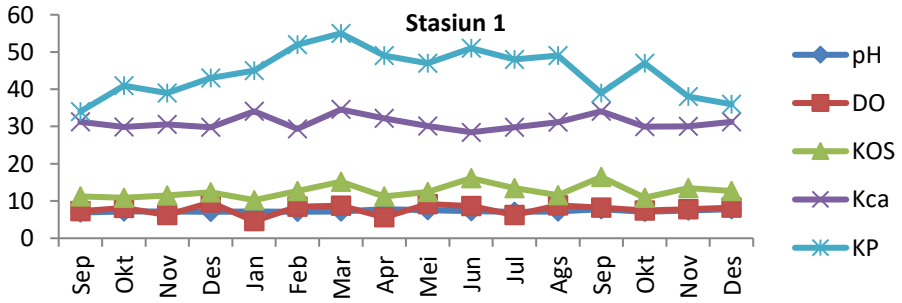


Figure 1: Population density of *C.sumatrana* at each respective station in Singkarak Lake.

Based on Table 1 it can be seen that the temperature factor (x_1) when rising 1^0 C at Tikalak area will be lower the population density in amount of 1,03 ind./m^2. Singkarak area fell by 0.58 ind./m^2. Saning Bakar area fell by 0.75 ind./m^2 ind./m^2 and Paninggahan area were down the population of 0.17 ind./m^2. As for KOS factors (x_2) it can be seen that if up 1% would cause a rise in the population density of 2,85 ind./m^2 (Tikalak area), 1.57 ind./m^2 (Singkarak area), 0.65 ind ./m^2 (Saning Bakar Area) and amounted to 1.30 ind./m^2 (Paninggahan area).



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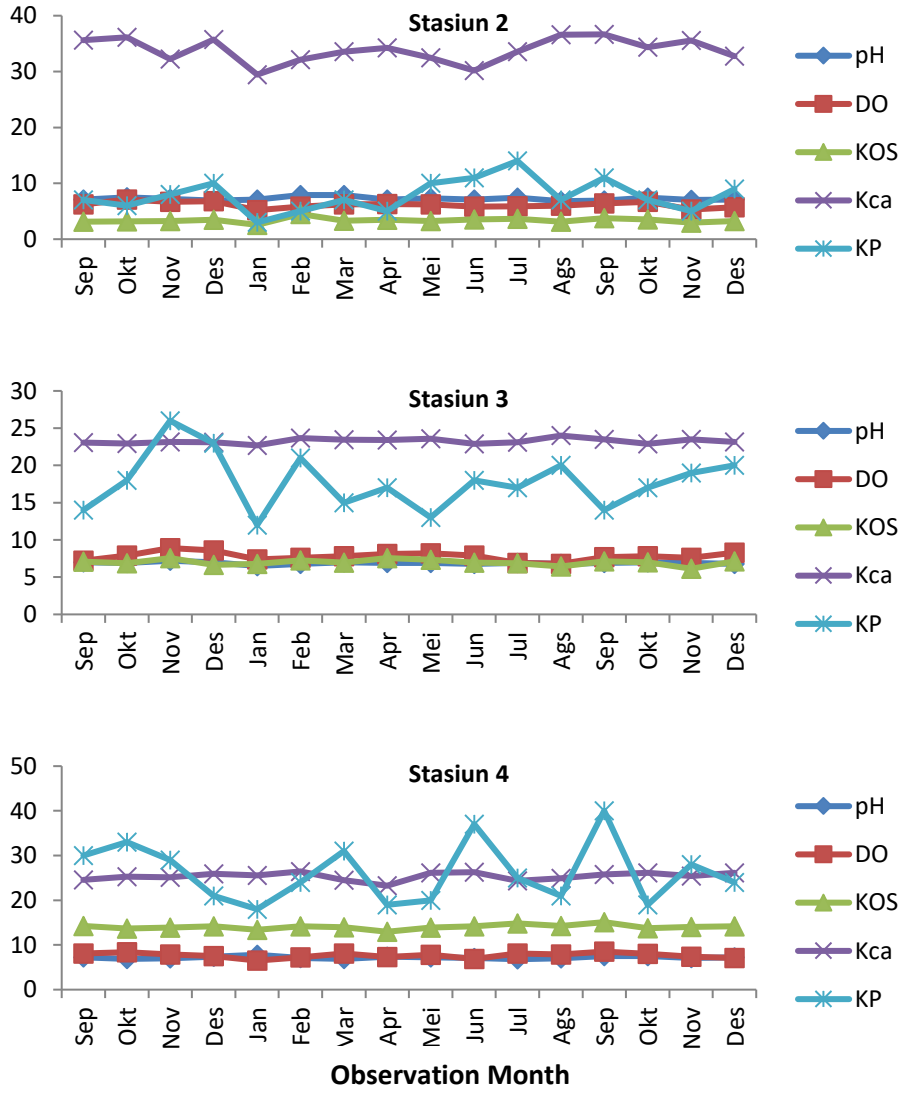

Figure2:Value of environmental parameters in Singkarak Lake

Table 1: Multiple regression equation and regression coefficient of each station observations

No	Locations	Multiple equations regresion	R
1.	Tikalak	$y = 3,24 – 1,03\ x_1 + 2,85\ x_2 - 2,52\ x_3 + 0,78\ x_4$	0,71
2.	Singkarak	$y = 1,03 – 0,58\ x_1 + 1,57\ x_2 - 1,38\ x_3 + 0,78\ x_4$	0,50
3.	Saning Bakar	$y = 1,42 - 0,75\ x_1 + 0,65\ x_2 - 0,89\ x_3 + 1,23\ x_4$	0,59
4.	Paninggahan	$y = 0,50 - 0,14\ x_1 + 1.30\ x_2 - 0,57\ x_3 + 0,56\ x_4$	0,58

Description: r = regression coefficient, x1 = the temperature factor, x2 = KOS factor, x3 = content of DO factor x4 = and waters pH factors

Dissolved Oxygen (DO) Factor (x_3) gave a negative correlation: whenever there is an increase of 1 ppm will cause a decrease in the population density of 2.52 ind./m^2 (Tikalak area), 1.38 ind./m^2 (Singkarak area), 0.89 ind./m^2 (Saning Bakar area) and 0.57 ind./m^2 (Paninggahan area). As for the degree of acidity (pH) factor (x_4) gave a positive correlation value is if there is an increase of 1 ppm calcium levels will cause an increase in population density was 0.78 ind./m^2 (Tikalak and Singkarak area), 1.23 ind. / m^2 (Saning Bakar), and 0.56 ind./m^2 (Paninggahan area).

The results of measurements of physical factors of the environment can be seen that for 16 months of virtually all environmental factors which are measured relatively the same except in certain months. Dissolved

oxygen in certain months was decreased and certain months had been increased. In January 2012 dissolved oxygen content was decreased and this causes the clam's population density was also lower for the month. Especially at stations Singkarak area, Saning Bakar area and Paninggahan area. Relationships are several factors that influence the shellfish population density can be seen in Table 1 above. Based on the equation that had been obtained at Tikalak area factor of dissolved oxygen and organic content of the substrate affects the density of shellfish populations while pH factor and the content calsium were not affect population density. The same was found at Singkarak area. However, at Saning Bakar area and Paninggahan area all environmental factors contribute to the density of shellfish populations. In accordance with the opinion of Belanger (1991) found that low DO content will affect the growth of mussels and opinions Belanger *et.al.* (1986) that will appear on the *Corbicula* rich sedimentary organic ingredients [2,3].

CONCLUSION

Based on the results and discussion of the ecology and biology of freshwater*Corbicula sumatrana* at Singkarak Lake, it was concluded as follows: The average population density of scallops *C.sumatrana* the highest found in Tikalak area in the amount of 44.63 ind./$m^{2,}$ followed by 26.19 ind./m^2at Paninggahan area area. Saning Bakar area was amounted to 17.75 ind./m^2 and the lowest at Singkarak area was 7.81 ind./m^2.

Organic compound of substrate and pH levels affect the population density of*C.sumatrana* while calcium levels and temperatures are not mepengaruhinya.

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