Biotilic as a Method for Analyzing River Water Pollution Levels

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Abstract: The river has many benefits for the needs of human life, but most of the 80% of the rivers are heavily, lightly and moderately polluted including the Mandar River which is widely used by the surrounding community. Water quality monitoring that can provide information by identifying aquatic biota living in rivers, namely Biotilik. The purpose of this study was to determine the level of water quality pollution in the Mandar River using the biolotic methods. This research is descriptive with a survey approach that identifies the Mandar River Biota as an indicator of water pollution in Petoosang Village, Alu District. The data analysis was carried out by starting from the identification of macroinvertebrates obtained, then grouping the biota into 2 groups, namely EPT (Ephemeroptera, Plecoptera, and Tricoptera) and non EPT, then calculating the Water Pollution Index. The results showed that the Mandar River in Petoosang Village, Alu District, was in the medium polluted category.
Keywords: River Water, Biotilic, EPT, Non EPT

Introduction

The water source that is most widely used as a raw material is river water, however with the increase in development, the level of river water pollution is also increasing. Many river flows have been polluted and are not suitable for consumption for various needs even though the river has a strategic function in supporting the development of an area (Dini, 2011). Monitoring and evaluation of water quality is very necessary to determine the quality of water and the impact of the various activities that have been carried out. The quality of water sources from Indonesia's important rivers is generally highly polluted weight by organic waste originating from household, industrial and agricultural waste. The uneven distribution of the population will result in the accumulation of pollutants in a very densely populated area. This can result in disruption of the subsidence water quality and the emergence of disease outbreaks due to poor environmental sanitation besides that It is known that the decline in river water quality has not only occurred in the downstream area of the river but has penetrated upstream of the river (Irianto, 2015). The Ministry of Environment (KLH) publishes the results of water quality monitoring rivers throughout Indonesia. From the monitoring carried out in 57 rivers in 33 Provinces, It was concluded that 80% of the rivers were heavily, lightly or moderately polluted. This result is worse compared to the percentage of pollution in 2012 which was at 75.2% (Rahmawati, 2014).

Mandar River is one of the rivers in West Sulawesi Province which is located at Polewali Mandar Regency comes from one of the foothills of the mountain in Tutar District flows past, Alu District (Pao-pao Village, Alu Village, Mombi Village, Saragiang Village and Petoosang Village), Limboro District (Lemba-lembang Village, Palece Village, Village Limboro), Tinambung District (Camba-camba Village, Kandeapi Village, Sepang Neighborhood, and empties into the bay of Mandar. The Mandar River has a tributary that flows from the village Kalumammang. The length of the Mandar River is about ± 150 km making the Mandar River enter one of the longest rivers in West Sulawesi. Utilization of Mandar river water is also used as a power plant by one of the villages, human activities ranging from washing bath clothes are carried out almost throughout riverside and utilization of river water as raw

material for drinking water so that the Mandar River cannot be separated from the life of some people who live on the banks of the Mandar River (Irianto, 2015).

Biotilic is a water quality monitoring method that can provide more information details in efforts to restore watersheds, because with biotilics we can find out the impact decrease in water quality resulting in changes in river habitat conditions. Change This habitat condition is responded to by the water biota that lives in the river, because every water biota has different levels of tolerance to water pollution (Rini, 2011). The use of the biotilic method as a method used in monitoring water quality rivers because this method is easier to implement by using biota as an indicator and compared using chemical parameters, biotilic can be observed continuous. This is because the biota spends its entire life in this environment. The purpose of this study was to determine the level of water quality pollution in the Mandar River using the biolotic method.

Methods

This research is descriptive with a survey approach that identifies the biota of the Mandar River as an indicator of water pollution. The research location was conducted by the Mandar River. The subject of this research is the biota in the Mandar river which is carried out at three points of the research location, namely in the upstream part of Petoosang Village, the middle part of Palece Village and the downstream part of Sepa Batu Village. The data analysis was carried out by starting from the identification of macroinvertebrates obtained, then grouping the biota into 2 groups, namely EPT (Ephemeroptera, Plecoptera, and Tricoptera) and non EPT, then calculating the water pollution index, and analyzed.

Result

Table 1. Identification of Biota Inspection in the Mandar River

No.	Family	Biotilik Score (Ti)	The Number Of Biota (Ni)	Ti x Ni
EPT				
9	Baetidae –A	2	4	8
Subtotal EPT (n EPT)			4	8
Non EPT				
30	Cordulidae –B	3	6	18
45	Hydrophilidae –A	3	5	15
46	Naucoridae	3	21	63
53	Gerridae	2	1	2
69	Atyidae	2	42	84
82	Thiaridae –B	2	6	12
88	Sphaeridae	3	15	45
Subtotal Non-EPT			96	239
Total Number			N=100	X=247
% EPT = $\frac{n\ EPT}{N}\ x\ 100\%$			4%	
INDEKS BIOTILIK (X/N)			2,47	

Based on the results of monitoring the identification of biota in the Mandar River, the sampling was carried out 12 times due to the swift river conditions so that the biota in the river was under the river flow. Researchers obtained 100 animals using the kicking technique to obtain biota samples. Of the 100 samples obtained, they have various different levels of tolerance to pollution, with 4 being included in the EPT group (Ephemeroptera, Plecoptera and Thichoptera) with 1 type of biota and 96 animals belonging to the non EPT group with 8 types of biota. The percentage abundance of EPT was 4% and the Biotilic Index (X / N) was 2.47.

The EPT group (Ephemeroptera, Plecoptera and Thichoptera) is a group of aquatic biota that is sensitive to the quality of water pollution, with a total of 4 biota with 1 type of EPT biota including Baetidae -A with 4 tails. This species is included in the green color category which indicates that it is quite sensitive to pollution. The non-EPT group (Ephemeroptera, Plecoptera and Thricoptera) is a group of biota that is resistant to water pollution quality, with a total of 96 biota with 7 types of non-EPT biota including Cordulidae -B with 6 tails, Hydrophilidae -A with 5 tails, Naucoridae with 21 tails, Gerridae with 1 tail, Atyidae with a total of 42, Thiaridae-B with 6 tails, and Sphaeridae B with 6 tails.

Species in the non EPT group including *Hydrophilidae -A, Cordulidae -B, Naucoridae, and Sphaeridae* are included in the green color category which is indicated to be quite sensitive to pollution. While the species Gerridae, Alyidae, and Thiaridae-B are included in the red color category with indications of resistance to pollution.

Tabel 2. River Pollution Assessment Using Biotilic Methods

Parameter	**Score**				**Assessment Score**
	4	**3**	**2**	**1**	
Diversity of Family Types	>13	10-13	7-9	<7	2
Diversity of EPT	>7	3-7	1-2	0	2
% EPT	>40 %	>15-40 %	>0-15 %	0 %	2
Biotilic Index	3,3-4,0	2,6-3,2	1,8-2,5	1,0-1,7	2
Total Score					**8**
Average Score (Total Score /4)					**8 : 4 = 2**
Water Quality Criteria	Not Polluted	Lightly Polluted	Moderate Polluted	Heavily Polluted	Moderate Polluted
Average Score	3,3-4,0	2,6-3,2	1,8-2,5	1,0-1,7	2,47

Assessment of the quality of river pollution at the first point uses the biotilic method, there are 8 types of family diversity with a score of 2, while the diversity of EPT types is 1 with a score of 2, for the percentage of abundance of EPT there are 4 with a score of 2, while the biotilic index is 2. So the total score from the four parameters, the value of 8 scores is then divided by 4 parameters and the results obtained are 8: 4 = 2 so that the results of the analysis of the level of pollution of the quality of Mandar river water in Petoosang Village are moderately polluted.

Discussion

The results of monitoring of biota sampling carried out in the Mandar River, obtained 100 biota from each sampling location using the kicking technique where the researcher entered the river flow for sampling, namely the biota in the water by means of the researcher standing facing the river then placing The net is in front with the mouth of the net facing the river flow, then slowly stirs the surface of the river in front of the net with a circular motion of the legs to stimulate the animals hiding out of the riverbed to enter the net.

This study used three data analysis techniques including reductive data analysis, namely reducing data with the aim of selecting samples based on existing biotilic identification sheets. When the biota sampling was carried out, several types of animals were also obtained that were not included in the research category on the biotilic identification sheet, so the animals were returned to the river flow. After reducing the data, the display data analysis is carried out, namely the presentation of the data by means of the biota obtained in the field and then recorded in the column provided by the researcher and separated based on the group and type of biota obtained so that it makes it easier for researchers to perform sample calculations and facilitate the identification of biotilics.

Mandar River is one of the largest watersheds (DAS) in Polewali Mandar Regency, West Sulawesi. The Mandar River originates from one of the mountains in Tutar District and flows through Alu District (Pao-pao Village, Alu Village, Mombi Village, Saragiang Village, and Petoosang Village), Limboro District (Lembang-lembang Village, Palece Village, and Limboro Village), Tinambung District (Lekopadis Village, Sepabatu Village, Kandeapi Village, Tinambung Village) and empties into Mandar Bay. The Mandar River has a tributary that flows from Kalummang Village. The length of the Mandar river is about ± 150 km, making the Mandar river one of the longest rivers in West Sulawesi. Researchers took the research location point in the waters of the Mandar river in order to see how the level of river water quality pollution. So the researchers decided on the research location in the Petoosang section The researcher used the kicking technique for sampling where the researcher entered the river flow by standing facing the river flow then placing the net in front with the mouth of the net facing the river flow, then stirring slowly the surface of the river in front. the net with its legs twisted around to stimulate hiding animals from the riverbed into the net.

It is said to be moderately polluted because according to the biota obtained, 96% are included in the non-EPT category, which is a group of biota that is resistant to pollution. Evidenced by the results obtained in the river, the types of biota in the EPT group (Ephemeroptera, Plecoptera and Thichoptera) are still obtained, including Baetidae -A, while the Non EPT groups obtained include *Cordulidae -B, Hydrophilidae -A, Naucoridae, Gerridae, Atyidae, Thiaridae –B and Sphaeridae*. The location of this research is not much human activity around the river and there are not many settlements on the riverbanks. Human activities in Petoosang Village are limited to bathing and washing, but the intensity is not too dense because the sampling location is far from residential areas. The condition of the river in Petoosang Village has a swift current, not too deep, a bit rocky but not too dangerous for researchers.

The Mandar River where along the riverbank has been a settlement for a long time and human activities are carried out every day along the downstream river with the river conditions are not too heavy because it is already downstream and this location is only about ± 500 meters from the sea. muddy and has a brownish water color.

Based on the monitoring results, it can be seen that the biota that is least found is the type of EPT biota. This is because this biota is sensitive, lives in clean areas and has a food source and has a high response to environmental changes (Chandra, 2014). In other words, EPT is difficult to find in the Mandar River because the river is polluted. Biotilic indicators provide results and provide an overview of the conditions of the Mandar river water quality where the research location points are moderately polluted. The more various types of biota obtained, the lower the level of pollution and the less diversity of biota obtained, indicating that the river is heavily polluted. This causes pollution in the upstream to downstream parts of the Mandar River to be included in the category C group. Trisnaini et al's research also found that the water quality of the Musi River waters was included in indicator C where only one aquatic biota was found, namely fish (Trisnaini, 2018). According to research by Syuhada et al, that the biotilic index is an enrichment of aquatic ecology with the results of moderate to heavily polluted research, it can be compared with the results of research in the Mandar river that the quality of river water is moderate and heavily polluted (Syuhada, 2016).

Based on Wijayanti's research, he also examined the analysis of aquatic larvae as an indicator of water quality in the upper reaches of the Gajah Wong River, which shows the water health status in the Hargobinangun area which is lightly polluted as evidenced by the number of EPT biota found (Wijayanti, 2015). Yasaroh's study also suggests the diversity of macrozoobenthos (Ephemeroptera, Plechoptera) as bioindicators of river water quality, it is known that the quality of the Gajah Wong river is likely to be slightly polluted (Yasaroh, 2016). Research by also found that the water quality in the Wanggu River was classified as somewhat polluted and very heavily polluted with the discovery of several types of macroinvertebrates that were sensitive and insensitive to water pollution (Kahirum, 2019).

According to Ekha (2015), community activities in the form of disposing and piling up trash on the riverbank, bathing and washing toilets in the river, disposing of tofu industrial waste water, domestic waste, and livestock waste into the river, and also being supported by an inadequate sanitation system can affect quality. River water. To control river water pollution, cooperation between the government and the community is required. Based on the research of Yohanes *et al.,* (2019), there are several efforts to control Krukut River water pollution that can be carried out, including community policing, conducting socialization and training, monitoring waste disposal, providing assistance to the community, and promoting water pollution control programs.

Meanwhile, according to Agustiningsih *et al.,* (2012) that the strategy for controlling river water pollution tends to prioritize increasing the role of the community, both the general public and the working community. Based on these 2 things, the combination of government and community control can help overcome the problem of pollution and river water quality in Indonesia.

Conclusions

Based on the results of monitoring the quality inspection of Mandar River water using the Biotilik method, it can be concluded that the Mandar River is included in the moderate polluted category. It is hoped that the government will provide counseling on the importance of preserving river water, periodically checking the quality of Mandar river water, and checking the quality of river water so that it uses biological parameters not only physical and chemical parameters. In addition, the community around the Mandar River is expected not to dispose of waste into the river and carry out regular river cleaning.

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