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Biodiversity of Shrimps on Barumun River, Labuhanbatu Selatan Regency, Indonesia

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Abstract

The purpose of this study is to find out the ecological index of shrimp (Crustaceans) and the correlation of aquatic parameters as support for their life. This study was conducted in March-May 2020. The method used by Purposive sampling at 5 points of observation stations is based on information on the presence of shrimp obtained from people living around the waters of the Barumun River. Shrimp samples are captured using gill nets, chasting nets, and fishing rods. Analysis of calculated data includes diversity index, dominance index, and correlation test using SPSS version 22. The results found 4 species of freshwater shrimp in Barumun river, and showed that the most caught shrimp species were Palaemonectes sp. (224) and the lowest species Macrobrachium sp. (100), the highest diversity index at station 1 (1,342) with a low category, the correlation results of physic-chemical factors of aquatic showed the highest value indicate positive correlation (+) for water brightness (0.948), and current velocity (0.314). In conclusion, the physical chemical factors of the waters give affect to the diversity of shrimp in Barumun river

Keywords: Barumun river, Biodiversity, Freshwater shrimp, Penaeid

INTRODUCTION

One of the major rivers in South Labuhanbatu Regency is the Barumun river. Barumun River has a range width from 750 – 1,050 m. The estuary ends in the Strait of Malacca located in Panai Hulu District, Labuhanbatu Regency (Siagian, 2017). The Barumun River is widely known as a fishing area for fishermen, both fish and shrimp (Siregar, 2019). According to Mashari et al., (2019) shrimp is one of the leading export commodities of the Indonesian fisheries sector and has a fairly high demand in the world. Indonesia's shrimp export volume was recorded at 14.13%.

Rahmi, et al., (2016) added the diversity of shrimp in a body of water is very dependent on environmental conditions, this will affect the survival of a shrimp population. The distinctive physical and chemical properties of waters show varying environmental conditions that cause organisms that live in these waters to have peculiarities as well. Tchakonté et al., (2014) these freshwater shrimps are sensitive to anthropogenic disturbance. The pollution produced by the urban, industrial and agricultural activities exerts considerable pressures on aquatic ecosystems, which result in a deterioration of the water and habitats quality on which the aquatic organisms depend (Wang *et al.,* 2012; Morrissey *et al.,* 2013). Aquatic organisms integrate various types and degrees of environmental impacts which occur on a variety of spatial and temporal scales (Colas *et al.*, 2014).

In addition Daryanto, et al., (2015) inform that freshwater shrimp have an important role in maintaining ecosystem balance. One of them is as a component of the food chain. Shrimp acts as feed for larger aquatic animals such as fish. In addition, it also acts as a scavanger and detritus in the waters. The food chain will be disrupted if it loses one of its components. Preservation of freshwater shrimp is important so that the balance of the ecosystem can be maintained. The presence of various types of freshwater shrimp in public waters can improve the quality of the environmental conditions of these waters.

The study of shrimp diversity in the Barumun River is quite interesting to conduct research, considering that shrimp has an important ecological and economic role for humans. So far, data and information related to shrimp diversity in the Barumun River have not been published.

METHOD

Sampling was carried out for 3 months from April to June 2020 around the waters of the Barumun River. Sampling location was set by Purposive method with five observation stations (Figure 1). The description of the sampling point is as follows:

a. Site 1 (1°53'33.38"N 100°6'9.00"E) around Barumun river bridge, Kota Pinang.
b. Site 2 (1°53'11.29"N 100°6'3.59"E) around palm plantation.
c. Site 3 (1°54'3.18"N 100°5'38.85"E) around palm oil mill of PT. Asam Jawa
d. Site 4 (1°52'45.15"N 100°6'5.74"E) around dense settlement
e. Site 5 (1°52'23.21"N 100° 5'36.35"E) around deserted settlement

Shrimp sampling is carried out using tools in the form of gill nets, nets, and fishing rods that are spread at predetermined station points. The shrimp samples caught were then observed and described based on the Lovett, Dore & Frimodt, and Chaitiamvong & Supongpan Identification Books.

Data Collection

The technique in data collection in this study is Explore research. The data taken include such as coordinate points, temperature, water, water brightness, current speed, water pH performed insitu (on the research site) and tools used in this study include: GPS (Global Postioning System), Thermometer, pH meter, sechi disk, pimpong ball, Fishing line, stopwatch, and fishing rod (length 2 m). But it can be adjusted to the state of the station, Kottelat (1993) as fish identification book, camera.

Figure 1. Map of Sampling Location

Data Analysis

Shannon –Winner Diversity Index (H')

Diversity index (H') calculated as follows (Krebs 1978)

$$H' = \sum_{i=1}^{S} (pi \ ln \ pi)$$

Description :
H' = Diversity Index Shannon –Winner
S = Total of Species
Ln = Nature logaritm
pi = total individu of each species (i = 1,2,3....etc)

The criteria for the diversity index are divided into 3 categories according Rappe (2010), namely:
H` < 1 = Low Biodiversity
1 < H` < 3 = Middle Biodiversity
H` > 3 = Hight Biodiversity

The results of the correlation test are presented in tabular form using the application analysis of the SPSS program version 22.

RESULT AND DISCUSSION

Biodiversity of Shrimp on Sampling Location

Based on sampling result at 5 observation stations in the Barumun river, South Labuhanbatu Regency, 4 types of shrimp were obtained, namely: Giant shrimp (*Macrobrachium* sp) with a total of 100 individu, Monkey river prawn (*Macrobrachium lar*) with a total of 129 individu, Indian Prawn (*Penaeus indicus*) with a total of 179 individu, Freshwater glass shrimp (*Palaemonectes sp*) with a total of 224 individu.

Base on figure 2, the most widely obtained is *Palaemonectes sp*. This is thought to be because the adaptability of this type to the habitat environment is much better than other species. According to Wiyanto et al. (2018) *palaemonectes sp* It has a rostrum shape that can adjust to aquatic conditions so that its population in nature is quite abundant. The lowest type of shrimp is (*Machrobranchium* sp), this is because *Machrobrancium* sp shrimp is the most common group of freshwater shrimp caught by local fishermen. These shrimp generally live adult in fresh water, but in the larval and juvenile phases many are found living in estuary (Puspita & Angella, 2014).

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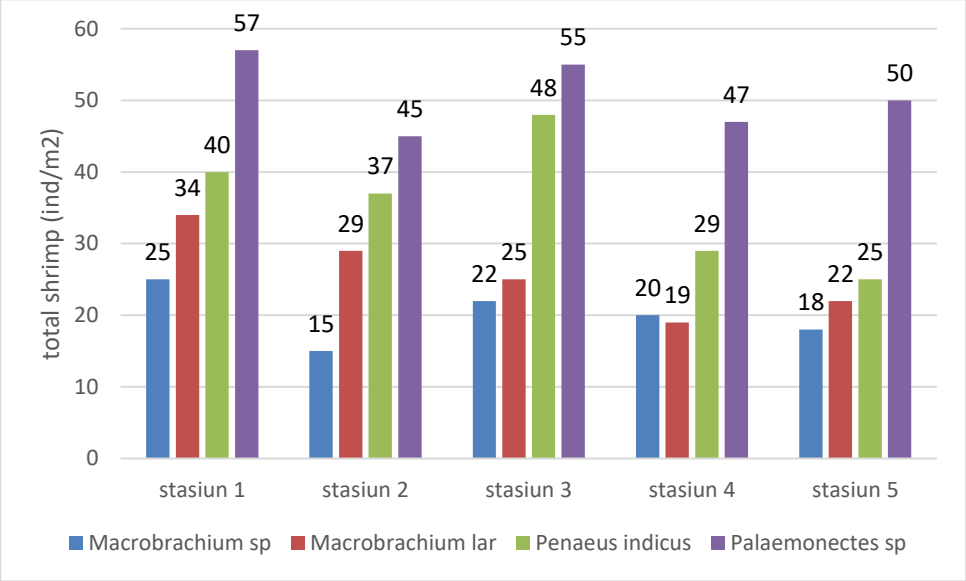

Figure 2. Shrimp Composition on Research Location

Diversity Index (H')

Based on research sampling in March, April, and May 2020 in the Barumun River, different diversity index values were obtained, but for all observation locations were categorized as moderate. The complete shrimp diversity index can be seen in table 1:

Table 1. Shrimp diversity index on Barumun river

Sampling site	Diversity Index (H')	Category
Site 1	1.342	Middle
Site 2	1.319	Middle
Site 3	1.312	Middle
Site 4	1.314	Middle
Site 5	1.300	Middle

The highest value of shrimp diversity (H') in the waters of the Barumun River was found at station 1 of 1,342 where this location is a natural area with minimal human and industrial activities, and is a tidal area in the estuary area of the Barumun River. At station 5 is the location with the lowest shrimp diversity value (H') of 1,300 where the location of these waters is located farthest from the river making this location the slowest to experience tidal changes that help the movement of shrimp towards the area. The results of this study are different from those obtained

by (Purnamasari, 2013) where the value of the diversity index (H') of shrimp found in Batanghari and Sarolangun districts (H'<3.32), this is influenced by the conditions of environmental factors that are in accordance with shrimp habitat. According Wiyanto et al., (2018) The diversity of shrimp in a body of water is influenced by its life cycle. Tchakonté et al., (2014) these freshwater shrimps are sensitive to anthropogenic disturbance.

Pearson Correlation Between Water Quality Parameters and Shrimp Diversity Index

The results of the correlation analysis of the physical chemistry parameters of aquatic and shrimp diversity can be seen in the table 2. Based on the results of the analysis of the correlation of physical chemical parameters of waters to the number of shrimp catches showed a very strong positive / unidirectional correlation with values of 0.91 and 0.94 respectively. According to Sarwono & Budiono (2012), that if the correlation value ranges from 0.80 - 1.00 then the correlation level is categorized as very strong. These results illustrate a unidirectional relationship with the intent, if the higher the shrimp caught, the number of shrimp catches is also predicted to increase, and vice versa.

Table 2. Coeficient Correlation Between Water Quality Parameters and Shrimp Diversity Index on Barumun River.

Species	Current Velocity	Light penetration	Temperature	pH	Cu	Pb	Cd	Zn	Oil	COD	BOD
Macrobrachium sp	-.166	.491	.03	-.49	.65	-.20	.08	.12	.18	.61	.49
Macrobrachium lar	-.473	.200	.78	-.30	.39	-.21	.72	.67	.85	.03	.38
P. indicus	.466	.734	.84	-.79	.62	-.34	.85	.89*	.55	.71	.63
Palaemonectes sp	.679	.286	.09	-.20	-.14	.27	-.11	.26	-.31	.16	-.17

Note : * = Significant correlation to confidence levels 0.05 (95%)

CONCLUSION

From this research found 4 species in Barumun river, Giant shrimp (*Macrobrachium* sp, Hanging shrimp (*Macrobrachium lar*), Kelong shrimp (*Penaeus indicus*), Rice shrimp (*Palaemonectes sp*). The Diversity index of Shanon-Wiener (H') analysis shows the medium category in the Barumun river. The Pearson correlation show the current brightness, temperature, copper, cadmium, zinc, oil and fat, COD, BOD has positively correlate to shrimp diversity, it means that this environment parameter has effect to development and growth of species shrimp found in Barumun river.

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