

Diversity Genera of Coliforms Bacteria in Buyan Lake

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Abstract—The cleanliness of the water is the main requirement for the health. Microbiological parameter is one of the parameters that should get the attention because its impact is dangerous, that can cause infectious diseases. Most coliforms bacteria do not cause disease, but its presence can indicate the presence of pathogenic organisms. The purpose of this research is the exploration genera of coliforms bacteria in Buyan lake Buleleng of Bali. The diversity genera of coliforms in the water of Buyan, has grown in NA and *Escherichia coli* in EMBA. A method based on the results identification genera of coliforms bacteria in 10 locations based on biochemical test reactions using IMVIC test and identification key of the Manual of Bergey's Determinative Bacteriology and MPN value. The results are indicated that there were eight genera of coliforms bacteria found in Buyan lake water include *Erwinia*, *Cedecea*, *Citrobacter*, *Escherichia*, *Hafnia*, *Proteus*, *Enterobacter*, and *Klebsiella*.

Keywords—Buyan lake; coliforms; diversity; general.

I. INTRODUCTION

Water hygiene is the main requirement for health. Clean water or drinking water must meet the requirements of physical, chemical, microbiology and radioactive. The microbiological parameter is one of the parameters that must get attention because of its harmful effects that can cause infectious diseases [1].

According to [2] water sources used by households in Indonesia as drinking water: water well (24.7%), pipes (14.2%), Wells/pumps (14.0%), and refill Depot (13.8%). Based on urban occupancy as well as the main rural water resources for drinking quite diverse, households in urban areas use well water/pumps (32.9%), and PDAM/PDAM (28.6), while communities in rural areas use well water (32.7). Water quality can be reviewed physically, chemically, and bacteriology. Given the importance of clean water for the community, then water must fulfill some requirements to be

declared as water worthy to be used for various general purposes.

Water is easily polluted by pathogenic microorganisms entering through waste. The provision of drinking water must fulfill the requirements following the regulation of [3]. To achieve existing quality standards, raw water should be processed and processed according to the characteristics of the water. The need for water consumption should be generally tasteless, colorless, odorless and contain no heavy metals.

Based on [4] on environmental quality standards and the raw criteria for environmental damage, the presence of microbes in water becomes one of the indicators used to determine water quality. [5] stated according to the provisions of WHO (World Health Organization) and APHA (American Public Health Association), water quality is determined by the presence and number of bacteria, among others coliform. The higher the level of coliform bacterial contamination, the higher the risk of other pathogenic bacteria presence. Symptoms of diseases that may arise from the pathogens include diarrhea, fever, stomach cramps, and vomiting.

Coliform is a fecal bacterium derived from animals including humans. One of the group's coliform bacteria is *Escherichia coli*, which is a bacterial commensalism on the human colon and is generally not pathogenic, but when in water contaminated by *E. coli* bacteria contained in the stool if consumed continuously in the long term will have an impact on the onset of diseases such as inflammation of the intestines, diarrhea, urinary tract infections, and bile. *Escherichia coli* is the best biological indicator of the safety of drinking water [6], as a (bioindicator) pollutant environment [7], and microorganisms show pollutants by pathogenic bacteria namely *Escherichia coli* [8].

Buyan Lake is located in the village of Pancasari, district of Sukasada, Buleleng Regency, province of Bali. This lake is

one of the 3 twin lakes that are formed inside a large caldera flanked by 2 lakes namely Tamblingan Lake in the west which includes the village of the Munduk, district of Banjar, regency of Buleleng and Beratan lake in the east which is included to Tabanan Regency, Province of Bali. Between the Buyan and Tamblingan Lake separated by a forest for approximately 1 kilometer, there is a pond that is directly connected to the Buyan Lake through a narrow canal that is Telaga Aya. Based on [9], Buyan Lake includes Caldera Lake which was formed due to volcanic eruptions and the ruins of Mount Beratan and Buyan Purba. It can be seen from the north side wall of a steep lake and form a rugged cliff.

Buyan lake area is a tourist area with the availability of several villas, recreation places for fishing, and camping areas on the shores of Buyan Lake, residential areas, and plantations. All activities undertaken in the area of Buyan lake affect the ecosystem of Buyan Lake has suffered high environmental quality degradation. The eastern, southern and southwestern areas of the lake have been increasingly shallow and grew with lush water hyacinth plants. This increasingly shallow lake occurs mainly due to the high level of erosion during the rainy season. The land that comes from rain carries streams of water to the lake. This situation is increasingly exacerbated by the condition of the lake because there is no water flow out so polluters will experience accumulation. Besides, the utilization of the lake area can be one of the causes of lake water pollution. [10].

II. METHODS

The research design was descriptive. The research subject was whole waters in Buyan lake village of Pancasari, district of Sukasada and regency of Buleleng. The research object is 250 ml of the Buyan lake water samples taken at 10 water sampling stations.



Fig. 1. Water samples taken at 10 sampling stations of Buyan lake

Samples were taken in duplo at each station. Most Probable Number (MPN) with the 333 series tubes grow in lactose broth was used to determine the quality of water lake. Quality test consists of phases namely presumptive test (grown bacteria di lactose broth), confirmed test (grown *E.coli* bacteria in Eosin Methylene Blue Agar (EMBA)) and completed test (grown in slant Nutrient Agar medium, lactose broth and Grams stain). To identify genera of bacteria isolated in Buyan Lake grown on Nutrient Agar (NA) medium and compared with Bergey's Manual Determinative of Bacteriology 9th edition [11]. The microbiological data of Buyan lake water was collected with microbiological procedures according to [12] and [13]. Identification of bacterial morphology based on [12] and based on biochemical tests of IMViC (Indole, Motility, Voges-Proskauer, Citrate Utilization and Catalase test) [12] and compared to Bergey's Manual Determinative of Bacteriology 9th edition [11]. Data Analysis Methods.

Data on the microbiological waters of Buyan Lake, among others: 1) Most Probable Number (MPN) based on a total coliform analyzed by comparing the value of MPN table and water quality according to [14], [15] and [3], [16] and [17]. 2) Absence of *E. coli* bacteria from the observation results of macroscopic and microscopic colonies analyzed descriptively. 3) Identification of a genera of bacteria that grows on the NA medium depicted descriptively.

III. RESULTS AND DISCUSSION

4) Results Most Probable Number(MPN) Buyan Lake

MPN is a method done to determine the existence of coliform bacteria and *E. coli* as an indicator of water pollution by hot-blooded animal feces in water samples. MPN consists of three stages, namely the presumptive test, the confirmed test, and a completed test. The MPN method is used to figure out the number of coliform bacteria in a liquid-shaped sample, although it can also be used for solid-shaped examples by first dilution [13]. The value of MPN obtained in research that was done at 10 stations is listed in the table I.

TABLE I. MPN COLIFORM VALUE IN EACH RESEARCH STATION ACCORDING TO MPN TABLE OF [13], [16], [17], [12] BY HAVING INCUBATION 2 X 24 HOURS.

Stations	Change							MPN index per 100 ml	95% confidence range
	Color			Gases forms					
	10 ml	1 ml	0.1 ml	10 ml	1 ml	0.1 ml			
1	Change color of medium (3 tubes)	Change color of medium (3 tubes)	Change color of medium (3 tubes)	3+	3+	3+	>1100	420- -----	
2	Change color of medium (3 tubes)	Change color of medium (1 tube)	Change color of medium (1 tube)	2+	1+	1+	20	4,5-42	
3	Change color of medium (3 tubes)	Change color of medium (3 tubes)	Change color of medium (2 tubes)	3+	3+	2+	1100	180-4100	
4	Change color of medium (3 tubes)	Change color of medium (3 tubes)	Change color of medium (3 tubes)	3+	3+	3+	>1100	420- -----	
5	Change color of medium (3 tubes)	Change color of medium (2 tubes)	Change color of medium (3 tubes)	3+	2+	3+	290	90-1000	
6	Change color of medium (3 tubes)	Change color of medium (2 tubes)	Change color of medium (0 tube)	3+	2+	0	93	18-420	
7	Change color of medium (3 tubes)	Change color of medium (1 tube)	Change color of medium (1 tube)	2+	1+	1+	20	4,5-42	
8	Change color of medium (3 tubes)	Change color of medium (3 tubes)	Change color of medium (3 tubes)	3+	3+	3+	>1100	420- -----	
9	Change color of medium (3 tubes)	Change color of medium (3 tubes)	Change color of medium (3 tubes)	3+	3+	3+	>1100	420- -----	
10	Change color of medium (3 tubes)	Change color of medium (3 tubes)	Change color of medium (3 tubes)	3+	3+	3+	>1100	420- -----	

After the observation was followed by presumptive test from the tube containing the lactose broth medium and there has been discoloration and gas formed in the tube of Durham, by having been grown to a selective medium for *E. coli* bacteria that is EMBA (table 2 and figure 2) and completed test (table 3), has been carried out incubation 1-2 x 24 hours.



Fig. 2. Grown of *E. coli* colony in EMBA medium and Gram stain

TABLE II. CHARACTERISTICS GROWN OF CONFIRMED AND COMPLETED TES

Stations	Confirmed test (<i>E.coli</i> bacteria)	Completed test
1	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
2	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
3	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
4	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
5	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
6	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
7	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
8	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
9	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)
10	Green metallic (was showed by arrow in figure 2)	Slant NA (+),LB formed gas and change of color (+)

TABLE III. RESULT OF COMPLETED TEST




Growth of bacteria after incubation 1 x 24 hour isolated from EMBA	
Growth of bacteria in slant agar isolated from EMBA	
Gram stain from slant agar	

TABLE IV. CHARACTERISTIC COLONY BACTERIA GROWN ON NA MEDIUM

Station	Characteristic of colonies				
	Pigmentation	Forms	Margin	Elevation	Surface of colonies
1	-White (shiny), milk white, Yellow	-Circular -Irregular	-Entire -Undulate	-Convex, Umbonate	-Smooth, Shiny
2	-White (shiny), milk white, White Yellowish	-Circular -Irregular - Rhizoid	-Entire, Undulate, Lobate, Serrate -Filamentous	-Convex, Umbonate, Lobate, Flat	-Smooth, Shiny, Rough
3	-White , milk white -Yellow	-Circular -Irregular - Rhizoid	-Entire, Undulate, Lobate, Serrate	-Convex, Umbonate, Flat	-Smooth, Shiny, Rough
4	-White -Clear -White Yellowish	-Circular -Irregular	-Entire, Undulate, Lobate, Serrate	-Convex, Umbonate -Flat	-Smooth, Shiny, Rough
5	-White, milk white, Clear purplish, Clear	-Circular -Irregular	-Entire, undulate, Lobate, serrate	-Convex, Umbonate, Flat	-Smooth, Rough
6	-White - Milk white - Clear - Purplish transparant	-Circular -Irregular	-Entire, Undulate, Lobate, Serrate, Filamentous	-Convex -Umbonate -Flat	-Smooth -Rough
7	-White -Milk white - Clear - Yellow	-Circular -Irregular	-Entire -Undulate -Lobate -Serrate	-Convex -Umbonate -Flat	-Smooth -Rough
8	- Clear, White, Orange, Milk white	-Circular -Irregular	-Entire, Undulate, Lobate, Serrate, Filamentous	-Convex -Umbonate -Flat	-Smooth -Rough
9	-Clear, White, White yellowish	-Circular -Irregular	-Entire, Undulate, Lobate, Serrate	-Convex, Umbonate, Flat	-Smooth -Rough
10	-Clear, White, White yellowish	-Circular, Irregular	-Entire, Undulate, Lobate, Serrate	-Convex, Umbonate, Flat	-Smooth -Rough

The result of observation on colony bacteria that grown on NA medium as table 4. The result of biochemical reaction on IMViC medium as table 5. The result of identification of bacteria based on [11] as table 6.

TABLE V. IMVIC TEST

Test	Indol test	Methyl Red (MR) test	Voges-Proskauer (VP) test	Citrate utilization test	Hydrogen Sulfide test		Motility test	Catalase test
Medium	Tryptophan Broth	MR Broth	VP Broth	Simmons Citrate Agar	Slant TSI Agar	TSI Agar (puncture)	TSI Semi solid	
Reagents	Kovacs	Methyl Red Solution	Barrit's Reagent/ Alfa naftol	-	-	-	-	Hydrogen Peroxide (H ₂ O ₂)
S1K1	-	+	+	+	+	+	-	+
S1K2	-	+	-	+	+	+	+	-
S1K3	-	+	+	+	+	-	+	+
S1K4	-	+	+	+	-	+	+	+
S1K5	-	+	+	-	+	-	-	+
S1K6	+	+	-	+	-	+	+	+
S1K7	-	-	+	+	-	+	-	+
S1K8	-	+	+	-	+	+	-	+
S1K9	-	+	+	+	+	-	-	+
S1K10	+	+	+	+	+	+	-	+
S1K11	+	+	-	+	+	-	-	-
S1K12	-	+	+	-	-	-	-	+
S1K13	-	+	+	-	+	-	-	+
S2K1	-	+	-	+	+	-	-	+
S2K2	-	+	-	+	+	-	-	+
S2K3	+	+	+	+	+	-	+	+
S2K4	-	+	+	+	+	-	+	+
S2K5	+	+	+	+	-	+	-	+
S3K1	-	+	+	-	-	-	+	+
S3K2	-	+	+	+	-	-	-	+
S3K3	-	+	+	+	-	-	-	+
S3K4	-	+	+	-	-	-	-	+
S3K5	-	+	+	-	-	+	-	+
S3K6	+	-	+	+	+	-	-	-
S3K7	-	+	+	+	-	-	-	+
S3K8	-	+	+	+	-	-	-	+
S5K1	+	+	+	+	+	+	-	+
S6K1	-	-	+	+	-	-	+	+
S6K2	-	-	+	+	-	-	-	+
S8K1	-	-	+	+	-	-	-	+

TABLE VI. GENERA OF BACTERIA ON BUYAN LAKE

Stasions and Colonies	Genera
S1K1	Not include <i>Enterobacteriaceae</i> familia
S1K2	Not include <i>Enterobacteriaceae</i> familia
S1K3	Erwinia
S1K4	<i>Cedecea</i>
S1K5	Not include <i>Enterobacteriaceae</i> familia
S1K6	Citrobacter
S1K7	Citrobacter
S1K8	Not include <i>Enterobacteriaceae</i> familia
S1K9	Not include <i>Enterobacteriaceae</i> familia
S1K10	Not include <i>Enterobacteriaceae</i> familia
S1K11	Not include <i>Enterobacteriaceae</i> familia
S1K12	Not include <i>Enterobacteriaceae</i> familia
S1K13	Not include <i>Enterobacteriaceae</i> familia
S2K1	<i>Leclercia (Escherichia)</i>
S2K2	<i>Leclercia (Escherichia)</i>
S2K3	Not include <i>Enterobacteriaceae</i> familia
S2K4	<i>Proteus</i>
S2K5	Not include <i>Enterobacteriaceae</i> familia
S3K1	<i>Havnia</i>

Stasions and Colonies	Genera
S3K2	<i>Klebsiella</i>
S3K3	<i>Klebsiella</i>
S3K4	<i>Havnia</i>
S3K5	<i>Havnia</i>
S3K6	Not include <i>Enterobacteriaceae</i> familia
S3K7	<i>Klebsiella</i>
S3K8	<i>Klebsiella</i>
S5K1	Not include <i>Enterobacteriaceae</i> familia
S6K1	<i>Enterobacter</i>
S6K2	<i>Citrobacter</i>
S8K1	<i>Citrobacter</i>

B. Discussion

Table 1 shows the value of MPN Buyan lake has indicated that the water of Buyan lake does not fulfill the requirements as drinking water according to [14], and [3] on the number of *E. coli* bacteria and the total coliform per 100 ml sample is 0 for drinking water. Meanwhile, according to [15] on water quality management and water pollution control for the 10 stations has a different MPN index value and has a distinct water grade quality. Water quality management is a water maintenance effort so that the desired water quality is achieved to ensure that the quality of water remains in its natural condition. The results of the analysis that has been done on the stations 2, 5, 6, 7 include grade 1 because the value of coliform MPN qualitative still under the threshold of total coliform allowed which is 1000 per 100 ml of water. The results of the analysis that has been done at the station 3 classified as quality water grade 2 is still under 5000 per 100 ml of water. The results of the analysis that has been done on stations number 1, 4, 8, 9 and 10 are likely to be quality water grade 2.3 or 4 because the value of MPN/100 ml more than 1100 with coliform range 420-----[16]. The amount in detail is not done, because the smaller dilution is not performed.

Results of bacterial growth in the EMBA media and Gram staining of the lactose broth medium, indicating that the *E. coli* bacteria are identified from the Buyan lake water. *Escherichia coli* is the best biological indicator of the safety of drinking water [6] and as (bioindicator) of environmental pollutants [7] indicating the water is contaminated by pathogenic bacteria [18]. *Escherichia coli* is a bacterium derived from animal or human impurities, while *Enterobacter aerogenes* are usually found in animals or tilled fields who have died [13].

According to [14], coliform bacteria that are eligible for clean water instead of piping are < 50 MPN. In general, the water of Buyan lake has not fulfilled the requirements as clean water according to [14] because most of the value of MPN exceeds from 50 (Stations 1, 3, 4, 5, 6, 8, 9,10).

Based on the water sampling location, Station 1 is the sampling point closest to the land (residential and plantation). The distance between settlements and public bathrooms with the lake is very close to about 20 to 50 meters, while the closest distance between the lake and the plantation area is about 15 meters. According to [19] the source of water must be at least 15 meters and located higher than the source of pollution such

as a latid, livestock cage, garbage bin, and so on. While the situation in the area of Buyan Lake that has been observed shows that public toilets and residents housing is located higher than the lake. So that pollutants are very likely to seep towards the lake even though the distance of the lake with the pollutant source is above the minimum limit. In addition, at Station 1, it has been observed to show that many organic and inorganic waste deposits are found.

Observation results have shown that station 2 is close to Station 1 so that the possible garbage and contaminants found on station 1 are carried to station 2. Station 3 is located close to Station 2 and is in the location of fish cage. The 4-site station is also a fish cage. Location 5 is close to the cliffs. Stations 6 and 7 are the sampling locations on the lakeside near the cliffs. The 8,9 and 10 stations are further away with residential settlements, but close to the camp site.

Bacteria of the Genera *Erwinia* were identified in the S1K3 colony. The genera of bacteria *Cedecea* is identified in the S1K4 colony. The bacterial genera *Citrobacter* is identified in the colonies S1K6, S1K7, S6K2, and S8K1. The genera *Escherichia* bacteria have been identified in colonies S2K1 and S2K2. The bacteria genera *Proteus* has been identified in the S2K4 colony. Bacterial genera *Hafnia* has been identified in colonies of S3K1, S3K4, and S3K5. Bacteria genera *Klebsiella* have been identified in colonies of S3K2, S3K3, S3K7, and S3K8. Bacterial genera *Enterobacter* has been identified in the colony of S6K1. The results of the study showed that as many as 13 other bacterial colonies did not include coliform bacteria.

The Genera *Escherichia* gives a positive reaction to the indol test, has shown that this bacterium is able to hydrolyze tryptophan type amino acids with the help of the triptonase enzyme with the end result in the form of Indol. *Escherichia* has also shown positive results in the red methyl test and the cataloging test. Positive results of red methyl test have shown that these bacteria can ferment glucose and produce a variety of acidic products so that it will lower the pH of growth media to 5.0 or lower. This test is useful in identifying bacterial groups that occupy the digestive tract, such as coliform and *Enterobacteriaceae*. Positive results against the catalase test have shown that this bacterium has a catalase or peroxidase enzyme. Bacteria included in the genera *Escherichia* react negatively to the Voges-Proskueur test and do not use the citrate as a source of carbon [20]. Negative results in the Voges-

Proskueur test indicate that this bacterium does not produce a result of a base glucose metabolism such as asetoin (acetyl-methyl-carbonyl). Negative results in the use of citrate trials have shown that these bacteria are incapable of using the citrate as the only source of carbon and energy. In addition, these bacteria have also been able to produce gases from carbohydrate metabolism but do not produce H₂S. Characteristic of bacterial colonies in the genera *Escherichia* e.g. *Escherichia coli* which has grown in the EMBA medium, dark colored with green metallic, different from other Enterobacteriaceae family such as *Salmonella* and *Proteus* if growing on the medium. It will show a pink colony without any green metallic characteristics on the surface of its colony [21]. The presence of green metallic is caused because these bacteria can quickly produce lactose, so that the amount of acid (which is produced from fermentation) precipitate the dye substance on the surface.

The bacteria included in the genera *Erwinia*, *Cedecea*, *Klebsiella*, *Proteus*, and *Enterobacter* have been positively reaction to the Voges-Proskueur test, the citrate test, and the catalase test. This means that the bacteria genera *Erwinia*, *Cedecea*, *Klebsiella*, *Proteus*, and *Enterobacter* have been able to produce the results of a base glucose metabolism such as asetoine (acetyl-methyl-carbonyl), has been able to use the citrate as the only carbon and energy sources, and has been toxic to oxidising hydrogen peroxide (H₂O₂) with the help of catalase or peroxidase enzymes. In addition, the bacteria included in the genera *Erwinia*, *Cedecea*, *Klebsiella*, *Proteus*, and *Enterobacter* have been able to ferment lactose by producing gases and acids (reorganized in Public Health England, 2015). Bacteria genera *Klebsiella* and *Enterobacter* have reacted negatively to the indol test, red methyl test, and H₂S test. This means that the bacteria in the genera *Klebsiella* and *Enterobacter* do not have a triptonase enzyme so that it is unable to hydrolyze the amino acid type of tryptophan that has a side cluster indol, it cannot ferment glucose and produce various products that are acidic, and able to produce gases from carbohydrate metabolism but do not produce H₂S. Unlike the *Erwinia* bacteria which only reacts negatively to the indol test but reacts positively to the red methyl test and the H₂S test, *Cedecea* bacteria have reacted negatively to the indol and H₂S tests but have been positively reacted to the red methyl test. While bacteria genera *Proteus* had a negative action against the test of indol and methyl red but had reacted positively to the H₂S test. Typical characteristics that distinguish bacteria genera *Klebsiella* and *Proteus* with *Erwinia*, *Cedecea*, and *Enterobacter* are bacteria that include the genera *Klebsiella* and *Proteus* are not motil, while bacteria that include the genera *Erwinia*, *Cedecea*, and *Enterobacter* is motil.

The bacteria included in the *Citrobacter* genera has reacted negatively to the Voges-Proskueur test, and has reacted positively to the red methyl test and has been able to hydrolyze the catalysis, has used the citrate as a carbon source, it cannot produce indol, but it has been able produce H₂S. *Citrobacter* is able to ferment lactose into acids and gases. Bacteria belonging to the genera *Hafnia* are stem-shaped and gram-negative

bacteria, unable to produce indol and H₂S and cannot use citrate as an energy source. These bacteria have been able to ferment glucose and has produced a variety of acidic products, has been producing hydrogen peroxide (H₂O₂), has produced the results of glucose metabolism, which is alkaline and motile.

The existence of the non-faecal coliform bacteria such as *Klebsiella*, *Enterobacter*, *Proteus*, *Cedecea*, *Erwinia*, *Hafnia*, and *Citrobacter* in the Buyan lake water is a natural thing to happen. It is supported by [22] stating that bacteria belonging to the genera *Citrobacter*, *Enterobacter*, and *Klebsiella* have properties such as *Escherichia coli*, but more widely found in soil and water than in the intestines, that it is called "non-fecal". The same is also conveyed by [23], that bacteria belonging to the genera *Enterobacter* can live as a normal flora in human gastrointestinal tract, but it can also be found, in water, soil, food, and plants. *Erwinia* appears as a pathogenic in or in plants, partly living in insects, and some strains are opportunistic pathogenic bacteria in humans and animals.

Bacteria that belong to the genera *Klebsiella* are everywhere in nature, these bacteria are most commonly found in water and can breed in high nutrient-rich water to place these bacteria live, e.g. in waste pulp mills, textiles, and processing sugarcane. These bacteria are also excreted in healthy human feces and animals and are detected in sewage-contaminated water [24]. This is in accordance with the condition of Buyan Lake that has been observed to serve as a reservoir of rainwater shelter so that all the contamination originating from around the lake will be estuary to the lake. The contamination that rises to Buyan Lake can be derived from the waste of toilets and households, plantation waste, and waste derived from tilapia cultivation. [25] states that water containing *Klebsiella* and *Citrobacter* bacteria in large quantities if consumed can cause infections in the urinary tract, lungs, respiratory tract, and septicemia.

IV. CONCLUSION

As for some of the coclution that can be withdrawn from the results of the study include:

1. The total number of bacteria coliforms on Buyan lake water that has been done based on Most Probable Number method ranges from 20 – > 1100.
2. Has detected *E. coli* bacteria that pollute the waters of Buyan lake,
3. In the water of Buyan lake has found 8 bacterial genera coliform among others, *Erwinia*, *Cedecea*, *Citrobacter*, *Escherichia*, *Proteus*, *Hafnia*, *Enterobacter* and *Klebsiella*.

Based on the results of the research obtained can be given some advice as follows.

1. The community around the Buyan lake should not build a house too close to the lake, and to maintain the lake ecosystem by not wasting garbage in the lakeside area, not using pesticides containing hazardous compounds for plantations, and periodically cleans the lakeside areas of weed and garbage.

2. Society should not use lake water as drinking water directly or if want to use it should be done processing in advance in accordance with the prescribed health standards.
4. Local governments and related institutions are expected to try to reduce the likelihood of higher pollution in the future.

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