

Original Research Article

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~~ was the survey method. The results showed ~~that~~, at the surface level, the temperature ranged between $(28.14 \pm 0.52$ and $30.61 \pm 1.76)^\circ\text{C}$, transparency between $(0.38 \pm 0.12$ and $0.65 \pm 0.06)$ m, dissolved oxygen (DO) was between $(1.92 \pm 1.10$ and $5.7 \pm 2.55)$ mg / L, chemical oxygen demand (COD) was between $(42.22 \pm 9.86$ and $54.09 \pm 15.89)$, nitrate between $(0.047 \pm 0.009$ and $0.05 \pm 0.015)$ mg / L, phosphate of $(0.015 \pm 0.002$ and $0.022 \pm 0.004)$ mg / L and pH was between 7.11 ± 0.27 and 7.33 ± 0.34 . Meanwhile at the Secchi depth values of the temperature ranged between $(2.93 \pm 0.71$ and $29.96 \pm 1.71)^\circ\text{C}$, ~~dissolved oxygen of~~ DO was 1.14 ± 0.90 and 3.37 ± 1.63 mg / L, nitrate ~~of~~ was 0.045 ± 0.008 and 0.056 ± 0.019 mg / L, phosphate ~~of~~ was 0.016 ± 0.003 and 0.035 ± 0.043 mg / L and pH was between $(6.68 \pm 0.33$ and $7.11 \pm 0.28)$. Based on ~~that~~ these values water quality parameters 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

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

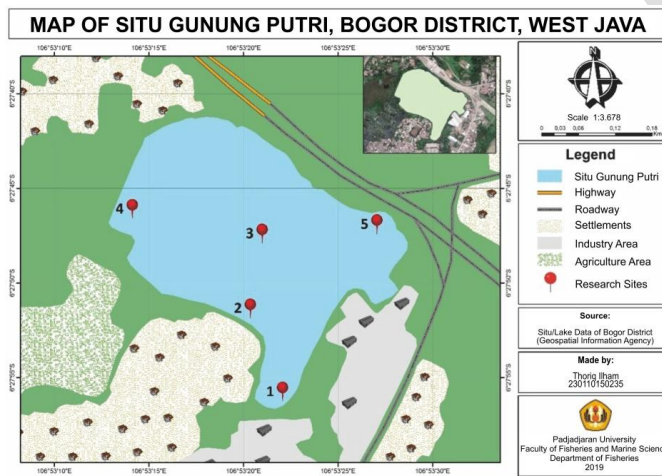


Figure 1. Data Collection Location at Situ Gunung Putri

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 presented~~ in Table 1.

Table 1. Physical and Chemical Parameters during Study

Parameters/depth	Station				
	1	2	3	4	5
Surface					

Parameters/depth	Station				
	1	2	3	4	5
Temperature (°C)	30.61±1.76	29.54±1.12	29.73±1.36	28.58±0.77	28.14±0.52
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 was~~ found on the surface of the water at the station 1 which reaches 30.61°C. The lowest temperature on the water surface ~~is was~~ 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

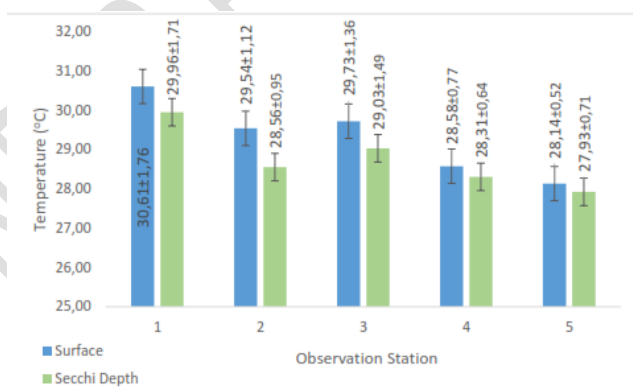


Figure 2. Temperature during observation

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The temperature in the secchi depth ~~is was~~ 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 layers.

The highest temperature at secchi depth ~~is was~~ obtained at station 1 reaching 29.96°C. The lowest temperature measured in secchi depth ~~is was~~ at station 5 of 27.93 °C. The difference

98 between the temperature on the surface with secchi depth ~~is was~~ not too significant at all
 99 stations. ~~†~~This is in line with the ~~statement findings~~ of Adiwilaga *et al.*, (2009) that the
 100 temperature obtained at each depth is not much different especially between surface layers
 101 and secchi depth.

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103 Transparency

104 The value of light penetration is strongly influenced by the intensity of sunlight, turbidity and
 105 the density of plankton in a waters column. Light penetration is a limiting factor for
 106 photosynthetic organisms (phytoplankton) and also ~~causes~~ death in certain organisms (Barus
 107 2004). Figure 3 showed transparency during study

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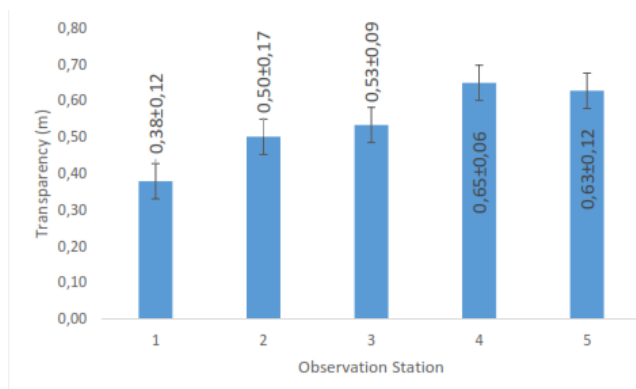


Figure 3. Water Transparency during Study

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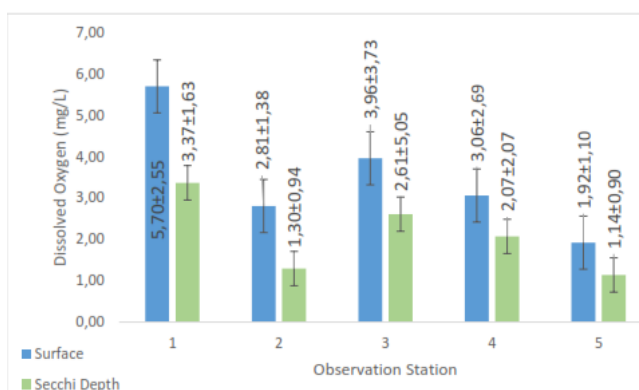
111 The lowest transparency value at station 1 ~~is was~~ 0.38 ± 0.12 m and the highest transparency
 112 at station 4 ~~is was~~ 0.65 ± 0.06 m. The transparency value according to Boyd (1990) ~~is was~~
 113 still within normal limits because the transparency of light is good for plankton growth
 114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

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116 Dissolved Oxygen

117 There ~~is was a~~ difference in dissolved oxygen concentration between the water surface and
 118 the secchi depth of each station caused by differences in sunlight penetration. The highest DO
 119 obtained at station 1 and the lowest ones at station 5 both in surface water and secchi depth.
 120 In surface level the highest average value ~~is was~~ 5.70 ± 2.55, mg/L and at secchi depth the
 121 value ~~is was~~ 3.37 ± 1.63, g/L. meanwhile lowest value ~~is was~~ 1.92 ± 1.10 mg/L and at secchi
 122 depth ~~is was~~ 1.14 ± 0.90 mg/L

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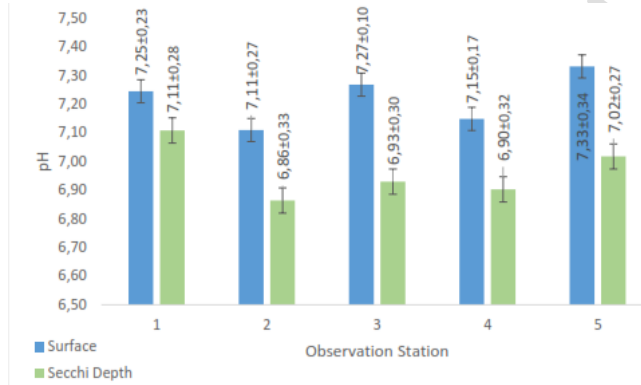
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Figure 4. Dissolved Oxygen during Study

126 According to Reeb (2009) DO concentrations which have decreased as depth increase due to
127 photosynthesis activities is higher in the surface waters level than in deeper waters level
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129 **Acidity/alkalinity (pH)**

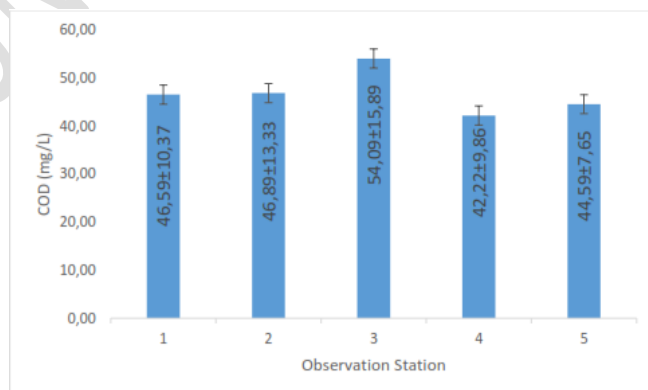
130 The highest average pH value in surface obtained at station 5 with a value of 7.33 ± 0.34 and
131 the lowest is-was found at station 2 with a value of 7.11 ± 0.27 . Whereas the highest value in
132 secchi depth occurred at station 1 with a value of 7.11 ± 0.28 and the lowest ones at station 2
133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



137 **Figure 5.** pH during Observation

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139 **COD**

140 The highest average COD (Chemical Oxygen Demand) value is-was found at station 3 with
141 an average value of 54.09 ± 15.89 mg / L while the lowest COD concentration is-was at
142 station 4 with an average value of 42.22 ± 9.86 mg / L. Based on Indonesian Government
143 regulation Number 82 of 2001. Those values were still below the threshold limit for class III of
144 50 mg/L (suitable for aquaculture activities, and aquatic organisms), but its very close to
145 border and need to get serious attention. COD distribution during study are showed in Figure
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Figure 6. COD Concentration during Observation

150 **Nitrate**

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

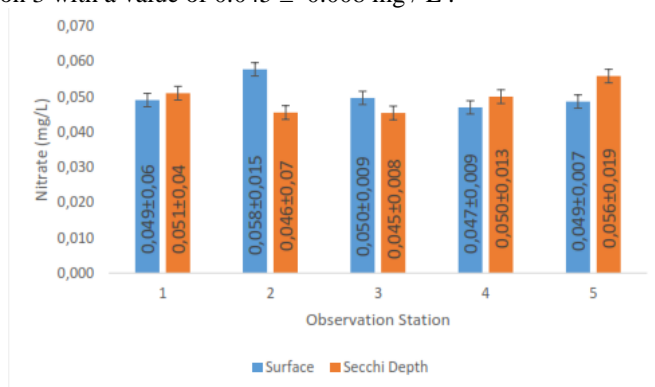


Figure 7. Nitrate Concentration during Study

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

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166 **Phosphate**

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

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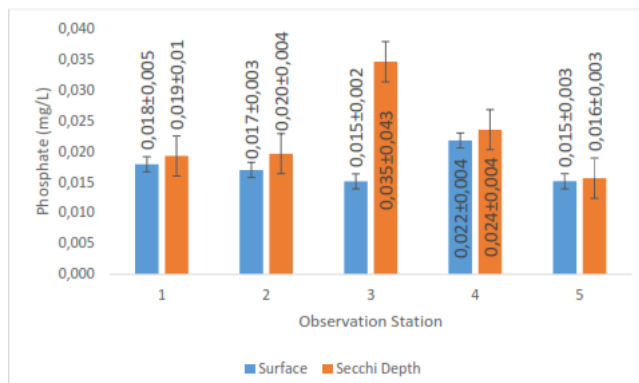


Figure 8. Phosphate Concentration during Observation

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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 [in phosphate concentration](#).

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CONCLUSIONS

Based on [this](#) 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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UNDER PEER REVIEW