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# Structure of the Macrozoobenthos Community in Estuaria of Padang Pariaman Regency

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## ABSTRACT

This research was carried out in rivers and estuaries in the Batang Naras River, Padang Pariaman Regency, West Sumatra. The river is often used by residents for pond irrigation and ice factory cooling machines. This activity will indirectly affect the biota in rivers and estuaries. Macrozoobenthos is one of the biological aspects that play an important role in assessing the quality of water. The purpose of this study was to determine the community structure of macrozoobenthos in the estuary of Batang Naras. The method used is a descriptive survey. Sampling was done by purposive sampling by setting up 3 research stations. Based on the research results found 2 *phyla*, namely *Arthropoda* and *Mollusca*, 3 classes namely *Crustacea*, Insects, and *Gastropod*s, 6 orders, 11 families, and 12 genera. The highest benthic diversity index (H') was found at station I at 1.803 and the lowest was found at station III at 1.222. This zone belongs to lightly to moderately polluted waters and the dominance value is 0.5. Diversity and dominance show moderate values. The influence of industrial activities and aquaculture disturb the amount of benthos in the estuary.

*Keywords: Macrozoobenthos, Diversity Index, Estuaria, Padang Pariaman.*



## INTRODUCTION

The Batang Naras River is one of the rivers that cross several villages in Padang Pariaman Regency. This river has a length of 20 km with an area that is crossed by the V Koto Timur to the Limau River which is the foundation of farmers, and traditional farmers used to irrigate the surrounding ponds. This river will empty into an estuary which is located in Pasir Naras.

These rivers and estuaries are often used by residents. Generally, residents use the river to irrigate rice fields and ponds along the river. The river estuary is most often used for irrigating SUPM Pariaman ponds. This activity indirectly affects the estuary and river biota. The impact of pond activities is quite significant on the estuary ecosystem. The waste of feeding that is not spread by fish/shrimp, manure from cultivation, dead probiotics, and plankton as well as organic material in the form of suspended and dissolved solids transported through drains/outlets of pond land (Febrina et al., 2019) have an impact on water pollution in estuaries. The rest of the feed will then become the main waste source of organic matter and nutrients to the aquatic environment. (Harianja et al., 2018) stated that pond waste causes hyper-nitrification followed by changes in phytoplankton ecology, increased sedimentation, siltation, hypoxia, and changes in productivity. If this activity is carried out without control, the estuary ecosystem will be damaged. Damage to the estuary ecosystem has an impact on aquatic biota such as benthos that live on the bottom of the waters. The decrease in the abundance and composition of these organisms is an indicator of the occurrence of ecological disturbances in river waters (Yuliana & Ahmad, 2017).

Water quality can be assessed in various ways, such as by chemical and physical analysis of water as well as by biological analysis. This analysis gives an unfavorable picture of dynamic waters which are influenced by temporary water conditions. (Ridwan et al., 2016) states that in a dynamic environment, biological analysis, especially the analysis of the community structure of benthic animals, can provide a clear picture of water quality. One of the most frequently studied biological aspects in water quality assessment is macrozoobenthos. According to (Sidik et al., 2016), benthos macrozoom is an organism that lives sedentary (*sessile*) and has varying adaptability to environmental conditions. In addition, the level of diversity found in the aquatic environment can be used as an indicator of pollution. Macrozoobenthos is very well used as a bioindicator of the aquatic environment because of its sedentary life habit (Putra et al., 2020). Benthos macrozoom is also an animal that is very sensitive to environmental changes and is most widely used as an indicator of metal pollution because its habitat is sedentary (Nangin et al., 2015). Considering the important role of the benthic macrozoom in the estuary and the absence of information and data on macrozoobenthos in the naras trunk, it is necessary to research the structure of the macrozoobenthos community.

# METHODS

## 2.1 Research time and place

Research this research was conducted in July 2021 at the estuary of the Batang Naras River, Sungai Limau, Padang Pariaman Regency, West Sumatra Province and geographically it is located at 33°00' South Latitude, and 100°07' East Longitude. Identification of benthic samples was carried out at the Integrated Laboratory Center for the Faculty of Biology, Andalas University.


Figure 1. Research Location

### 2.2 Sampling and data analysis techniques

This research was conducted with a descriptive survey, sampling was carried out directly in the field by setting three research stations. The station was determined based on the water conditions of Batang Naras. At each station, 3 points were made, namely: 1) is a watershed area that has not been polluted by ponds and industrial waste; 2) is a watershed confluence area with ponds and industry; and 3) is the downstream river flow close to residential areas. The tools used in this research are a thermometer, Secchi disk, Eckman grabs measuring 25 cm x 25 cm, plastic bag, permanent marker, label, graded filter, tweezers, tray, film bottle, stereo microscope, DO meter and pH indicator, label paper, datasheet, identification book. The materials used are formal in 4%, and 70% alcohol. Sample collection using *Eckhman* grab has an opening size of 25 x 25 cm. The sample is then filtered from the base substrate or mud using a multilevel filter and accommodated in plastic with 4 ml/% formalin for preservation. Measurement of physics-chemistry of each water was carried out at each research station. Physical-chemicals of the waters were carried out during the day as well as at high and low tides.

### 2.3 Data analysis

Diversity index analysts refer to (Krebs, 1989) are as follows:

$$H' = -\sum Pi \ln Pi$$

Information:
$Pi$ = Number of individuals in each species ($ni$) Total number of individuals ($N$)
$Ni$ = Number of individuals of the $i$ - $th$ type
$N$ = Total number of individuals

Criteria:
$H < 1$ : Low diversity and productivity indications in the ecosystem.
$1 < H < 3$ : Moderate diversity, moderate ecological pressure, fairly balanced conditions.
$H' > 3$ : High diversity and stable ecosystem

Evenness index:

$$E = H'/(\log)s$$

Information:
$H'$ = Diversity value
$s$ = Number of types
$E$ = Evenness value

## RESULTS

### 3.1 Macrozoobenthos composition

From the research that has been carried out, it was found that the composition of benthos consists of 2 *phyla*, 3 classes, 6 orders, 11 families, and 12 genera spread over 3 (three) research stations with classification based on the hierarchical level as shown in Table 1 below.

Table 1. Classification of benthos found

| *phylum* | Class | Order | Family | Genus |
|---|---|---|---|---|
| *Arthropods* | *Crustaceans* | *Decapoda* | *Palaemonidae* | *Parathelphusidae* |
| | *Insecta* | *Diptera* | *Chironomidae* | *Chironomus* |
| | | *Trichoptera* | *Philopotamidae* | *Cimara* |
| | | *Placoptera* | *Dipseudopsidae* | *Dipseudopsis* |
| | | | *Taenopterydae* | *Hastaperla* |
| | | *Odonata* | *Lestidae* | *Lestes* |
| | | | *Macromiidae* | *Macromia* |
| | | | *Gamphidae* | *Progomphus* |
| *Mollusca* | *Gastropod* | *Heterodonts* | *Lymnaecidae* | *Indoplanorbis* |
| | | | *Bulimidae* | *Paludestrina* |
| | | | *Thiaridae* | *Thiara* |
| | | | | *Melanoides* |

Note: in the Batang Naras, V Koto, Kampung Dalam, Padang Pariaman.

From Table 1 above, it can be seen that the *phylum Anthropoda* is the *phylum* that has the most genera found in the Batang Naras, V Koto Kampung Dalam, Padang Pariaman, which consists of 2 classes, 5 orders, 8 families and 8 genera, then followed by *Mollusca phylum* which consists of 1 class, 1 order, 3 families and 4 genera. This situation indicates that the conditions of the aquatic environment, such as sandy and rocky bottom substrates, the DO content in the water is quite high (6.93-8.14 mg/l), water pH (5.4-5.9), and the temperature is still within the tolerance range between 29-31°C (Table 2) so that this area is suitable for life. According to Novianti et al (2016) *Anthropods* like rocky and sandy habitats, high DO content in water, and normal water pH. According to (Hynes, 1976), some mollusks can live and thrive well on various types of substrates that have abundant nutrient availability, high DO content in water, and normal water pH.

### 3.2 Types of macrozoobenthos

Table 2. Benthic composition obtained at each station

| | Genus | Station I | Station II | Station III | Amount |
|---|---|---|---|---|---|
| *Crustaceans* | *Parathelphusidae* | 5 | 2 | 0 | 7 |
| *Insects* | *Chironomus* | 4 | 4 | 3 | 11 |
| | *Chimara* | 5 | 5 | 5 | 15 |
| | *Dipseudopsis* | 4 | 4 | 1 | 9 |
| | *Hastaperla* | 3 | 3 | 1 | 7 |
| | *Lestes* | 1 | 0 | 0 | 1 |
| | *Macromia* | 2 | 0 | 0 | 2 |
| | *Progompus* | 8 | 10 | 6 | 24 |
| *Gastropod* | *Indoplanorbis* | 6 | 6 | 4 | 16 |
| | *Paludestrina* | 8 | 16 | 2 | 26 |
| | *Thiara* | 17 | 0 | 0 | 17 |
| | *Melanoides* | 9 | 7 | 0 | 16 |
| N | | 72 | 57 | 22 | |

The abundance of macrozoobenthos in the Batang Naras River in Table 2 was *Paludestrina*, which was 26 individuals. This species is found on the bottom substrate of the waters in the form of muddy sand, namely at station I, station II, and station III. The lowest abundance of macrozoobenthos species is *Lestes*, which is 1 individual, which is only found at station I. The highest abundance is at station I, which is 72 because station I has an area that has not been polluted by waste. The abundance at station II and station III is lower than at station I because station II is the confluence of river flows with pond and household waste and station III is the downstream part close to residential areas.

### 3.3 Density value

Based on the data on the number of benthic compositions obtained at each research station, as shown in Table 3, the values of population density, relative density, and frequency of attendance are shown in Table 3 below.

Table 3. Density of benthos

| No | Class and Genus | Density (Ind/m²) | | | Relative Density (%) | | | Relative Frequency (%) | | | Uniformity Index (H') | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | I | II | III | I | II | III | I | II | III |
| *Crustaceans* | | | | | | | | | | | | | |
| 1 | *parathelphu sidae* | 6.17 | 2.47 | | 6.94 | 3.61 | | 55.56 | 22.22 | | -0.162 | -0.103 | |
| 2 | *chronomus* | 4.94 | 2.94 | 3.70 | 5.56 | 4.30 | 13.63 | 44.44 | 44.44 | 33.33 | -0.140 | -0.166 | -0.243 |
| 3 | *chimara* | 6.17 | 6.17 | 6.17 | 6.94 | 9.02 | 22.73 | 55.56 | 55.55 | 55.56 | -0.162 | -0.191 | -0.312 |
| 4 | *Dipseudopsis* | 4.94 | 4.94 | 1.23 | 5.56 | 7.23 | 4.53 | 44.44 | 44.44 | 11.11 | -0.140 | -0.166 | -0.122 |
| 5 | *Hastaperla* | 3.70 | 3.70 | 1.23 | 4.16 | 5.41 | 4.53 | 33.33 | 33.33 | 11.11 | -0.114 | -0.137 | -0.122 |
| 6 | *Lestes* | 1.23 | | | 1.38 | | | 11.11 | | | -0.050 | | |
| 7 | *macromia* | 2.47 | | | 2.78 | | | 22.22 | | | -0.085 | | |
| 8 | *Progomphus* | 9.88 | 12.35 | 7.41 | 11.11 | 18.06 | 27.29 | 88.89 | 111.11 | 66.67 | -0.217 | -0.281 | -0.334 |
| *Gastropod* | | | | | | | | | | | | | |
| 9 | indoplanorbis | 7.41 | 7.41 | 4.94 | 8.34 | 10.84 | 18.20 | 66.67 | 66.67 | 44.44 | -0.182 | -0.214 | -0.282 |
| 10 | *Paludestrina* | 9.88 | 19.75 | 2.47 | 11.11 | 28.89 | 9.10 | 88.89 | 177.78 | 22.22 | -0.217 | -0.340 | -0.192 |
| 11 | *Thiara* | 20.99 | | | 23.61 | | | 188.89 | | | -0.316 | | |
| 12 | melanoides | 11.11 | 8.64 | | 12.50 | 12.64 | | 100.00 | 77.78 | | -0.232 | -0.233 | |
| | TOTAL | 88.89 | 68.37 | 27.15 | 100.00 | 100.00 | 100.00 | 800.00 | 633.32 | 244.44 | -2017 | -1,831 | -1,607 |
| Diversity Index | | | | | | | | | | | 2017 | 1,831 | 1,607 |

From Table 3 above it can be seen that the highest density obtained at station I is the genus *Thiara* of the *Gastropod* class of 20.99 ind/m² with a relative density of 23.61% with a frequency of presence of 188.89 %. At station I the genus that can live and reproduce is *Thiara*, this is because station I has the most suitable physical and chemical water conditions for their habitat, besides that it is accompanied by basic substrate conditions in the form of sandy soil which is very suitable for the life of this genus. This is supported by (Desmawati et al., 2020) which states that *Thiara* is an animal that likes a sandy mud bottom habitat.

The lowest density at the station I was the genus *Lestes* from the class *Insecta* at 1.23 ind/m² with a relative density of 1.38% and a frequency of presence of 11.11 %. The small number of the genus *Lestes* at station I is due to the condition of the substrate in the form of sandy soil which can inhibit the population growth of this species. According to (Gilbert, 1980), this genus likes places with a basic substrate of sand and rock.

The density of benthic composition at station II which has the highest density value is the genus *Paludestrina* with a population density value of 19.75 ind/m², a relative density value of 28.89%, and a frequency of attendance value of 177.78%. The high value of population density, relative density, and frequency of presence of the *Paludestrina* genus is due to the environmental conditions of the waters in their life, namely the basic water substrate in the form of muddy sand and the pH of the waters that are suitable for the life of the genus. (Hutchinson & Edmondson, 1993) stated that *Paludestrina* can survive in the pH range of 5.4-5.9. This is by the physical and chemical factors of the waters obtained where the substrate at this station is muddy sand. Furthermore (Aulia et al., 2020), stated that several benthic genera exist that can tolerate large and drastic changes in environmental factors or can tolerate very extreme environmental factors.

The lowest density value obtained at station II is from the genus *Parathelphusidae* with a population density value of 2.47 ind/m², a relative density value of 3.61%, and an attendance frequency value of 22.22%. The effect of DO and the condition of the base substrate in the form of slightly muddy sand can inhibit the population growth density of this species. According to Gilbert (1980), the genus *Parathelphusidae* can thrive in an environment with high DO content in water, normal pH, and high organic substrate content.

At station III, the genus with the highest density value was the genus *Proghompus* with a population density of 7.41 ind/m² with a relative density of 2.45%. Attendance Frequency is 66.67%. The high density of this genus at station three is due to the sandy and rocky water substrate, the high oxygen content in the water, and the water currents that are suitable for the life of this genus. According to McCafferty (1983), *Progomphus* likes sandy, muddy, rocky substrates, high substrate organic content, and slow currents ranging from 0.11m/s.

The lowest density value obtained at station III is from the genus *Dipseudopsis* and *Hastaperla*, each of which has a population density value of 1.23 ind/m² with a relative density of 0.35%. The frequency of attendance is 11.11 %. The small number of genera *Dipseudopsis* and *Hastaperla* at this station is due to water conditions with a pH of more than 5 and a fairly high temperature that makes it difficult for this genus to thrive. (Gilbert, 1980). This is by the physical and chemical factors of the waters obtained, namely 5.4 and a relatively high temperature of 26 °C. According to (Gilbert, 1980), this genus can grow well in the pH range of 4-5 with a temperature of 26-28 °C.

## 3.4 Diversity Index (H')

Based on the data analysis, it was found that the H' value at each station was shown in Table 4 below.

Table 4. Diversity Index (H')

| H' | Station | | |
|---|---|---|---|
| | I | II | III |
| H' | 1 , 803 | 1 , 553 | 1 , 222 |

In Table 4. it can be seen that the H’ values obtained at the three research stations ranged from 1.222 to 1.803. The highest H’ was found at station I (the location before the tributary flows mixed with factory waste) which was 1,803. Different diversity index values are obtained due to the number of species living in a community in a different place which is influenced by species migration and water flow factors. (Rosalina & Sofarini, 2021) states that a community is said to have high species diversity if there are many species with the number of individuals of each species being relatively even. In other words, if a community consists of only a few species with an unequal number of individuals, then the community has low diversity.

Shanon-Wienner H’ is at station III (the downstream river flows close to residential areas) which is 1.222. The low diversity index is due to the abundance of the genus *Prompagus*, which causes the distribution number of individuals in each species not to be evenly distributed. (Angreni et al., 2017) stated that species diversity is influenced by the distribution or distribution of individuals within each species, because a community even though there are many types, but if the distribution of individuals is uneven, then species diversity is considered low. The Shannon-Wiener H’ is an index of biota diversity in an area, the higher the value, the higher the level of diversity, and vice versa. The diversity of benthos composition at each station is related to the environmental factors that exist at that station. From Table 4, it can be seen that the highest H' is found at station I, which is 1.803, which is a relatively low activity location, while the lowest diversity index is at station III, which is 1.222 which is a flow location. the downstream river is close to residential areas. Based on the range of H' obtained, Batang Naras waters are categorized as lightly to moderately polluted.

### 3.5 Water physics-chemistry quality

Based on research conducted in Batang Naras River, V Koto Kampung Dalam, Padang Pariaman, the average value of physics-chemistry factors at each station is shown in Table 5 below.

Table 5. Results of measurement of physics-chemistry quality

| No | Parameter | Unit | Station | | |
|---|---|---|---|---|---|
| | | | I | II | III |
| 1 | Temperature | °c | 29 | 31 | 30 |
| 2 | Brightness | cm | 43 | 32 | 35 |
| 3 | Turbidity | NTU | 1.00 | 2.00 | 2.00 |
| 4 | Current speed | m/sec | 0.18 | 0.16 | 0.11 |
| 5 | water pH | - | 5.9 | 5.8 | 5.4 |
| 6 | Depth | M | 1 | 0.6 | 2.2 |
| 7 | Dissolved Oxygen (DO) | mg/l | 8.14 | 6.93 | 7.43 |
| 8 | COD | mg/l | 15.9 | 19.9 | 23.9 |
| 9 | BOD | mg/l | 9.91 | 5.55 | 9.91 |
| 10 | Nitrate | mg/l | 0.14 | 0.09 | 0.08 |

And in Table 5 we can see that the water temperature at the three research stations is around 29-31 °C, with the highest temperature being at station II (location of ice factory waste) at 31 °C and the lowest at station I (location of ice factory waste). before the creeks mix with factory effluent) by 29 °C. The difference in temperature at the three research stations was due to differences in measurement time and weather conditions when measurements were made, as well as a result of differences in activity at different stations. According to (Utomo & Chalif, 2014), the temperature pattern of aquatic ecosystems is influenced by various factors such as the intensity of the sun, the heat exchange between the water and the air around it, and also the canopy factor (coverage by vegetation) and trees growing on the banks of the river.

From the results of field research, after the brightness test was carried out, the highest brightness was found to reach a value of 43 NTU, presumably the result of sunny weather at the time of measurement of these substations. However, the brightness level is not above 45, which means that it is not good for fisheries, as explained by (Suparjo, 2009) which states that waters with a brightness value of <45 cm are not good for fisheries because they can reduce the visibility of fish. Thus, it can be said that the waters of the Batang Naras River based on the brightness value during observations are not good for fisheries. Meanwhile, the turbidity level was found in the Batang Naras watershed, which was the highest at stations II and III, each of which was 2.00 NTU, and the lowest was at station I, namely 1.00 NTU. The high level of turbidity at Stations II and III is thought to be due to the entry of liquid waste from the ice factory into the Batang Naras River, V Koto

Kampung Dalam, Padang Pariaman. The value of river current velocity at the three research stations ranges from 0.18 - 0.11 m/s. The higher current velocity is found at station I (the location before the tributary flows mixed with factory waste) while the lowest is station III (the downstream river flow is close to residential areas). This difference in river flow is because the river has a different slope where station I (the location before the tributary mixes with factory waste) is an upstream area which is higher than the other two stations, while station III (the downstream river flows) close to residential areas) has a deeper depth and is polluted by oil, water flows more slowly than the other two stations.

According to (Pamuji et al., 2015), current velocity greatly affects the presence of benthos in waters. Some benthic genera can only adapt to slow currents such as *Progomphus* and some prefer waters with fast currents such as *Dipseudopsis* and *Hasterperia*. Meanwhile, the speed of the Batang Naras water current ranges from 0.11-0.18 m/s. This river has an average current speed of 0.5 m/s which is included in the fast category. So that the highest density of the genus found at the three stations is benthos which can survive in this current range, such as *Thiara*, *Paludestrina,* and *Proghompus* which like swift water habitats. While the current speed ranges from 0.25-0.49 m/s including the medium category and the current speed ranges from 0.1 to 0.24 m/s including the slow category.

At station II the benthic composition which has the highest density value is the genus Paludestrina (19.75 ind/m²). The high presence of this genus is due to the environmental conditions of the waters by their life, namely the basic substrate of the waters in the form of muddy sand so that the water conditions are rather cloudy with a fairly good pH for this genus, namely 5.8. According to (Hutchinson & Edmondson, 1993), *Paludestrina* can survive in the pH range of 5.4-5.9. The presence of high waste material causes the level of turbidity of the waters to be high, for some benthos such as *Paludestrina* is still able to survive in this habitat. The highest density at station III is the genus *Proghompus* with a population density of 7.41 ind/m². The high presence of this genus is due to water conditions with sandy and rocky bottom substrates, with high water turbidity conditions, namely 2.00 NTU. The oxygen content in the water at this station is still within the normal water pH limit of 5.4 and can still be tolerated for benthic life. According to (Dewiyanti et al., 2018), *Progomphus* likes sandy, muddy, rocky substrates, high substrate organic content, and slow currents and can still tolerate extreme environmental changes such as pollution and moderate turbidity levels.

The pH values at the three research stations ranged from 5.4 to 5.9. The highest pH value was at station I (before the tributary flow mixed with factory waste) which was 5.9 and the lowest was at station III (the downstream river flow was close to residential areas) at 5.4. This is due to the addition or loss of $CO^2$ through the process of photosynthesis which will cause changes in pH in the water. Overall, the pH values obtained from the three research stations did not support the life and development of benthos. According to (Purnani, 2009), life in water can still survive if the degree of acidity of the water has a pH range of 7-8.5. The maximum degree of acidity (pH) allowed for class I and class II water is 6-9, while at observation stations it ranges from 5.4-5.9 thus these waters are not suitable for use for class I and class II water but suitable for use for class IV water.

The highest water depth is at station III, which is 2.2 m (representing areas close to residential areas). The occurrence of siltation at station II is due to the accumulation of sediment from factory waste in the form of dregs and other waste materials that are thought to have accumulated at the bottom of the water so that the waters become shallow.

DO values obtained from the three research stations ranged from 6.93-8.14 mg/1 with the highest value found at station I (watershed area before mixing with factory waste) of

8.14 mg/l and the lowest at station II (ice factory waste location). The high value of DO at station I (watershed area before mixing with factory waste) is due to the low organic content due to not so much activity in this area so that sunlight can penetrate deeper water bodies, while the low value of DO at station II (location of ice factory waste) shows that many organic compounds enter the water body originating from ice factory waste and various community activities around the river, where the presence of organic compounds will cause the decomposition process carried out by microorganisms that run aerobically (require oxygen). (Sediadi & Manik, 1994) stated that the value of DO in waters experiences daily and seasonal fluctuations, which are strongly influenced by changes in temperature and the photosynthetic activity of plants that produce oxygen. Overall, the value of DO content in the research location can still be tolerated by benthic life. The range of tolerance of benthos to DO is different (Desmawati et al., 2020). Based on class I and class II water quality standards according to Government Regulation No. 22/2021 for class I the minimum allowable DO limit is 6 mg/l and for class II the minimum allowable limit is 4 mg/l. The DO level at the observation station is greater than the DO level in class I and II water quality criteria, so these waters are suitable for use as class I and II water.

Observations also showed that the highest COD at station III was 23.9 mg/l, which was significantly different from other stations, presumably because the water samples taken at the station contained oil compounds and other materials that are difficult to degrade biologically. This is supported by the provision of AgNO3 which indicates the presence of these non-biodegradable materials. An increase in the concentration of organic matter, both biodegradable and non-biodegradable, can increase the COD value. The measured COD values are quite normal at other substations, presumably due to the influence of the input of organic materials into the waters which are more biodegradable. Based on (Wanna et al., 2018), the limit of COD content in unpolluted waters is usually less than 20 mg/l. Thus, the COD content of Batang Naras River during observation is not good for fishery activities.

The BOD values at the three research stations ranged from 5.55-9.91 mg/l, with the highest values found at stations I and III of 9.91 mg/l and the lowest at station II of 5.55 mg/l. The difference in the BOD value at each research station is caused by the different amounts of organic matter at each station, which is related to the oxygen deficit because the oxygen is used by microorganisms in the decomposition process of organic matter, increasing the BOD value. Based on the water quality standards for class I and class II according to PP No. 22/2021 for class I, the minimum allowed BOD limit is 2 mg/l and for class II it is 3 mg/l. The BOD level at the observation station is greater than the BOD level at the water quality criteria of class I and class II, so these waters are suitable for use for class III and class IV waters.

The average value of nitrate in Batang Naras River ranges from 0.14-0.09 mg/l. The highest nitrate was found at station I and the lowest was found at station III. The high levels of nitrate at the station I are caused by residential areas and agricultural areas that use fertilizers so that waste from settlements and agriculture enters the waters and enriches nitrates. The nitrate content according to the water quality standard criteria for class I and class II is 10 mg/l, while the nitrate content in all research stations is far below the specified quality standard so these waters are suitable for use.

## CONCLUSION

From the research that has been done to look at the composition of benthos in the Batang Naras River, Sub-district V Koto Kampung Dalam, Padang Pariaman Regency, the following conclusions can be drawn: 1) The benthic composition obtained consisted of 2 *phyla*, namely *Arthropoda* and *Mollusca*, 3 classes namely *Crustacea*, *Insects* and *Gastropods*, 6 orders, 11 families and 12 genera; 2) The highest density was the genus *Thiara* with a density of 20.99 ind/m² at station I and the lowest were the genera *Lestes*, (station I), *Dipseudopsis and Hastaperla* (station III) with a density value of 1.23 ind/m², respectively; 3) highest benthic H' was found at station I of 1.803 and the lowest was found at station III of 1.222. This zone belongs to lightly to moderately polluted waters; and 4) The physical and chemical quality of Batang Naras water is the temperature ranges from 29°C-31°C, brightness ranges from 32 to 43 cm, turbidity ranges from 1-2 NTU, current velocity ranges from 0.11 to 0.18 m/s, water pH is 5.4-5.9, river depth ranges from 0.6-2.2 m, DO ranged from 6.93-8.14 mg/l, COD ranged15.9-23.9 mg/l, BOD ranged from 5.55-9.91 mg/l and nitrate ranged from 0.08-0.14 mg/l.

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