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Macrozoobenthos community structure as an indicator of water quality on the coast of Sungai Pakning Village, Bukit Batu District, Bengkalis

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Abstract

Sungai Pakning is a sub-district and the capital of Bukit Batu District, Bengkalis Regency, which has an area of 34 km^2. The Pakning River is widely used for tourism, ship transportation, ship landings, and settlements, potentially disrupting the aquatic ecosystem's balance. This research aims to determine the structure of the macrozoobenthos community and the status of the water quality conditions of the Pakning River. This research was carried out in August – September 2023 using a purposive sampling technique with three stations. There are 9 (nine) macrozoobenthos species, namely *Nerita polita*, *Unosalpinx cinerea*, *littorina melanostoma*, *Telescopium telescopium*, *Indothais gradata*, *Cheritiea obtusa*, *Natrica trigina*, *Achatinella mustelina*, and *Uca* sp. The abundance of macrozoobenthos is 20,400 ind/ha. The relative abundance of macrozoobenthos is 34.56%. Calculated biodiversity index (H'= 1.62), uniformity index (E= 0.59), and dominance index (C= 0.25). The ANOVA test results showed that the abundance of macrozoobenthos between stations obtained a significant value of 0.656 where (p > 0.05). The results of the ANOVA test for the abundance of macrozoobenthos between subzones obtained a value of 0.521, where (p > 0.05). Water quality measurements in Pakning River waters obtained temperature values of 27-28°C, water pH 7, and salinity ranging from 30-31‰. The average sediment organic matter ranges from 26.40% -32.58%, and the dominant sediment type is muddy. The research results show that water conditions are still within normal limits and support the survival of macrozoobenthos.

1. INTRODUCTION

Sungai Pakning Village is one of Indonesia's Villages in Bukit Batu District, Bengkalis Regency, Riau. Sungai Pakning Village is an area in Riau Province that has a lot of water activity. Various activities can cause a decrease in the quality of the coastal waters of the Pakning River, which will have an impact on the biota that lives in these waters. Changes in the quality of a body of water will affect the structure of the macrozoobenthic community, such as the diversity of the benthos that live at the bottom of the water. Water with good quality will have high species diversity, and polluted waters will have low species diversity.

Risna et al. (2021) state that macrozoobenthos are aquatic organisms that live on the surface or in marine sediments. Macrozoobenthos relatively settles on a particular substrate, making it more sensitive to environmental disturbances and water and sediment quality changes. This makes

macrozoobenthos a good indicator for determining water quality. Macrozoobenthos is a type of aquatic biota that is relatively abundant in the waters of the Pakning River. Macrozoobenthos has a feeding mechanism in the form of a suspension-feeder, deposit-feeder, or both and lives in sandy, muddy, muddy sand or hard substrate ecosystems. The factor underlying the use of benthic animals, especially macrozoobenthos, as indicator organisms in waters, is that benthos are relatively sedentary or have low mobility.

There are several reasons why macrozoobenthos is often used as an indicator of pollution, including the fact that it is susceptible to changes in the quality of the water where it lives, thus affecting the community and its abundance. Macrozoobenthos is also easy to find in almost all seas and has many types. Each type responds differently depending on the pollutant or waste; its mobility is limited so that it can be used as an indicator of environmental conditions. Easy to find and identify, at least at the family level, sampling is easy, does not require complicated and expensive equipment, and does not affect other organisms (Maruru, 2012).

The structure of the macrozoobenthic community can be determined based on type, abundance, relative abundance, diversity, dominance, and uniformity. A community with high species diversity will result in species interactions involving energy transfer or food webs and predation and competition relationships, resulting in ecosystem stability due to high species evenness. Furthermore, with high dominance, ecosystem instability occurs because certain species dominate energy transfer through the food web. One of the communities found in the sea is the shellfish community (Latuconsina, 2016).

Research on macrozoobenthic community structure as an indicator of water quality in various regions has been carried out, including Meisaroh et al. (2018) at Serangan Beach, Bali Province; Siahaan et al. (2021) on Lekang Island, Rear Padang District, Batam City, Riau Islands Province, and Ahmad et al. (2018) in Sumenep Regency. However, not much similar research has been carried out in Riau waters, especially in the coastal waters of the Pakning River, Bengkalis. Therefore, the author is interested in researching macrozoobenthos community structure as an indicator of the quality of the coastal waters of the Pakning River.

2. RESEARCH METHODS

Time and Place

The research was carried out from August to September 2023. Conducted at the Beach, Sungai Pakning Village, Bukit Batu District, Bengkalis.

Material and Tools

The parameters measured in this research are to determine the structure of the macrozoobenthic community (type, abundance, relative abundance, diversity, uniformity, dominance index). The main variables are macrozoobenthos and sediment substrate (sediment fraction, organic material). Meanwhile, the supporting variables are water's physical and chemical parameters, including temperature, degree of acidity (pH), and salinity. The tools used in this research were a hand refractometer, pH meter, filter, ice box, plastic sample, digital scale, multi-level sieve, 1000 mL measuring tube, furnace, oven, dropper pipette, and aluminum foil.

Research method

The method used in this research is a survey method. This method is a method of collecting primary data and sampling using purposive sampling. Namely, sampling is taken along the coastline, which has been determined as a station point and is considered to represent the research area. Community structure parameters measured in this study include type, abundance, diversity, dominance, and uniformity. Sampling and water quality measurements are carried out in the field and then analyzed in the laboratory. Next, the data obtained was analyzed statistically and discussed descriptively.

A. Type

The macrozoobenthos community consists of several types with several numbers of individuals. Several classes support this macrozoobenthos community. This class consists of Gastropoda, Bivalvia, Crustacea, Echinoidea, Asteroidea, Ophioroidea, and Holothuroidea. Macrozoobenthos were grouped, counted, and identified based on the shapes obtained using the identification book by Carpenter and Niem (1998).

B. Abundance

Abundance is the number of individuals per unit area or unit volume. The relationship of all physical-chemical factors influences the abundance of a living creature and the level of natural resources that can be obtained from the life cycle of a living creature. Then, to calculate abundance, you can use the formula:

$$Di = \frac{Ni}{A}$$

Information :

In = Abundance macrozoobenthos (ind/ha).
Ni = number of individuals (ind).
A = Plot area

C. Relative Abundance

Relative abundance is calculated using the following formula:

$$KR = \frac{Ni}{N}\ x\ 100\%$$

Information:

KR = Relative Abundance (%)
ni = number of individuals of a species
N = Total of all individuals

D. Diversity index (H')

To calculate the species diversity index (H'), use the following formula:

$$H' = \sum_{i=1}^{s} pi \ln pi$$

Information:

S = number of types
pi = proportion of individuals from species I to the total individuals of all species (pi=ni/N)
here = total number of individuals from type I (individuals/m^2)
N = total individuals of all types (individuals/$m^{2)}$

E. Dominance Index

The dominance index can be calculated using the following formula:

$$C = \sum_{i=1,2,3,\ldots}^{S} \left(\frac{ni}{N}\right)^2$$

Information :

C = Dominance index
s = number of types successfully taken
here = number of individuals of type I (ind/cm^2)
N =Total number of individuals of all types (ind/cm^2)

F. Uniformity

The uniformity index is an index that describes balance by describing the distribution pattern or composition of the individuals of each species present in a community.

$$E = \frac{H'}{\ln S}$$

Information:
E = species uniformity index
H' = diversity index
S = number of all types

G. Sediment type

Sediment type is very important for organisms living at the bottom of waters, both in still and flowing water. Sediment types can be classified into mud, sandy, and sand. In general, muddy bottom sediments are more favored by benthos than sandy bottoms.

H. Organic Total Sediment

Organic material dissolved describes the total organic matter content of waters consisting of dissolved, suspended (particulate), and colloidal organic matter. The organic content contained in marine sediments consists of particles originating from rock fragments and pieces of skin (shell) as well as skeletal remains from marine organisms or from terrestrial organic residue that has been transported by various natural media and deposited on the seabed over some time. Quite a long time. In general, the deposition of organic carbon material and its conditions (material originating from shells and corals) is more abundant in areas near the coast and in the open sea environment.

3. RESULTS AND DISCUSSION

General Conditions of Research Locations

Sungai Pakning is a sub-district and the capital of Bukit Batu District, Bengkalis Regency. Geographically, the Pakning River borders the Bengkalis Strait to the north, Sword Island to the east, Pangkalan Jambi Village to the south, and Dumai City to the west. Based on this position, the Pakning River has a relatively long coastline. The area of the Pakning River is 34.00 km^2. Sungai Pakning Village consists of 6 RWs and 21 RTs. It has an area of 34.00 km² and a population of 4,003 people. The people in Sungai Pakning Village are of various ethnicities, namely Malay, Minang, Batak, and Javanese, as well as people of Chinese descent and various religions recognized by the Republic of Indonesia.

The Pakning River has many ports, and these ports can be a gateway for economic activities to enter and exit. The Pakning River also has the potential for diverse coastal and marine resources, ranging from mangrove forests, seagrass beds, and another aquatic biota. The potential in marine tourism is also one of the attractions of the Pakning River, namely the large number of mangrove forests that can be used as tourist attractions.

Water Quality

Water quality parameters were measured to see how the research was going. The average measurements of water quality parameters can be seen in Table 2.

Table 2. Measurement of water quality in Pakning River waters

Station	Temperature (°C)	Salinity (ppt)	pH
I	28	31	7
II	27	30	7
III	28	30	7
Average	27.6	30.6	7

Based on observations, the pH value of the waters at each station is at 7. The pH value obtained from stations I to III is included in the normal category. According to Effendi (2003), most aquatic biota will be sensitive to changes in pH, while the preferred pH range is around 7 – 8.5. The results of salinity measurements obtained values ranging from 30-31 ppt. The salinity values at stations 1 to 3 are still in the normal category. The salinity values obtained at stations 1 to 3 show good values for macrozoobenthic life. The ideal salinity range to support the life of aquatic organisms, especially macrozoobenthos, is 27 – 34 ppt (Sinyo, 2013).

The water quality in the waters of the Pakning River, which includes temperature, pH, and salinity, shows good quality and can support the life and growth of macrozoobenthos. The waters of the Pakning River are still in good condition, according to the Minister of Environment's water quality standards NO 51 OF 2004. Based on the results of the measurements carried out, it can be concluded that the waters of the Pakning River have a water environmental quality that is classified as normal and is still in a condition that supports the life and sustainability of macrozoobenthos.

Sediment Organic Material

The analysis of organic matter content in Pakning River waters can be seen in Table 3

Table 3. Sediment organic material content at each observation station in Pakning River Waters

Station	Transect 1(%)	Transect 2 (%)	Transect 3 (%)	Average
I	25.93	32.52	35.69	31.38
II	26.71	34.57	36.51	32.59
III	23.17	27.31	28.74	26.40

Table 3 shows that the average range of organic matter content in Pakning River waters is between 26.40%-32.58%. The highest organic material content was at station II transect three at 36.51%, and the lowest was at station III transect 1 at 23.17%. The organic material content of sediment in the waters of the Pakning River is in the high category, possibly due to the type of sediment fraction in the form of mud. Sediments rich in organic material are often supported by an abundance of benthic organisms, including gastropods because organic material is a food source for marine biota that live on the substrate. Hence, their dependence on organic material is very large. It can be concluded that these three stations have the same criteria; namely, they are muddy, so the substrate is rich in organic material, which significantly influences their distribution and abundance of macrozoobenthos.

Sediment Type

The results of sediment fraction analysis at each research station in the waters of the Pakning River consist of 3 (three) types of sediment fractions: gravel, sand, and mud. The sediment type at each station is based on the proportion of gravel, sand, and mud content classified according to Sheppard's triangle. The percentage of weight fractions and sediment types are presented in Table 4.

Based on Table 4, it can be concluded that the sediment type in the waters of the Pakning River is mud sediment type (*Mud*). The most significant fraction percentage is in the mud fraction at station II transect 1 with a value of 97.36%, while the smallest percentage is in the gravel fraction at station III transect 2 with a value of 0.10%.

Macrozoobenthic species

After identifying the macrozoobenthos samples, the identification results showed that there were 9 (nine) macrozoobenthic species consisting of 8 (eight) families and 9 (nine) genera. The macrozoobenthos obtained at all research stations consisted of the families Neritidae, Potodidae, Buccinidae, Thiaridae, Potamididae, Naticidae, Achatinellidae and Ocypodidae. The macrozoobenthos species found can be seen in Table 5.

Table 4. Percentage of sediment fraction and sediment type

Stasiun	Transect	Average sediment fraction (%)			Sediment type
		Gravel	Land	Mud	
I	1	0.90	7.70	92.21	Mud
	2	0.14	3.63	96.23	Mud
	3	0.60	5.43	94.51	Mud
II	1	0.80	2.56	97.36	Mud
	2	0.17	8.47	91.36	Mud
	3	0.26	5.59	94.15	Mud
III	1	0.20	5.53	94.27	Mud
	2	0.10	4.30	95.60	Mud
	3	2.17	6.50	91.33	Mud

Table 5. Macrozoobenthos species found

No	Class	Family	Genus	Species
1	Gastropods	Neritidae	*Nerita*	*Nerita polita*
2		Naticidae	*Paratectonatics*	*Natrica trigina*
3		Muricidae	*Urosalpinx*	*Unosalpinx cinerea*
4			*Indothais*	*Indothais gradata*
5		Potodidae	*Telescope*	*Telescopium telescopium*
6		Littorinidae	*Littoraria*	*littorina melanostoma*
7		Potamididae	*Cheritidea*	*Cheritidea obtusa*
8		Achatinellidae	*Achatinella*	*Achatinella mustelina*
9	Malacostraca	Ocypodidae	*Uca*	*Uca* sp

Based on the identification results of macrozoobenthos samples in the waters of the Pakning River, 9 (nine) species were obtained consisting of *N.polita*, *U.cinerea*, *L.melanostoma*, *T. telescopium*, *I.gradata*, *C. obtusa*, *N. trigina*, *A.mustelina*, and *Uca* sp. *C. obtusa* from the Potamididae family are the species most commonly found at the research location. *C. obtusa* is often found at the research location due to the mangrove ecosystem, where there is much organic material produced by mangrove tree litter, and the substrate around the research location is muddy. The muddy substrate is a substrate that is rich in nutrients. Therefore, there are many of these species. It is thought that the condition of the water environment at the research location, which is still expected, is also the cause of the large number of *C. obtusa* found.

Based on Table 5, it can be concluded that the dominant species found come from the Gastropoda and Malacostraca classes. This is because both have pretty good abilities to adapt to their environment. After all, they have a hard shell to survive and protect their bodies from environmental influences compared to organisms from other classes directly related to their environment (Widyastuti, 2011). According to Nurrachmi & Marwan (2012), benthic animals are closely related to the availability of organic material in the substrate because organic material is a source of nutrients for biota, which is generally found in bare substrates.

Muddy substrate conditions are the habitat of snails because, at low tide, these snails will bury themselves in mud to avoid the heat of the sun and dryness, as stated by Setiawan (2013), namely that Cerithidea are often found in mangrove forest areas where Rhizophora grows. Because Rhizophora can provide a muddy substrate, which is the habitat of *Cerithidea*.

Macrozoobenthos Abundance

The highest abundance of macrozoobenthos is at station II, namely 20,400 ind/ha, and the lowest is at station III, namely 10,400 ind/ha. The high abundance value at station II is likely due to the physicochemical factors of the waters, namely the type of muddy substrate favored by macrozoobenthos.

Also, the temperature, pH, and salinity at station II are still in average conditions to support macrozoobenthos. Apart from the muddy substrate type, there is also a mangrove ecosystem at station II, which promotes macrobenthic life. The low abundance of macrozoobenthos at station III is thought to be due to chemical factors, namely the presence of a port. The graph of the average abundance of macrozoobenthos can be seen in Figure 1.

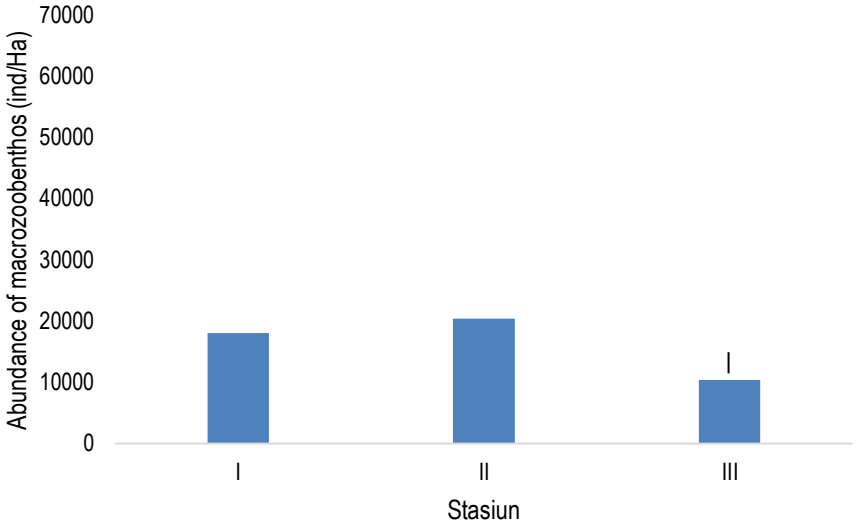

Figure 1. The abundance of macrozoobenthos

Based on Figure 1, it can be seen that the results of calculating the macrozoobenthic abundance value at the research location in the waters of the Pakning River can show that the highest macrozoobenthos abundance value was at station II, namely 20,400 ind/ha, and the lowest abundance was at station III, namely 10,400 ind/ha. The existence of physicochemical factors is thought to be the factor for the high abundance at station II, namely the muddy substrate, which is the habitat for macrozoobenthos, and temperature, pH, salinity, and DO are categorized as suitable for supporting macrozoobenthic life. Station II shows the highest abundance value because this location contains mangrove forests, which are managed to maintain the area. The low value of macrozoobenthos abundance at station III is suspected to be due to social factors. From the results of observations in the field, port activity is present, which causes a low abundance of macrozoobenthos at station III.

Based on Figure 1, it can be seen that the results of calculating macrozoobenthos abundance values in Pakning River waters have varying values at each station. The abundance of macrozoobenthos in each intertidal subzone, subzone I, has the highest abundance, namely 62,200 and/Ha, while the lowest abundance is in subzone II, namely 43,300 and/Ha. The standard deviation in subzone I to subzone II ranges between ±0.21-0.31. The high abundance value in subzone I is thought to be due to the presence of mangrove ecosystem vegetation, which facilitates the entry of organic material in the form of mangrove litter around the banks of the Pakning River. Meanwhile, the low abundance of macrozoobenthos in subzone II is thought to be influenced by the low organic material content.

According to Nurrachmi & Marwan (2012), benthic animals are closely related to the availability of organic material in the substrate because organic material is a source of nutrients for biota, which is generally found in bare substrates. Sandy bottom substrates do not provide a stable place for organisms because wave action continuously moves substrate particles. In contrast, benthic organisms will quickly adapt to muddy substrates by digging into the substrate or forming permanent channels.

Based on Figure 2, it can be seen that the results of calculating macrozoobenthos abundance values in the waters of the Pakning River have values that also vary in each subzone. The abundance of macrozoobenthos in Pakning River waters is relatively low compared to coastal waters or other intertidal waters. Compared with research conducted by Rosdatina et al. (2019) in the waters of Penyengat Island,

Riau Islands, it was 42,000 Ind/Ha. This is suspected to be the influence of port activities in the waters of the Pakning River.

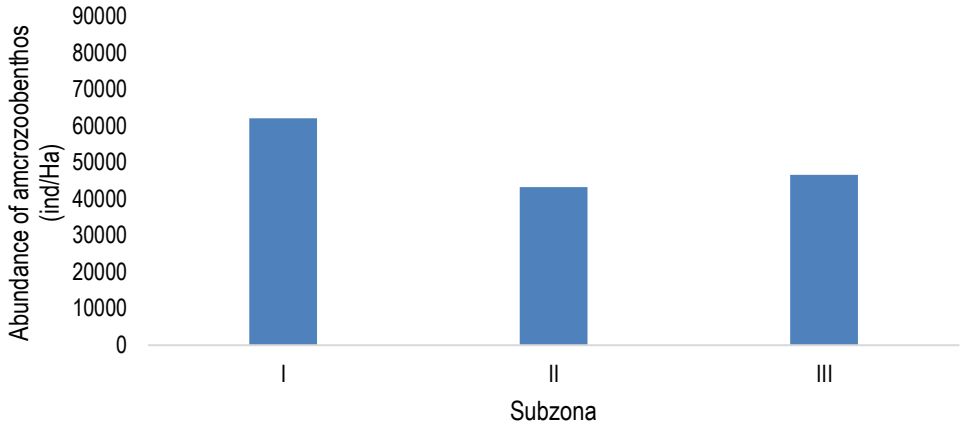

Figure 2. Abundance of macrozoobenthos

Relative Abundance of Macrozoobenthos

The average relative abundance of gastropods is presented in Table 6.

Table 6. Relative abundance of macrozoobenthos

Species	Relative Abundance
Telescopium telescopium	0.74
Indothais grade	33.09
Littorina melanostoma	5.23
*Uca*sp	10.29
Ceritidea obtuse	34.56
Nerita polita	0.74
Natica trigina	9.56
Achatinella mustelina	3.68
Unosalpinx cinerea	5.15

Based on Table 6, *Ceritidea obtuse* has the highest relative abundance, namely 34.56%, while *Telescopium telescopic has* the lowest relative abundance, 0.74%. The graph of the average abundance of macrozoobenthos in the waters of the Pakning River can be seen in Figure 3.

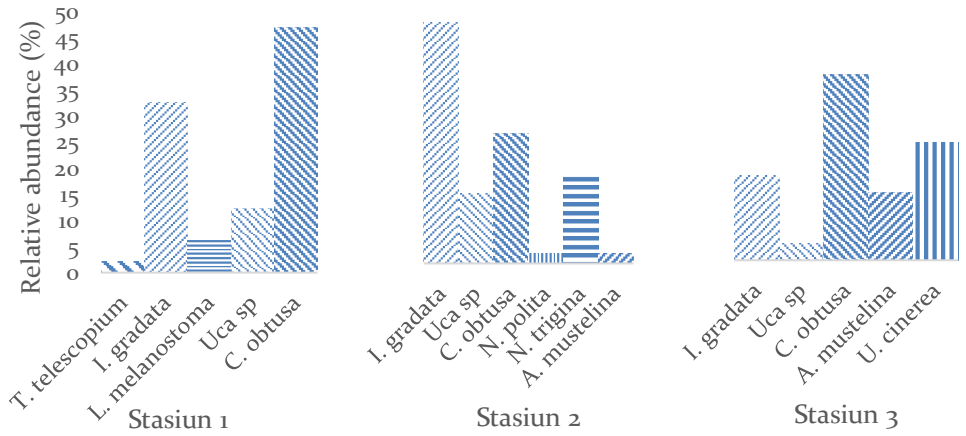

Figure 5. Relative abundance of macrozoobenthos

The relative abundance of macrozoobenthos in the waters of the Pakning River shows that *Ceritidea obtusa*has has the highest relative abundance value compared to other species found at the research location with a relative abundance value of 34.56%, while the species that has the lowest relative abundance is*T.telescopium* with an abundance value of 0.74%. High relative abundance of species*Ceritidea obtusa*It is thought to be caused by water physicochemical factors, including temperature, salinity, pH, currents, and substrates that support life *Ceritidea obtuse.* High abundance*Ceritidea obtusa*This is also because the substrate that supports the species' survival is muddy. On the other hand, Telescopium has the lowest relative abundance level and is thought to be caused by biological factors, namely the large amount of waste and competition in nature.

According to Rahmasari et al. (2015), an organism's high and low abundance is influenced by various factors, including the physico-chemistry of water, temperature, salinity, pH, currents, and bare substrate. Based on the relative abundance value in the waters of the Pakning River, it is relatively high compared to the waters of the South Coast of Pamekasan Madura Regency, which was carried out by Rahmasari et al. (2015), namely the species that has the highest relative abundance at the research location, namely *N. distortus* with a relative abundance value of 11.21%.

Macrozoobenthos Community Index

Macrozoobenthos diversity in the waters of the Pakning River can be determined using the diversity index. The macrozoobenthic diversity index calculation results are simplified and tabulated in Table 7.

Table 7. Macrozoobenthos community index in Pakning River Waters.

Observation station	Diversity Index (H')	Uniformity index (E)	Dominance Index (C)
Station I	1.23	0.44	0.34
Station II	1.41	0.51	0.28
Station III	1.42	0.51	0.27
Research Location	1.62	0.59	0.25

Table 7 shows that the diversity values at stations I, II, and III, as well as the research location, are 1.23, 1.41, 1.42, and 1.62. From the results of the research that has been carried out, the highest macrozoobenthos diversity index is found at station III at 1.42, which is thought to be due to the large number of types of macrozoobenthos found. The lowest diversity index was at station I, with a value of 1.23. The level of diversity is influenced by the fertility of the habitat, which can support the life of each species that occupies that place. Overall, the macrozoobenthic diversity index values between stations are not much different.

Based on the diversity index criteria, it can be concluded that the macrozoobenthos diversity category in the waters of the Pakning River is in the medium category, where the index value $1 \leq H' \leq 3$ indicates that species diversity in the waters of the Pakning River, productivity is sufficient, ecosystem conditions are pretty balanced, ecological pressure is moderate. The diversity of a species is greatly influenced by the number of species and the total number of individuals of each species found; conversely, if the number of species is small and the total number of individuals of each species is small, then the species diversity is low. Diversity is synonymous with the stability of an ecosystem; that is, if the diversity of an ecosystem is relatively high, then the condition of the ecosystem tends to be stable. Ecosystem environments that have disturbed diversity tend to be moderate. In the case of ecosystem environments that are polluted, diversity tends to be low (Nurfitriani, 2017),

According to Arbi (2013), high or low diversity index values can be influenced by various factors, including the number of species found and some in more significant numbers than other types. Macrozoobenthos diversity is influenced by the fertility of the habitat occupied by a species, such as the availability of food and the lack of competition.

Overall, the macrozoobenthos diversity index values differ between stations. The value obtained is lower than the results of research conducted by Safitri et al. (2020) in the waters of Senggarang Besar, Tanjung Pinang City, which ranged between 0.93-1.94. According to Rijaluddin (2017), the low value of the macrozoobenthic diversity index reflects the level of heavy pollution by domestic waste that accumulates in the waters. Apart from that, macrozoobenthic diversity is also influenced by macrozoobenthic fishing carried out by the community and the presence of predation, competition, and more complex niche factors.

The macrozoobenthos uniformity index calculation results are simplified and tabulated in Table 5. Based on Table 5, it can be concluded that the uniformity index calculation results obtained at station I were 0.44, which shows the lowest uniformity index; at station II, namely 0.51, and station III, it is 0.51, which shows the highest uniformity index. Based on Table 5, it can be seen that the macrozoobenthos uniformity index in Pakning River waters ranges from 0.44 - 0.51. This shows that the uniformity is moderate. The uniformity index (E) values obtained at the three research stations can be seen in Table 5. The low uniformity index value at station I is because several species are too numerous compared to other species.

Meanwhile, at stations II and III, the number of each species was even. Based on the uniformity index value in the waters of the Pakning River at the three research stations, it shows a moderate uniformity value, namely $0.4 \leq E < 0.6$. A moderate level of uniformity indicates that the distribution of macrozoobenthos species is less even. According to Budi et al. (2013), the uniformity index is a reasonable estimate for determining the dominance of an environment. The uniformity index value will be low if one or several types are abundant. The uniformity index reaches its maximum value if the distribution of the number of individuals of each species is even. The smaller uniformity value (closer to zero) indicates that the distribution of the number of individuals for each species is not the same, and there is a tendency for the community to be dominated by certain species (Hidayani, 2015). The macrozoobenthos uniformity index obtained in the waters of the Pakning River is in the good enough category for the growth and life of macrozoobenthos. The lower the uniformity index indicates the unequal distribution of the individuals of each type, the more certain types tend to dominate in an ecosystem (Odum, 1998). A low uniformity index also indicates that the waters may be polluted.

Based on Table 5, the results of calculating the dominance index were obtained at station I, which was 0.35, which indicated the highest dominance index; station II, which was 0.29; and station III, which was 0.27, which indicated the lowest dominance index. (Table 5). The dominance index value in the waters of the Pakning River at the three research stations shows a low dominance value, namely $0 \leq C < 0.3$. This indicates that at this location, there is no dominance of certain species; all types are evenly distributed and stable. Even though a higher number of individuals of certain types were found at the research station, this is thought to be related to the condition of the waters or the type of substrate that supports the population.

The macrozoobenthos dominance index calculates the presence of certain species that dominate a community (Bai'un *et al*., 2021). The dominance index values obtained in the waters of the Pakning River ranged from 0.27 – 0.35. The highest dominance index value is at station I, namely 0.35 because there is a type that dominates. The high value of the dominance index is due to the low number of species obtained. Apart from that, the abundance value obtained for one species tends to be high and dominates, while the lowest index value is found at station III, namely 0.27. The results of the dominance index analysis are in line with the results of the diversity index and uniformity index analysis, where high diversity index and uniformity index values are usually followed by low dominance index values and vice versa (Hidayani, 2015).

4. CONCLUSIONS

The macrozoobenthic species found in the waters of the Pakning River Beach consist of 9 (nine) species, 8 (eight) families, and 9 (nine) genera. The species consist of *N.polita, N.atramentosa, T.telescopium, I.gradata, T.granifera, C.obtusa, N.trigina, A.mustelina*, and *Uca* sp. The abundance of

macroozobenthos in the Pakning River Coastal waters is low, with the most commonly found species being *C. obtusa*. The diversity value (H') at the research location is moderate. The uniformity value (E) is low, and the dominance value (C) means no species dominates. Water quality conditions based on the diversity index show that the waters of Sungai Pakning Beach indicate moderate diversity; namely, the distribution of the number of individuals is moderate, and the condition of the waters is moderately polluted.

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