

**WATER QUALITY DISTRIBUTION IN SITU GUNUNG PUTRI
BOGOR REGENCY, INDONESIA**

ABSTRACT

The purpose of this study was to determine water quality distribution in Situ Gunung Putri. This research was conducted from February to March 2019, carried out in Situ Gunung Putri and at the Limnology Research Center of the Indonesian Institute of Sciences, both located in Bogor, West Java. The method used is the survey method. The results showed at the surface level, the temperature ranged between (28.14±0.52 and 30.61 ±1.76)°C, transparency between (0.38±0.12 and 0.65 ± 0.06) m, dissolved oxygen between (1.92 ±1.10 and 5.7± 2.55) mg / L, COD between (42.22± 9.86 and 54.09 ± 15.89), nitrate between (0.047 ± 0.009 and 0.05 ± 0.015) mg / L, phosphate of (0.015±0.002 and 0.022± 0.004) mg / L and pH between 7.11± 0.27 and 7.33 ±0.34). Meanwhile at the Secchi depth values of the temperature ranged between (2.93±0.71 and 29.96 ±1.71)°C, dissolved oxygen of(1.14 ±0.90 and 3.37±1.63) mg / L, nitrate of (0.045 ± 0.008 and 0.056 ± 0.019) mg / L, phosphate of (0.016±0.003 and 0.035± 0.043) mg / L and pH between (6.68± 0.33 and 7.11 ±0.28). Based on that values water quality except COD in Situ Gunung Putri is still at the optimal range for aquatic organisms.

Keyword : Water quality, Situ Gunung Putri, Bogor

INTRODUCTION

Situ is a Sundanese for small lake that is formed naturally or artificially, the source of water comes from springs, rainwater or surface runoff. Situ or lake has two main functions, ecological functions and socio-economic-cultural functions. The ecological function of situ as an area of biodiversity conservation, both flora and fauna and as a water regulatory systems, flood control, habitat for wild life or protected species, while the socio-economic-cultural function is to meet the needs of human life, among others as a usable source of water by the community both directly in agriculture, fisheries, industry and household activities (Sittadewi 2008).

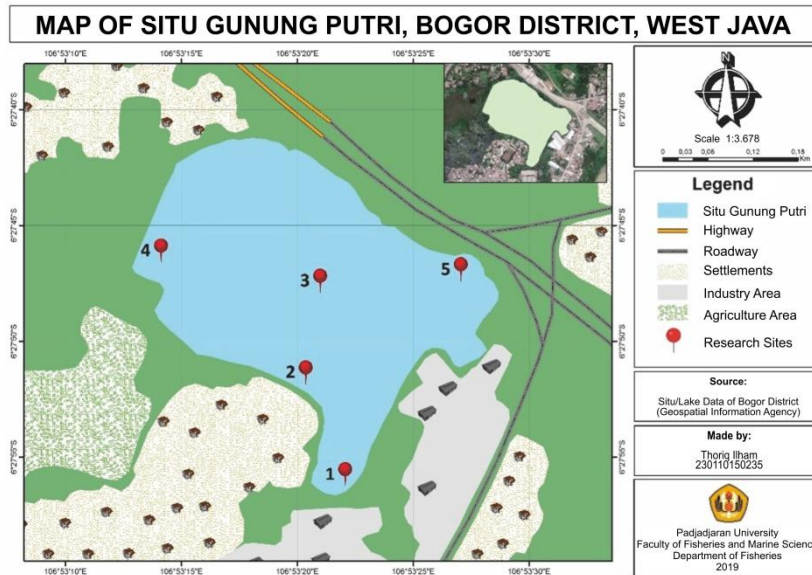
Situ Gunung Putri is located in Gunung Putri Village, Gunung Putri District, Bogor Regency, West Java. The location is right by the Jagorawi toll road and is located amongst industrial area, housing area and agricultural area. Situ Gunung Putri was once used as a tourism object around 2010 to 2013, but discontinued since 2014. Since then the location has been used as a fishing area. Changes in the condition of Situ Gunung Putri waters over time due to human activities, both industry, agriculture and households that produce waste, causing water quality in Situ Gunung Putri tend to decrease. Therefore, research is needed to evaluate Situ Gunung Putri waters quality in order to obtain the latest information as a basis for the management of Situ Gunung Putri as an aquatic resource.

METHODS

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This research was carried out from February to March 2019 at Situ Gunung Putri, Bogor and in the laboratory of the Limnologi Research Center, Indonesian Institute of Sciences, Cibinong, Bogor, West Java.

The method used in this study is a survey method. Samples obtained from five station that defined by land use as it can seen in Figure 1. Sampling was done six times with one week interval . Water quality parameters to be analyzed are temperature, Transparency, DO, COD, Nitrate, Phosphate and pH, both from surface level and secchi depth except tranparency and COD not taken in secchi depth.



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Figure 1. Data Collection Location at Situ Gunung Putri

Temperature, DO, pH measured *in situ* using Horiba Water Quality Checker and transparency measured using the Secchi Disc. measurement of nitrate, phosphate and COD concentrations was carried out in the laboratory. Measurement of nitrate concentration was carried out using the brucine method using a UV-Visible spectrophotometer at a wavelength of 420 nm. Phosphate concentration was measured by ascorbic acid method using a UV-Visible spectrophotometer at a wavelength of 880 nm. Meanwhile COD measurement was carried out in the IPB Environmental Productivity laboratory, using the closed reflux method with a spectrophotometer at a wavelength of 600 nm (APHA 2015).

RESULT AND DISCUSSION

Water Quality Parameters

The result of water quality parameters consisted of physical and chemical during observations can be seen in Table 1.

Table 1. Physical and Chemical Parameters during Study

Parameters/depth	Station				
	1	2	3	4	5
Surface					
Temperature (°C)	30.61±1.76	29.54±1.12	29.73±1.36	28.58±0.77	28.14±0.52

Parameters/depth	Station				
	1	2	3	4	5
Transparency (m)	0.38±0.12	0.5±0.17	0.53±0.09	0.65±0.06	0.63±0.12
DO (mg/L)	5.7±2.55	2.81±1.38	3.96±3.73	3.06±2.69	1.92±1.10
COD (mg/L)	46.59±10.37	46.89±13.33	54.09±15.89	42.22±9.86	44.59±7.65
Nitrate (mg/L)	0.049±0.006	0.058±0.015	0.05±0.009	0.047±0.009	0.049±0.007
Phosphate (mg/L)	0.018±0.005	0.017±0.003	0.015±0.002	0.022±0.004	0.015±0.003
pH	7.25±0.23	7.11±0.27	7.27±0.10	7.15±0.17	7.33±0.34
Secchi Depth					
Temperature (°C)	29.96±1.71	28.56±0.95	29.03±1.49	28.31±0.64	27.93±0.71
DO (mg/L)	3.37±1.63	1.30±0.94	2.61±5.05	2.07±2.07	1.14±0.90
Nitrate (mg/L)	0.051±0.004	0.046±0.007	0.045±0.008	0.050±0.013	0.056±0.019
Phosphate (mg/L)	0.019±0.001	0.020±0.004	0.035±0.043	0.024±0.004	0.016±0.003
pH	7.11±0.28	6.86±0.33	6.93±0.30	6.90±0.32	7.02±0.27

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Temperature

The highest temperature is found on the surface of the water at the station 1 which reaches 30.61°C. The lowest temperature on the water surface is 28.14°C at station 5 is also still within the ideal temperature limit for the survival of aquatic organisms. Average temperature during study can be seen in Figure 2

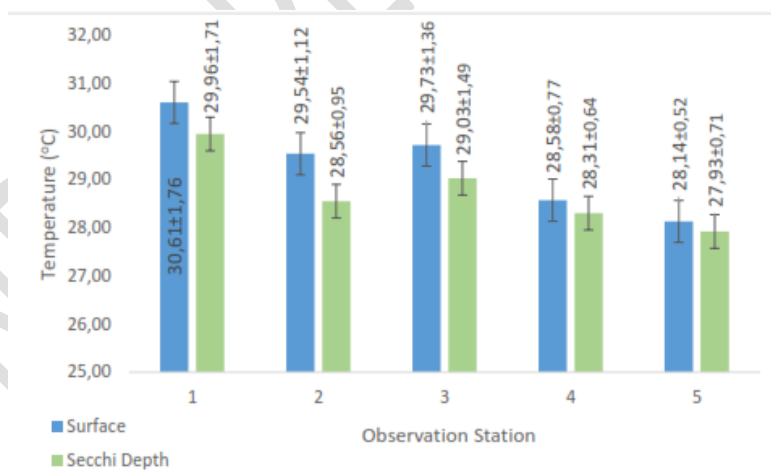


Figure 2. Temperature during observation

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The temperature in the secchi depth is also measured to determine the effect on the transparency of sunlight. According to Effendi (2003) that sunlight entering the waters will be absorbed and change into heat energy. In the surface layers waters will have a higher temperature and lower density than in the lower layer.

The highest temperature at secchi depth is obtained at station 1 reaching 29.96°C. The lowest temperature measured in secchi depth is at station 5 of 27.93°C. The difference between the temperature on the surface with secchi depth is not too significant at all station. This is in line

98 with the statement of Adiwilaga et al (2009) that the temperature obtained at each depth is not
99 much different especially between surface layers and secchi depth.

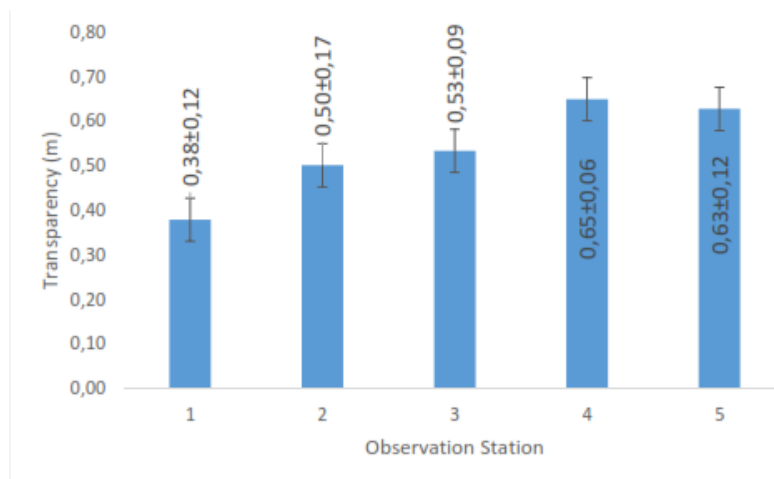
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101 **Transparency**

102 The value of light penetration is strongly influenced by the intensity of sunlight, turbidity and
103 the density of plankton in a waters column. Light penetration is a limiting factor for
104 photosynthetic organisms (phytoplankton) and also death in certain organisms (Barus 2004).

105 Figure 3 showed transparency during study

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Figure 3. Water Transparency during Study

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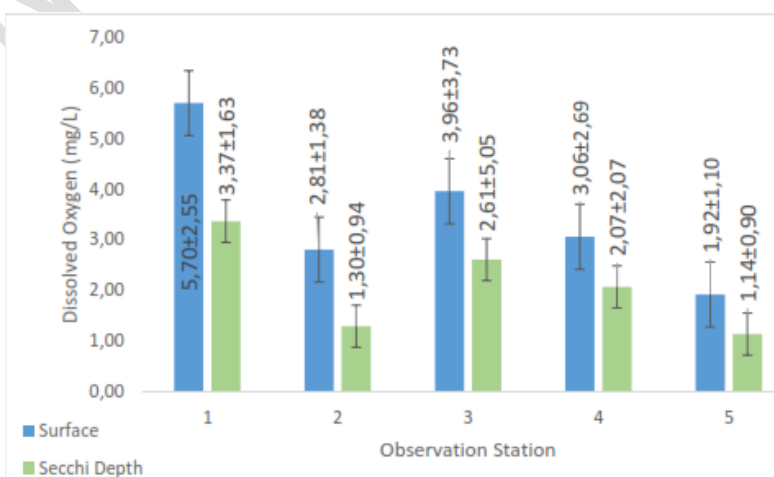
109 The lowest transparency value at station 1 is 0.38 ± 0.12 m and the highest transparency at
110 station 4 is 0.65 ± 0.06 m. The transparency value according to Boyd (1990) is still within
111 normal limits because the transparency of light is good for plankton growth optimally which
112 is 30 cm (0.30 m) to 50 cm (0.50 m).

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114 **Dissolved Oxygen**

115 There is difference in dissolved oxygen concentration between the water surface and the
116 secchi depth of each station caused by differences in sunlight penetration. The highest DO
117 obtained at station 1 and the lowest ones at station both in surface water and secchi depth.
118 In surface level the highest average value is 5.70 ± 2.55 , mg/L and at secchi depth the value
119 is 3.37 ± 1.63 , g/L. meanwhile lowest value is 1.92 ± 1.1 mg/L and at secchi depth is
120 1.14 ± 0.90 mg/L.

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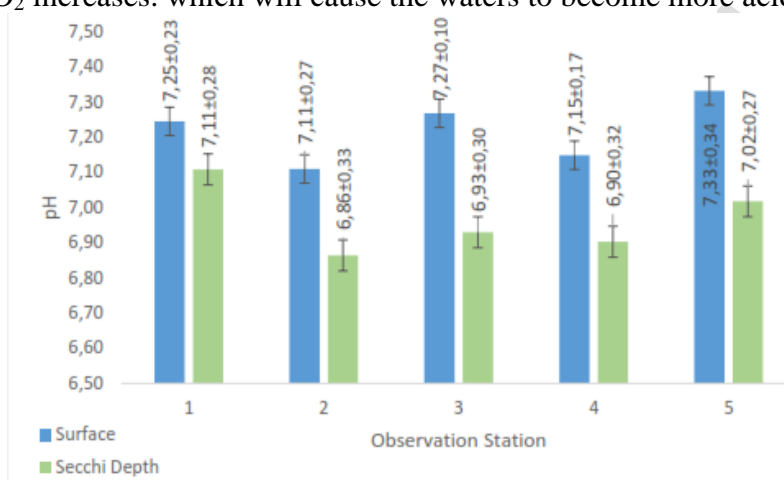
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Figure 4. Dissolved Oxygen during Study

According to Reeb (2009) DO concentrations which have decreased as depth increase due to photosynthesis activities is higher in the surface waters level than in deeper waters level

127 **Acidity (pH)**

128 The highest average pH value in surface obtained at station 5 with a value of 7.33 ± 0.34 and
129 the lowest is found at station 2 with a value of 7.11 ± 0.27 . Whereas the highest value in secchi
130 depth occurred at station 1 with a value of 7.11 ± 0.28 and the lowest ones at station 2 with a
131 value of 6.86 ± 0.33 . The difference in pH between surface and secchi depth is normal
132 condition. according to Araoye (2009) statement, that the decrease in pH at the deeper waters
133 level occurs due to an increase in microbial activity to decompose organic matter so that O_2
134 decreases and CO_2 increases. which will cause the waters to become more acidic .



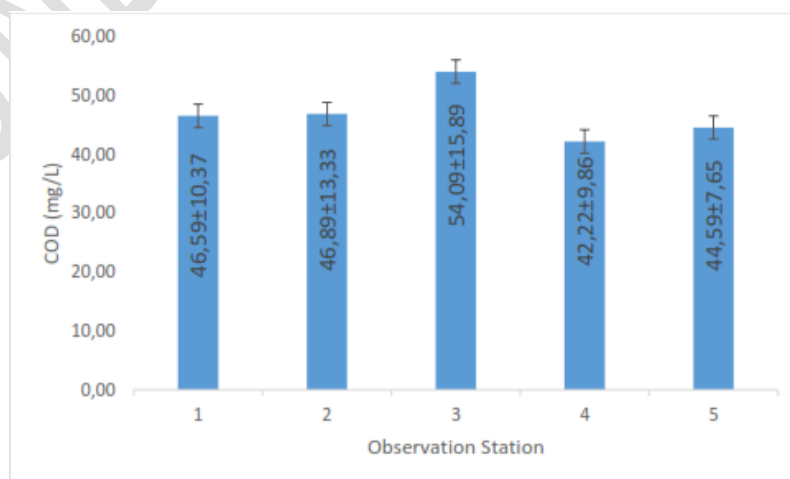
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Figure 5. pH during Observation

137 **COD**

138 The highest average COD (Chemical Oxygen Demand) value is found at station 3 with an
139 average value of 54.09 ± 15.89 mg / L while the lowest COD concentration is at station 4
140 with an average value of 42.22 ± 9.86 mg / L. Based on Indonesian Government regulation
141 Number 82 of 2001. Those values still below threshold limit for class III of 50 mg/L (suitable
142 for aquaculture activities, and aquatic organisms), but its very close to border and need to get
143 serious attention. COD distribution during study showed in Figure 6.

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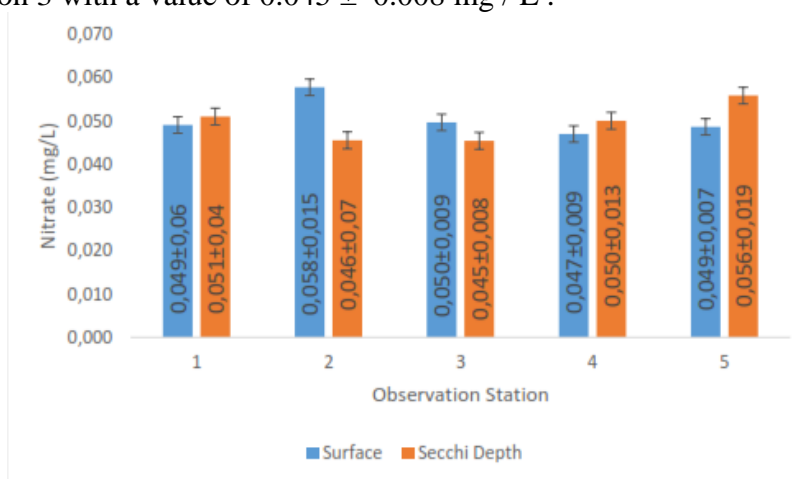
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Figure 6. COD Concentration during Observation

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147 **Nitrate**

148 Based on the results as shown in Figure 7, the highest average value of nitrate concentration
149 in surface layer was found at station 2 at 0.058 ± 0.015 mg / L and the lowest ones obtained
150 at station 4 of 0.047 ± 0.009 mg / L. On the other hand the highest average nitrate
151 concentration in secchi depth found at station 5 of 0.056 ± 0.019 mg / L and the lowest
152 occurred at station 3 with a value of 0.045 ± 0.008 mg / L .



153 **Figure 7.** Nitrate Concentration during Study

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155 Concentration of nitrate in waters are influenced by several parameters such as dissolved
156 oxygen and organic matter content. According to Zahidah (2017) if dissolved oxygen
157 concentration low, the activity of microorganisms in decompose of organic matter and
158 nitrification process will affected. And this result similar to Yuliana et al (2012) that conduct
159 research in Jakarta Bay, found that there is relationship between nitrate concentration with
160 oxic condition. In Figure 7 it can be seen that there is no significance difference between
161 surface level and secchi depth.

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163 **Phosphate**

164 Phosphate concentration can be seen in Figure 8. The highest average phosphate
165 concentration in surface level is at station 4 of 0.022 ± 0.004 mg / L and the lowest occurred
166 at station 3 of 0.015 ± 0.002 mg / L. Meanwhile the highest phosphate concentration in
167 secchi depth is at station 3 with a value of 0.035 ± 0.043 mg / L and the lowest is at station 3
168 with a value of 0.016 ± 0.003 mg / L.

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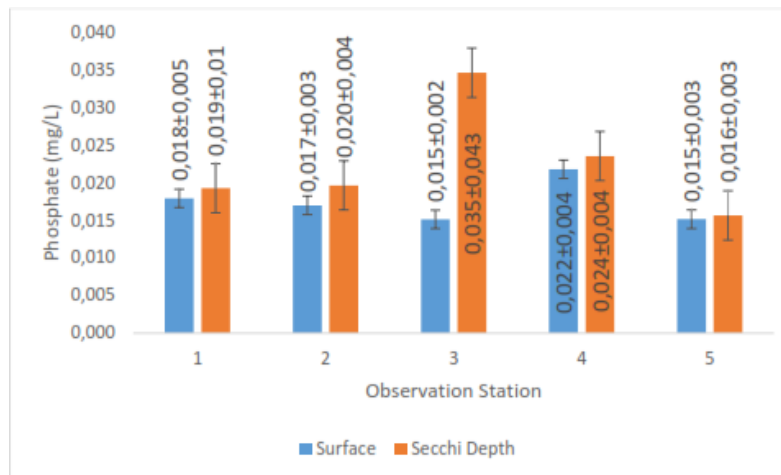


Figure 8. Phosphate Concentration during Observation

Phosphates are needed in small amounts, as a transfer of energy from the outside into cells of the organism (Effendi, 2003). According to Indonesian Government regulation Number 82 of 2001, phosphate concentration in all of the station was still far below the threshold of phosphate concentration for aquaculture and aquatic organisms (class III), which was less than 1 mg / L. From Figure 8 it can be seen that there is no significance difference between surface layer and secchi depth.

CONCLUSIONS

Based on research it can be concluded that water quality in Situ Gunung Putri is still at in the optimal range according to Indonesian Government regulation Number 82 of 2001, except for Chemical Oxygen demand which is very close to threshold value

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