Macrozoobenthos community structure in the Urban Lake - Situ Cikaret, West Java

Imroatushshoolikhah1,*, J Sudarso1, A Ibrahim1, H U Hafizha2, D Rohaningsih1 and L Sari1

1 Research Center for Limnology, Indonesian Institute of Sciences, Jl. Raya Jakarta-Bogor km 46, Cibinong, Indonesia
2 Universitas Islam Negeri Sunan Gunung Jati, Indonesia, Jl. A.H Nasution, Cibiru, Jawa Barat, Indonesia

*Corresponding author: imroa@limnologi.lipi.go.id

Abstract. Situ Cikaret is an urban lake that suffers from anthropogenic activities. The macrozoobenthos community has been used to examine the inland water ecosystem. However, there is finite information about macrozoobenthos in Situ Cikaret urban lake. The research aims to study the macrozoobenthos community structure in Cikaret urban lake. Samples were taken in March and April 2019 in five sites using Ekman Grab and identification was in the Research Center for Limnology LIPI. CAP-6 for ANOVA-Similarity (ANOSIM) is used to analyze the similarity within the community, whereas MVSP 3.22 for Canonical Correspondence Analysis (CCA) to find the relation between macrozoobenthos and the environment. Water quality including temperature, pH, conductivity, total dissolved solids (TDS), oxidation reduction potential (ORP), depth, clarity, turbidity, dissolved oxygen (DO), and total suspended solids (TSS) was measured. Ten groups have been found, namely Chironomidae, Coleoptera, Tubificidae, Naididae, Glossiphoniidae, Viviparidae, Thiariidae, Ampullariidae, Planorbidae, Corbiculidae. The predominant family was Tubificidae (9,525 individual/m²). ANOSIM shows no significant difference in similarity (p>0.05) between locations. A linear correlation shows between diversity index and DO, pH, turbidity, and water temperature. CCA shows the abundance of Tubificidae, Chironomidae, Viviparidae, Ampullariidae, Planorbidae, Corbiculidae has a tendency towards the temperature, pH, ORP, turbidity, DO, TDS, depth.

Keywords: Cikaret; lake; macrozoobenthos; situ; urban

1. Introduction
Urban lake is described by Persson [1] as inland water which is part of surface water that is hemmed by an urban environment. Further, urban lakes are used for water storage and water supply for local areas [2]. Situ Cikaret is an urban lake located in the center of Bogor Regency, West Java, whereas “Situ” refers to the local name for a small lake in West Java. The catchment area of Situ Cikaret is about 8.46 km² and part of Ciliwung watershed [3]. Totally, about 106 situ have been recorded in Bogor Regency and 200 in the great Jakarta [4]. Situ Cikaret itself has mainly functioned as a flood control system for Great Jakarta and the source of water supply irrigation and fishery for Cibinong district [3]. Nine species of fishes were recorded, which 4 of them have been known as the local species [5]. Another potential aspect of Situ Cikaret, local people utilize Situ Cikaret for multipurpose, for example, canoeing areas
for athletes’ exercise. Moreover, some people come for recreation, for instance, some do fishing and some others enjoy the panoramic view.

The growth of the urban environment increased the vulnerability of urban lakes. The main threat of urban lakes is pollution and eutrophication [2]. Meanwhile, the settlement area surrounding Situ Cikaret increased by about 3.61% from 2.9 Ha in 2002 to 4.47 in 2012 Ha [3]. The increasing population will lead to the incline of domestic waste. Sewage and domestic waste have been recorded as the main types of threats to urban lakes. It was reported that urban lakes in the megacity of Jakarta have suffered from pollution particularly by nutrients, microbial, organic, and toxic pollutants [6]. Moreover, based on previous research [5], the dissolved oxygen (DO) level in Situ Cikaret ranged between 3.59–4.33 mg/L. Low oxygen levels are a serious problem for the fish population. However, the concentrations were below the water standard for fishery which should be above 5 mg/L [7]. In addition, Situ Cikaret were in eutrophic level based on the total nitrate and phosphate which were recorded respectively 2.197–2.921 mg/L and 0.053–0.061 mg/L [5].

Further, the condition of urban lakes needs to be explored in the terms of biodiversity and the quality can be determined based on it. Macrozoobenthos community structure has been widely explored and used to understand the status of the inland water ecosystem. The community confers not only water quality but also the type and level of pollution [8]. Some of them are tolerant, for instance, Tubificidae (worms) and Chironomidae who can tolerate the low level of oxygens in the water. Lymnaea tolerant to heavy metal, while some others are intolerant [8, 9]. Due to their whole life living in the bottom of the water body, either attached to the substrates or in the sediment, the community of macrozoobenthos can be used as the bioindicator to access the condition of the water ecosystem [10–12].

However, given several threats from the environment surrounding the urban lake, the aim of this study was to study the latest condition of Situ Cikaret urban lake in terms of macrozoobenthos community structure. Therefore, this study would be beneficial for the comprehensive management of inland water ecosystems. Regarding this goal, research using biota at the level of community was important to be conducted.

2. Materials and methods

2.1. Study area and sampling method

The research was carried out by survey method in the Situ Cikaret urban lake in March and April 2019. Environment variables data and sediment contain-macrozoobenthos samples were collected from five sites: ST1, ST2, ST3, ST4, and ST5 (figure 1) by purposive sampling three times in every two weeks, whereas March week I, March week III, and April Week I. Those five locations were chosen to represent typical reasons. Site 1 is the inlet, where the water flows from the stream to the lake. It is located in the Kebantenan stream. In addition, there is a nata de coco factory and fish cat fishpond near location 1. Site 2 is near the settlement, while site 3 is the center of the urban lake. Site 4 is in the Tambakan stream, while site 5 is located in the Cikaret stream. Those both are the outlet.

Samples of sediment-contained benthic macrozoobenthos were taken using the Ekman Grab. It was taken three times in repetition in each location, then filtered using a filter with the mesh size 30 (0.3 mm) in pores. The samples then were composited and stored in one plastic bag. A 10% formaldehyde solution was added for preservation. After being preserved, samples were brought to the laboratory and rinsed. Clean macrozoobenthos are ready to be stored in a 70% alcohol solution. Those samples then were sorted and identified in the Research Center for Limnology LIPI.

The procedure of macrozoobenthos collection and identification was based on the standard guidance. Two types of microscope, namely Nikon stereoscopic and Olympus binocular compound were used for identification. Identification books are used as the guidance, including insect [13], chironomid [14], and oligochaete [15,16], and gastropods [17]. Moreover, to investigate the environmental conditions around the sampling sites, some parameters of the water quality were measured in-situ, including pH, temperature, DO, conductivity, ORP, TDS, turbidity, by using water quality checker (WQC) HORIBA. Meanwhile, TSS was processed in the laboratory.
2.2. Data analysis
The ecology of the macrozoobenthos community including taxa richness, abundance, diversity index, and evenness index were analyzed [18].

2.2.1. Taxa number and diversity index. Shannon-wiener diversity index and Evenness index were calculated to understand the population dynamics within the macrozoobenthos community. The diversity index and the evenness index are calculated by MVSP software 3.22. The Shannon Diversity Index formula as follow (H'):

$$H' = - \sum \frac{n_i}{N} \log_2 \frac{n_i}{N}$$  

2.2.2. Corellation of the diversity index and water quality. Pearson product moment was used to analyze the correlation between the diversity index and environment variables. The calculation was processed by using STATISTICA version 10 (STATSOFT). Meanwhile, similarity within the community was calculated by CAP-6 for ANOVA-Similarity (ANOSIM) to show if there any significan difference of macrozoobenthos among the locations.

2.2.3. Environmental variables analysis. The analysis of environmental variables contribution to macrozoobenthos community composition was calculated by using MVSP 3.22. Meanwhile, Kruskal-Wallis analysis has been used to find out the significant difference in water quality parameters among locations.

Figure 1. The location of sampling sites in Situ Cikaret urban lake.
3. Results and discussion

3.1. Spatiotemporal of community assemblage

In general, 22 taxa of macrozoobenthos were found from Situ Cikaret urban lake samples in 2019. It represents groups of oligochaetes, insects, gastropods, and bivalves. Totally, 2,147 was collected during the research, whereas the individual numbers varied from 5 to 600 individuals in each.

Table 1. The individual number of macrozoobenthos family groups (ind/m²).

| Groups       | Families            | Site 1 | Site 2 | Site 3 | Site 4 | Site 5 |
|--------------|---------------------|--------|--------|--------|--------|--------|
|              |                     | A      | B      | C      | A      | B      | C      | A      | B      | C      |
| Oligochaetes | Tubificidae         | 471    | 643    | 20     | 37     | 11     | 26     | 6      | 0      | 46     | 44     | 63     | 19     | 17     |
|              | Naididae            | 0      | 1      | 2      | 1      | 12     | 1      | 0      | 5      | 2      | 4      | 9      | 12     | 1      |
|              | Glossiphoniidae     | 0      | 0      | 6      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 2      | 0      | 0      |
| Insects      | Chironomidae        | 2      | 0      | 0      | 1      | 0      | 2      | 0      | 0      | 0      | 0      | 0      | 2      | 1      |
|              | Coleoptera          | 0      | 0      | 0      | 1      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      |
| Gastropods   | Viviparidae         | 0      | 6      | 2      | 13     | 62     | 18     | 0      | 0      | 12     | 24     | 33     | 17     | 46     |
|              | Thiaridae           | 0      | 1      | 0      | 48     | 175    | 22     | 0      | 0      | 15     | 7      | 5      | 114    | 22     |
|              | Ampullariidae       | 0      | 0      | 1      | 0      | 0      | 0      | 0      | 0      | 1      | 0      | 0      | 10     | 12     |
|              | Planorbidae         | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 1      | 0      | 0      | 1      | 8      |
| Bivalves     | Corbiculidae        | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 2      |
| TOTAL        |                     | 473    | 651    | 31     | 101    | 260    | 70     | 6      | 5      | 75     | 79     | 111    | 177    | 109    |

*Notes: A = March week I, B= March week III, C= April week I*

Table 1 shows that the community comprising 9 families (Tubificidae, Naididae, Glossiphoniidae, Chironomidae, Thiaridae, Viviparidae, Ampullariidae, Planorbidae, Corbiculidae) and 1 ordo (Coleoptera). Overall, the sampling was conducted 3 times in each location. However, there were no macrozoobenthos found in the sites 3 in March week III and site 5 in March week III. The second sampling (March week I) was the time at which the most macrozoobenthos were found. Furthermore, Tubificidae was the most dominant in Situ Cikaret, which about 65% has been found during sampling. Two other dominant families were Thiaridae (19%) and Viviparidae (11%). Meanwhile, Coleoptera was the least in the number of individuals.

It can be seen from table 2, that Oligochaetes comprising 8 genera of worms, they are Limnodrillus, Branchiura sowerby, Dero, Uncinais, cf Nais, cf Haemonais, Branchiodrillus, and cf Specaria. However, some individuals can not be identified to the level of genus (the unknown Tubificidae and Naididae). In addition, one genus of freshwater leech was identified as Placobdelloides. Oligochaetes, particularly Limnodrillus and Branchiura sowerby almost have always been found in every location. Moreover, Limnodrillus was abundant in every location.

In another aspect, mollusc comprised the group of gastropods and bivalves. Further, 7 genera were successfully identified from gastropods, they are Thiara, Melanoïdes, Tarebia, Filopaludina, Pomacea, Ameriana, and Planorbis. Meanwhile, there was only one genus of bivalves, Corbicula.

In contrast, groups of insects representing only Chironomidae and Coleoptera. These two were found neither in large numbers of individuals nor in the variation. Chironomidae consists of Chironomus and Kiefferulus, while Coleoptera could not be identified into genus level.
Table 2. Taxa distribution.

| Periods* | Site 1 | Site 2 | Site 3 | Site 4 | Site 5 |
|----------|--------|--------|--------|--------|--------|
|          |       | A      | B      | C      | A      | B      | C      | A      | B      | C      |
| **Brachyura** |       | *      | **     | *      | **     | *      | **     | **     | **     | **     |
| **Tubificidae** |       |       |       |       |       |       |       |       |       |       |
| **Limnodrillus** |       | ****   | ****   | **     | **     | **     | **     | **     | **     | **     |
| **Dero** |       |       |       |       |       |       |       |       |       |       |
| **Branchiodrillus** |       | *      |       |       |       |       |       |       |       |       |
| **Uncinai** |       |       |       |       |       |       |       |       |       |       |
| **Haemonais** |       |       |       |       |       |       |       |       |       |       |
| **cf Nais** |       |       |       |       |       |       |       |       |       |       |
| **cf Specaria** |       |       |       |       |       |       |       |       |       |       |
| **Naididae** |       |       |       |       |       |       |       |       |       |       |
| **Placobdellodeis** |       |       |       |       |       |       |       |       |       |       |
| **Chironomous** |       |       |       |       |       |       |       |       |       |       |
| **Kiefferulus** |       |       |       |       |       |       |       |       |       |       |
| **Coleoptera** |       |       |       |       |       |       |       |       |       |       |
| **Filopaludina** |       | *      |       |       | **     | **     | **     | **     | **     | **     |
| **Thiarai** |       |       |       |       |       |       |       |       |       |       |
| **Melanoides** |       | **    |       | **     | **     | **     | **     | **     | **     | **     |
| **Tarebia** |       |       |       |       |       |       |       |       |       |       |
| **Pomacea** |       | *      |       |       | *      |       |       | *      |       | **     |
| **Ameriana** |       |       |       |       |       |       |       |       |       |       |
| **Indoplanorbis** |       |       |       |       |       |       |       |       |       |       |
| **Corbicula** |       |       |       |       |       |       |       |       |       |       |

*Notes: A = March week I, B = March week III, C = April week I
*: individual ≤ 10; **: 10 < individual ≤ 100; ***: 101 < individual ≤ 200; ****: >200

3.2. Macrozoobenthos metrics

The result of the ecological analysis can be observed in Figure 2. It was noticeable that there was a trend of the inclining number of taxa from the first (March week I) and the last (April week I) period of sampling. The least number of taxa was noted in Site 3 in all periods of sampling, which were 1 taxon in the period of March and 2 taxa in April. Meanwhile, the most number of taxa was in Site 5 for about 13 on the period sampling of March week of III.

![Figure 2](image-url)

*Notes: A = March week I, B = March week III, C = April week I

Figure 2. From left to right are Shanon-wiener index, Evenness index, and a number of taxa.
The diversity index ranged from 0 to 0.79, which means that it ranged from low to moderate in diversity. The increase of this index comprised the variation of the macrozoobenthos in the field. The low diversity can be affected by several factors. The type and its variety probably could be the one factor. However, we did not analyze the type of bottom substrate in this study. Meanwhile, the occurrence of macrophytes has also impacted this community since this gives attachment area as a microhabitat for the bottom fauna, particularly for gastropods [19]. Macrophytes seem to exist in locations 4 and 5 in Cikaret urban lake, however, it can be explained that the abundance of gastropods and the diversity index relatively high compare to the other locations. Furthermore, the Evenness index ranged from 0.1 to 0.9, which can be explained that 0.1 means macrozoobenthos were unevenly distributed and 0.9 means macrozoobenthos were well distributed in all of the locations.

Table 3. The result of ANOSIM.

| Grup 1     | Grup 2     | P Value | P (%) | Sample stat. (r) |
|------------|------------|---------|-------|------------------|
| Group 1    | Group 2    | 0.05    | 10    | 0.51             |
| Group 1    | Group 3    | 0.10    | 10    | 0.75             |
| Group 1    | Group 4    | 0.25    | 50    | 0.33             |
| Group 1    | Group 5    | 0.20    | 20    | 0.67             |
| Group 2    | Group 3    | 0.10    | 10    | 0.71             |
| Group 2    | Group 4    | 0.15    | 30    | 0.18             |
| Group 2    | Group 5    | 0.80    | 80    | -0.33            |
| Group 3    | Group 4    | 0.10    | 10    | 0.58             |
| Group 3    | Group 5    | 0.16    | 333   | 0.25             |
| Group 4    | Group 5    | 0.10    | 10    | 0.75             |

The similarity of macrozoobenthos among locations has been analyzed by using CAP-6 for ANOVA-Similarity (ANOSIM). The result of ANOSIM shows in table 3 that there is no p<0.05, which means that no significant difference of macrozoobenthos that were found among locations in the Cikaret urban lake. In another word, the groups of macrozoobenthos are similar between each sampling site based on the analysis.

3.3. Physicochemicals lake condition

Environmental variables of the Cikaret urban lake as illustrated in table 4. Meanwhile, Pearson correlation analysis between environmental variables and the community show significant differences in dissolved oxygen, pH, water temperature, and turbidity (p<0.05). A strong correlation was shown between those four variables with Pearson correlation respectively, are 0.61, 0.62, 0.6192, and 0.619 (0.5-0.69 = strong correlation).

The diversity index of macrozoobenthos has a linear correlation with the dissolved oxygen (DO). The low DO associate with low diversity. In addition, based on the measurement results, most of the DO levels in Situ Cikaret did not meet the standard or below 4 mg/L. However, based on Government Regulation of Indonesian Republic No. 82 [20] concerning Water Quality Management and Water Pollution Control, the dissolved oxygen (DO) quality standard for category II waters is a minimum of 4 mg/L. Only site 3 where DO levels meet the quality standards, which is exceeding 4 mg/L. Sites 2 and 4 had exceeded the DO standard, respectively 4.52 mg/L and 4.71 mg/L. The lowest DO level occurs at site 1, where is around 1 mg/L. The low DO level reflected poor oxygenation in the lake. This condition limiting macrozoobenthos to inhabit and resulting intolerant taxa such as Oligochaeta, Glossiphoniidae, and Chironomids can survive [21]. The low oxygen level in Cikaret lake resulted in Tubificidae as the predominant taxa. However, the low of DO concentration in Cikaret urban lake had been recorded for almost a decade, since in 2010 around 3.59–4.33 mg/L [5] then it continue to decline to 2.9 mg/L on
average in 2019. On the contrary, the high level of dissolved oxygen will support the high level of diversity of biota [22].

**Table 4. Environmental variables in Situ Cikaret.**

| Sites | Periods | Temp (°C) | pH | ORP (mv/sec) | Cond. | Turb (NTU) | DO (ppm) | TDS (mg/L) | TSS (mg/L) | Clarity (m) | Depth (m) |
|-------|---------|-----------|----|--------------|-------|------------|----------|------------|------------|-------------|---------|
| 1     | A       | 27.22     | 7.40 | 107  | 0.086 | 28.4      | 1.08     | 0.0560     | 12         | 0.35       | 0.35    |
|       | B       | 28.68     | 6.90 | 66   | 0.092 | 24.8      | 1.67     | 0.0600     | 5          | 0.30       | 0.30    |
|       | C       | 29.10     | 7.26 | 15   | 0.010 | 72.6      | 1.04     | 0.0890     | 7          | 0.15       | 0.35    |
| 2     | A       | 28.87     | 7.45 | 181  | 0.085 | 10.5      | 1.12     | 0.0550     | 4          | 0.73       | 0.93    |
|       | B       | 29.38     | 6.80 | 193  | 0.089 | 13.9      | 4.52     | 0.0580     | 4          | 0.50       | 0.50    |
|       | C       | 29.83     | 7.50 | 191  | 0.084 | 12.6      | 2.92     | 0.0550     | 7          | 0.65       | 0.75    |
| 3     | A       | 28.23     | 8.02 | 161  | 0.083 | 24.5      | 5.60     | 0.0054     | 8          | 0.47       | 3.50    |
|       | C       | 28.40     | 8.21 | 198  | 0.087 | 22.7      | 4.02     | 0.0560     | 7          | 0.44       | 1.40    |
| 4     | A       | 28.42     | 7.54 | 181  | 0.083 | 15.2      | 4.71     | 0.0540     | 8          | 0.55       | 1.17    |
|       | B       | 28.67     | 7.00 | 228  | 0.059 | 14.7      | 3.90     | 0.0580     | 5          | 0.88       | 1.00    |
|       | C       | 28.90     | 7.88 | 204  | 0.084 | 14.1      | 3.80     | 0.0550     | 6          | 0.50       | 1.40    |
| 5     | B       | 29.04     | 6.27 | 218  | 0.039 | 12.1      | 2.11     | 0.0390     | 1          | 0.65       | 0.86    |
|       | C       | 28.93     | 7.51 | 198  | 0.084 | 9.5       | 2.07     | 0.0550     | 6          | 0.65       | 0.75    |

Kruskal-walls test (H) 6.70  6.29  8.40  3.140  11.2  8.68  5.78  4.67  9.24  10.99  0.0550
Probability (p) 0.15  0.17  0.07  0.530  0.02**  0.06  0.216  0.32  0.06  0.03***

*Notes : A = March week I, B= March week III, C= April week I
** : 1 and 5
*** : 1 and 3

The pH value ranges between 6.2–8.2 in the Situ Cikaret urban lake. Pearson correlation analysis shows a linear correlation between diversity index and pH. It means the increase of pH associated with the increase of diversity of macrozoobenthos in the lake. Previous research shows that neutral pH leads to the maximum diversity of freshwater snails (gastropods) [23]. There were seven taxa of gastropods in Cikaret urban lake. Further, some macrozoobenthos associated with the pH condition, for example, the group of mollusk, related to the shell formation. On the other hand, previous research seems to have a negative correlation with diversity [24]. Situ Cikaret urban lake has functioned as a water reservoir for irrigating rice fields, for tourism, and for freshwater fish farming [25]. While, the land use nearby the lake were settlement, small scale industry, and public services such as hospital and the roadway. Some sewage and garbage are potentially affect pH. The data shows that the pH fluctuates in three sampling points, namely site 1, site 2, and site 4. These points have similar changes trend in pH values. In the second measurement, the pH value appears to decrease, then increase in the next measurement. Apart from being influenced by dissolved materials, the pH value can also be influenced by chemical reactions that occur in the water body.

Turbidity in Situ Cikaret waters ranges between 9.5 to 72.6 NTU. It has a linear correlation with the diversity of macrozoobenthos. In contrast, turbidity seems to have a negative correlation with the diversity in Lake Gala [21] and density in Himalaya [26]. Turbidity can be an indicator of suspended materials in the water which is usually in the form of organic material. The highest turbidity is measured at site 1, which is 72.6 NTU, followed by site 3 at 24.5 NTU. The turbidity values at the other points are fairly similar. The source of organic material at site 1 may come from catfish farming and nata de coco factory activities near the location. Organic material from catfish farming can be in the form of feed residue and fish manure, while the nata de coco factory may produce from untreated waste that contains...
As it is known, the production of nata de coco produces relatively acid waste and contains high organic materials [27].

Despite there being vegetation cover nearby the lake, the water temperature, in general, is close to 30°C. Building, settlement, and the roadway however are dominant land-use which are close to the lake. Nevertheless, aquatic biota can generally still grow in waters with temperatures up to 30°C [29]. Meanwhile, the water temperature has a linear correlation with the diversity of macrozoobenthos. This result contrasts with other research that the diversity shows a negative correlation on high temperature [28]. High temperature was not suitable for macrozoobenthos, since it impacted the physiological processes of the biota [29].

To analyze the similarity of water quality parameters among the locations, the Kruskal-Wallis analysis was used. There was a significant difference in turbidity between site 1 and 5 (p=0.02). However, based on the measurement, turbidity in site 1 were the highest which ranged from 24 NTU to 72 NTU. In contrast, water in site 5 were the least turbid, which ranged from 9 NTU to 12 NTU. Site 1 is inlet and located in Kebantenan stream. It seems due to the flow and the current, the water was very turbid. While in Site 5 is an outlet, which the water flow out through this site. In addition, a significant difference was also recorded for the Depth measurement between sites 1 and 3. Site 1 was recorded as the shallowest part by about 0.3 meters, meanwhile site 3 was the deepest part with the depth around 1 to 3.5 meters. Site 3 is in the center of the lake.

3.4. Canonical correspondence analysis of macrozoobenthos- water quality variables

The analysis of canonical correspondence was conducted to explain the correlation between the abundance of macrozoobenthos community and the water quality variables.

Figure 3 illustrates the ordination of canonical correspondence analysis. The CCA shows environmental variables including the water temperature, pH, ORP, Turbidity, DO, TDS, Depth were best correlated with axis 1. Meanwhile, the abundance of most families such as Tubificidae, Chironomidae, Viviparidae, Ampullaridae, Planorbidae, Corbiculidae has tendency towards the water temperature, pH, ORP, Turbidity, DO, TDS, Depth. In contrast with those, water qualities, conductivity, water clarity, and TSS shows tend to relate with the existence of the Naididae.
4. Conclusion
It can be summarized that the low in biota diversity particularly in the aspect of macrozoobenthos which show the instability of the community. It reflects that the condition of Cikaret urban lake is disturbed. The water quality of this lake does not favorable for biota except for those who have a wide range of tolerance. For instance, the low DO allows only pollutant tolerant of macrozoobenthos (for example Tubificidae) to exist in the lake. Moreover, this family was found in a high abundance. However, the type and the level of pollutants did not analyze in this study. Therefore, further research with more variables needs to be conducted. In addition, the lake needs better management otherwise the lake condition will continue to degrade.

Acknowledgements
Authors would like to thank Aldiano Rahmadya for the technical support. We also would like to thank Ms. Fajar Sumi Lestari as the technical staff for the help in the field.

References
[1] Persson J 2012 Urban lakes and ponds. In: Bengtsson L, Herschy R W, Fairbridge R W. (eds) Encyclopedia of Lakes and Reservoirs. Encyclopedia of Earth Sciences Series. Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-4410-6_15.
[2] Flores LN 2008 Urban lakes: Ecosystems at risk, worthy of the best care. Proceedings of Taal 2007: The 12th World Lake Conference. 1333-37.
[3] Supriyadi A, Syaufina L and Ichwandi I 2015 Evaluasi kebijakan pengelolaan Situ Cikaret, Kabupaten Bogor. Limnotek. 22 (1) 52 – 63.
[4] Suryanta S 2016 Kualitas situ di Kabupaten Bogor berdasar interpretasi data satelit penginderaan jauh serta pengaruhnya dalam pengendalian banjir Sungai Ciliwung. Prosiding Seminar Nasional Geografi UMS. 521-33.
[5] Lukman 2010 Kondisi perikanan perairan situ dan studi empat situ di wilayah Bogor. Prosiding Seminar Nasional Ikan VI. 371-79.
[6] Henny H and Meutia AA 2014 Urban lakes in megacity Jakarta: Risk and management plan for future sustainability. The 4th International Conference on Sustainable Future for Human Security. SustainN 2013. Procedia Environmental Sciences 20 737–46.
[7] Bhatnagar A and Devi P 2013 Water quality guidelines for the management of pond fish culture. International Journal Of Environmental Sciences (3) 6 1980-2009.
[8] Sudarso J and Wardiatno Y 2015 Penilaian status mutu sungai dengan indikator makrozoobentos. Pena Nusantara. Pp 1-397.
[9] Bezmaternykh DM 2018 Effect of anthropogenic pollution on macrozoobenthos structure in Barnaulka River (Upper Ob Basin). Water Resources 45 (1) 89–97.
[10] Fierro P, Bertrán C, Mercado M, Peña-Cortés F, Tapia J, Hauenstein E and Vargas-Chacoff L 2006 Using benthic macroinvertebrates to assess ecological status of lakes current knowledge and way forward to support WFD implementation. Revista de Biología Marina y Oceanografía.
[11] Gawad SSA 2019 Using benthic macroinvertebrates as indicators for assessment of the water quality in River Nile, Egypt. Egyptian Journal Of Basic And Applied Sciences 6 (1) 206–19.
[12] Solimini A, Solimini G, Free G, Donohue I, Irvine K, Pusch M, Rossaro B, Sandin L and Cardoso AC 2006 Using benthic macroinvertebrates to assess ecological status of lakes current knowledge and way forward to support WFD implementation. European Commission Directorate-General Joint Research Centre Institute for Environment and Sustainability.
[13] Merritt WR and Cummins KW 1996 An introduction to the aquatic insects of North America. Iowa: Kendall/ hunt Publishing Company.
[14] Epler JH 2011 Identification manual for the larval Chironomidae (Diptera) pf North & South Carolina. North Carolina : North Carolina Department of Environment and Natural Resources Division of Water Quality: 1.1-9.18.
[15] Kathman RD and Brinkhurst RO 1999 Guide to the freshwater oligochaetes. Aquatic Resources Center, USA.

[16] Yule CM and Sen YH 2004 Freshwater invertebrates of the Malaysian region. Malaysia: Universiti Sains Malaysia 162-74.

[17] Marwoto RM, Isnaningsih AR and Mujiono 2011 Keong air tawar Pulau Jawa (Moluska, Gastropoda). Pusat Penelitian Biologi LIPI. pp 1-16.

[18] Krebs CJ 1978 Ecology: The experimental analysis of distribution and abundance. Harper and Row Publisher, New York.

[19] Trajanovski S, Gjoreska BB, Trajanovska S, Talevska1 M and Zdraveski K 2016 Macrophyte vegetation as a structuring factor of the macrozoobenthic communities in Lake Ohrid. BOTANICA serbica 40 (2): (2016) 145-151.

[20] Government Regulation of Indonesian Republic No.82. 2001. Concerning water quality management and water pollution control.

[21] Elipek BC, Arslan N, Kirgiz T, Öterler B, Güher H, Özkan N 2010 Analysis of benthic macroinvertebrates in relation to environmental variables of Lake Gala, a national park of Turkey. Turkish Journal of Fisheries and Aquatic Sciences 10: 235-243.

[22] Merritt RW, Cummins KW, Berg MB, Novak JA, Higgins MJ, Wessell KJ and Lessard JL 2002 Development and application of a macroinvertebrate functional-group approach in the bioassessment of remnant river oxbows in southwest Florida. J. N. Am. Benthol. Soc., 2002, 21(2):290–310.

[23] Spyra A 2017 Acidic, neutral and alkaline forest ponds as a landscape element affecting the biodiversity of freshwater snails. Sci Nat 104: 73

[24] Custodio M, Chanaméa F, Pizarro S and Cruz D 2018 Quality of the aquatic environment and diversity of benthic macroinvertebrates of high Andean wetlands of the Junín region, Peru. Egyptian Journal of Aquatic Research 44 (2018) 195–202.

[25] Nugraheni CT, Pawitan H, Purwanto YJ and Ridwansyah I 2019 Neraca air Situ Cikaret dan Situ Kabantenan di Kabupaten Bogor menggunakan pemodelan hidrologi SWAT. Limnotek-Perairan Darat Tropis di Indonesia 26 (2).

[26] Sharma RC and Rawat JS 2008 Monitoring of aquatic macroinvertebrates as bioindicator for assessing the health of wetlands: A case study in the Central Himalayas, India. Ecological indicators 9 (2009) 118–128.

[27] Said NI and Widayat W 2020 Uji kinerja pengolahan air limbah industri nata de coco dengan proses lumpur aktif. Jurnal Air Indonesia 11 (2).

[28] Ngode SO, Raburu PO and Achieng A 2014 The impact of water quality on species diversity and richness of macroinvertebrates in small water bodies in Lake Victoria Basin, Kenya. Journal of Ecology and the Natural Environment. 6 (1): 32-41.

[29] Enagwaw Y and Lemma B 2019 Ecological conditions and benthic macroinvertebrates of Lake Tinishu Ababya, Ethiopia. Oceanography and Fishery Open Access Journal 10 (2): OFOAJ.MS.ID.555782.