

Primary Checklist of Phytoplankton Genera in Sunye Lake, Myanmar

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ABSTRACT

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Phytoplankton are the foundation of food webs and the most important producer in aquatic ecosystems. They can photosynthesize and convert light energy into organic energy. They are a secret ingredients used as a bioindicator of water quality and pollution. This study investigated composition of phytoplankton in freshwater body of Sunye lake, Mandalay region. The study was conducted one year from January 2020 to December 2020. According to the study, out of 47 total algal genera; Chlorophyceae (14 genera), Bacillariophyceae (11 genera); Cyanophyceae (nine genera); Zygnematophyceae (two genera), Euglenophyceae (one genera) and Conjugatophyceae (one genera) were recorded. In this study, among total genera of 37, the class of Chlorophyceae (45%) is the largest group followed by Bacillariophyceae (28%), Cyanophyceae (19%), Zygnematophyceae (4%), Euglenophyceae (2%) and Conjugatophyceae (2%). This present check list study will be useful base line data for further study of phytoplankton in the lake.

Aims: The aim of study is to record and give the information's of phytoplankton existence and useful data for further study and lake ecosystem.

Study design: The water sample was collected monthly year morning once a week throughout the study period.

Place and Duration of Study: This sample were collected from natural freshwater Sunye lake during January 2020 to December 2020 for one year period.

Methodology: Phytoplankton samples were taken by filtering through 25 µm mesh plankton net and preserved with a Lugol's solution and kept in refrigerator for further study. The sample was identified and took photograph by using the microscope (OPTIKA). The result of phytoplankton were checked with phytoplankton identification key, taxonomic database site.

Results: In the present study, 47 genera belong to the six different classes of phytoplankton were recorded: chlorophyceae, bacillariophyceae, cyanophyceae, zygnematophyceae, euglenophyceae, conjugatophyceae.

Conclusion: The current study is first time to study the checklist of phytoplankton in Sunye Lake and should be continuously study to update the checklist data of phytoplankton genera and seasonally abundance which is important indicators of lake ecosystem.

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Keywords: Algae, Chlorophyte, Freshwater, Ecosystem

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1. INTRODUCTION

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A tiny small microscopic plant, phytoplankton is an important basic species of food web and as a source of nutrient in aquaculture. These organisms have an extreme ecological importance in the different water bodies worldwide, as they fix carbon dioxide, produce oxygen and are important key element in the basis of various food chains [3]. Phytoplankton

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are mentioned as pollution indicator species [6] and presence of phytoplankton reflected the status of water quality [2]. Phytoplankton are renewable, sustainable and economical sources of biofuels, bioactive medicinal products and fooding ingredients [15].

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composition of algae formed under the influence of nutrient source, morphometry the

Species

23 chemistry and history of the use of each of the lakes [16]. Many features such as width,
24 discharge, substratum size, light, temperature and depth also affect the species
25 compositions and productivity of lotic environments [6].
26

27 Checklist is important for ecological study, monitoring and conservation ecosystem and
28 need to be updated, without baseline information it is difficult to study any changes. A
29 regular checklist species occur to quickly determine the presence of new and possibly,
30 invasive species in the freshwater system [20]. Regular checklist species is vital in
31 monitoring existence of native species. Study phytoplankton help understand such as
32 changes in fish stocks, pollution and climate.
33

34 Sunye Lake, Mandalay Region, it has been formed as a natural freshwater lake in central dry
35 zone (typically 500-1000 mm of rain per year) [21] [8] since 11 century AD. This area
36 covered has 537 ha with 150 m above sea level. The maximum depth of the lake is 3.1 m and
37 the average depth is 1.5 m. Many hills and hillocks surround to the lake which form the
38 natural reservoirs. It is providing important water resources for household usage and
39 irrigation. The present study is first time investigation and checklist of basic aquatic
40 phytoplankton genera. The aim of study is to record and give the information of
41 phytoplankton existence and useful data for further study and lake ecosystem.
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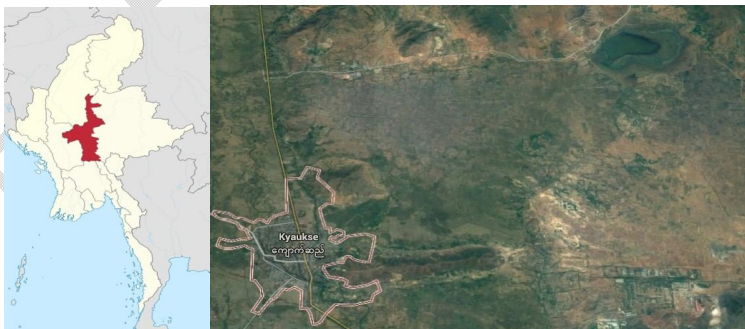
43 2. MATERIAL AND METHODS

44 2.1 Study Area and Procedure

45
46 This sample were collected during January 2020 to December 2020 for one-year period.
47 Geographically, this lake lies between 21°40' -40°8' N Longitude and 96°11' -45°9' E
48 Latitude (figure 1). The water sample was collected once a week monthly and early morning
49 at 8:00 Am to 9:00 Am throughout the study period. Phytoplankton samples were taken by
50 filtering through 25 µm mesh plankton net, 20 liters of water sample was passed through in
51 100 mL polythene bottles which tightly tied with the plankton net. Collected 100 mL
52 phytoplankton sample to be analyzed and it was preserved in a Lugol's solution immediately
53 packing with black plastic bag. The preserved sample was kept in refrigerated condition
54 about 48 hours for further study.

54 Should you write down the number of sampling stations (points)

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Fig.1. Location map of the Sunye Lake

Comment [U1]: Is the sampling only on the surface?

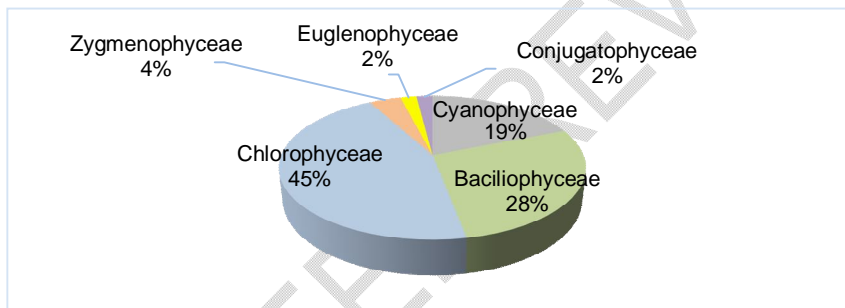
Comment [U2]:
The map should be equipped with:
1. Coordinates (Latitude and Longitude)
2. Legend
3. Map size
4. Position of sampling location

59 **2.2 Phytoplankton Identification**

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61 The sample was identified and took photograph by using the microscope (OPTIKA). The
62 results of phytoplankton were checked with phytoplankton identification key, taxonomic
63 database site algaebase.com and monograph. Easy identification of the most common
64 freshwater algae by [30] was used as main reference book.

65
66 **3. RESULTS AND DISCUSSION**

67
68 In the present study, 47 genera belong to the six different classes of phytoplankton were
69 recorded in table 1 and species composition is shown in figure 2. Microscopic image of
70 phytoplankton is shown in figure 3, 4 and 5. Thirteen different genera of chlorophyceae
71 class were found, they are *Colostrum* sp., *Quadrigula* sp., eight different *Scenedesmus* sp.,
72 three different *Pedistrum* sp., *Selenastrum* sp., *Chlorella* sp., *Monoriphidium* sp.,
73 *Chlorogonium* sp., *Chlorococcum* sp., *Golenkinia* sp., *Dictyosphaeria* sp., *Oocystis* sp.,
74 *Westella* sp.



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77
78 **Fig. 2. Percentage of phytoplankton composition by class in Sunye Lake.**

79
80 Chlorophyceae were the highest species composition with 45%. The Chlorophyceae,
81 freshwater green algae are a large and important group, they include some common species
82 and many members are important both ecologically and scientifically. The
83 Chlorophyceae encompass the widest range of morphologies in the green algae and
84 included nearly all green algae [29][17]. A total of 99 phytoplankton taxa belong to 50
85 genera were recorded from Yezin Dam, 12 belonged to Chlorophyceae [27]. Four types of
86 phyla, 37 algae species were recorded in Mya Kan Thar Lake, Loilem Township,
87 Chlorophyta, Chlorophyceae group was also highest [24]. Total 18 Chlorophyta algal
88 species were recorded in Naung-yar Lake Loikaw city [23].

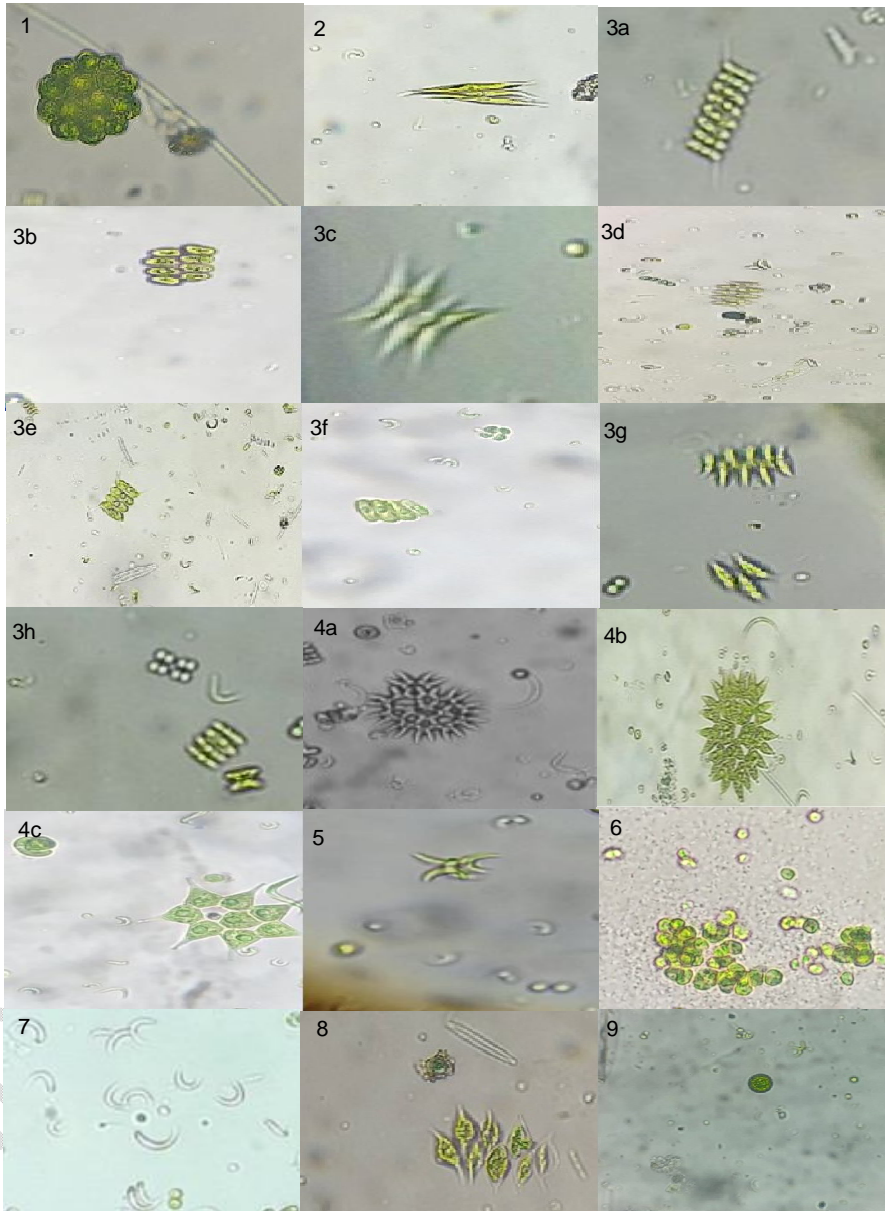
89
90 Baciliophyceae were the second highest number of species with 28% in present study.
91 These group is also called diatom. Eleven Baciliophyceae class record are two *Fragilaria*
92 sp., two *Synedra* sp., two *Pinnularia* sp., *Cyclotella* sp., *Craticula* sp., *Navicula* sp.,
93 *Aulacoseria* sp., *Merismopedias* sp., *Phormidium* sp., *Cymbella* sp. and *Nitzschia* sp. Current
94 research finding was similar with report from Indawgyi Lake in which the Chlorophyceae
95 showed the highest number of species, diatom is the second highest [10]. Diatoms are found
96 both in the marine and freshwater column as phytoplankton as well as on the bed as benthic
97 microalgae or microphytobenthos [31]. Diatoms are reported as pollution indicator of wetland
98 and reservoir [11]. Applications of Diatom analysis is now commonly used in archaeology [7].

99

100 In this study, nine Cyanophyceae, *Oscillatoria* sp., *Anabaena* sp., *Spirulina* sp., *Microcystis*
 101 sp., two different *Tetraedron* sp., *Gloeocapsa* sp., *Nostoc* sp., *Arthrospira* sp., and
 102 *Chroococcus* sp. were recorded with 19%. Some other freshwater phytoplankton studied have
 103 been reported in Myanmar. A total of 70 algal species were recorded from Indawgyi Lake in
 104

105 **Table 1. List of Phytoplankton in Sunye Lake.**

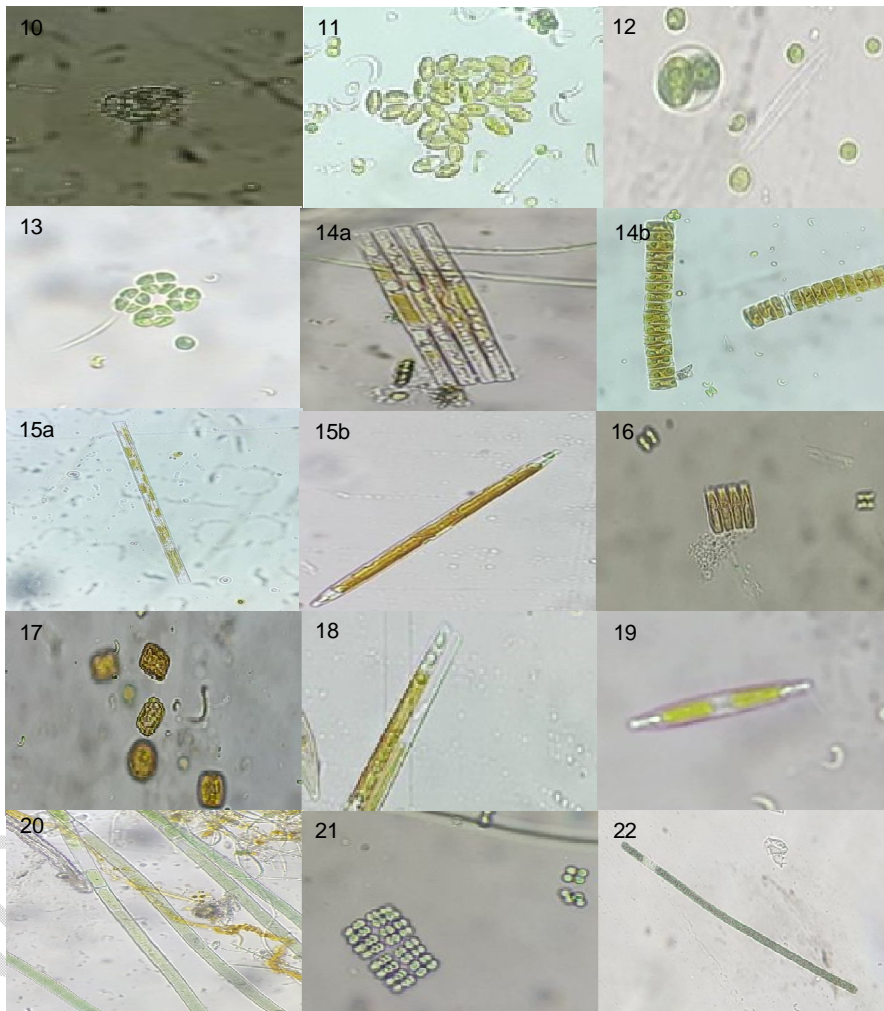
No	Genus	Family	Order	Class
1	Coelastrum	Scendesmaceae	Sphaeropleales	Chlorophyceae
2	Quadrigula	Oocystaceae	Trebouxiophyceae	Chlorophyceae
3	Scendesmus	Scendesmaceae	Sphaeropleales	Chlorophyceae
4	Pedistrum	Hydrodictyceae	Sphaeropleales	Chlorophyceae
5	Selenastrum	Selenastraceae	Sphaeropleales	Chlorophyceae
6	Chlorella	Chlorellaceae	Chlorellales	Chlorophyceae
7	Monoriphidium	Selenastraceae	Sphaeropleales	Chlorophyceae
8	Chlorogonium	Haematococcaceae	Chlamydomonadales	Chlorophyceae
9	Chlorococum	Chlorococceae	Chlamydomonadales	Chlorophyceae
10	Golenkinia	Neochloridaceae	Sphaerophyceae	Chlorophyceae
11	Dictyosphaerium	Chlorellaceae	Chlorellales	Chlorophyceae
12	Oocystis	Oocystaceae	Chlorellales	Chlorophyceae
13	Westella	Scendesmaceae	Sphaeropleales	Chlorophyceae
14	Fragilaria	Fragilariaceae	Fragilariales	Baciliophyceae
15	Synedra	Fragilariaceae	Fragilariales	Baciliophyceae
16	Pinnularia	Pinnulariaceae	Naviculales	Baciliophyceae
17	Cyclotella	Stephanodiscaceae	Thalassiosirales	Baciliophyceae
18	Craticula	Stauroneidaceae	Naviculales	Baciliophyceae
19	Navicula	Naviculaceae	Naviculales	Baciliophyceae
20	Aulacoseria	Aulacoseria	Centrales	Baciliophyceae
21	Merismopedia	Chroococcaceae	Centrales	Baciliophyceae
22	Phormidium	Oscillatoriaceae	Centrales	Baciliophyceae
23	Cymbella	Cymbellaceae	Cymbellales	Baciliophyceae
24	Nitzschia	Bacillariaceae	Bacillariales	Baciliophyceae
25	Oscillatoria	Oscillatoriaceae	Oscillatoriales	Cyanophyceae
26	Anabaena	Nostoceae	Nostocales	Cyanophyceae
27	Spirulina	Spirulinaceae	Spirulinales	Cyanophyceae
28	Microcystis	Microcystaceae	Chroococcales	Cyanophyceae
29	Tetraedron	hydrodictyceae	Sphaeropleales	Cyanophyceae
30	Gloeocapsa	Chroococcaceae	Chroococcales	Cyanophyceae
31	Nostoc	Nostocaceae	Nostocales	Cyanophyceae
32	Arthrospira	Microcoleaceae	Oscillatoriales	Cyanophyceae
33	Chroococcus	Chroococcaceae	Chroococcales	Cyanophyceae
34	Staurastrum	Desmidiaceae	Desmidiales	Zygnemophyceae
35	Zygnema	Zygnemataceae	Zygnematales	Zygnemophyceae
36	Euglena	Euglenaeae	Euglenida	Euglenophyceae
37	Closterium	Closteriaceae	Desmidiales	Conjugatophyceae



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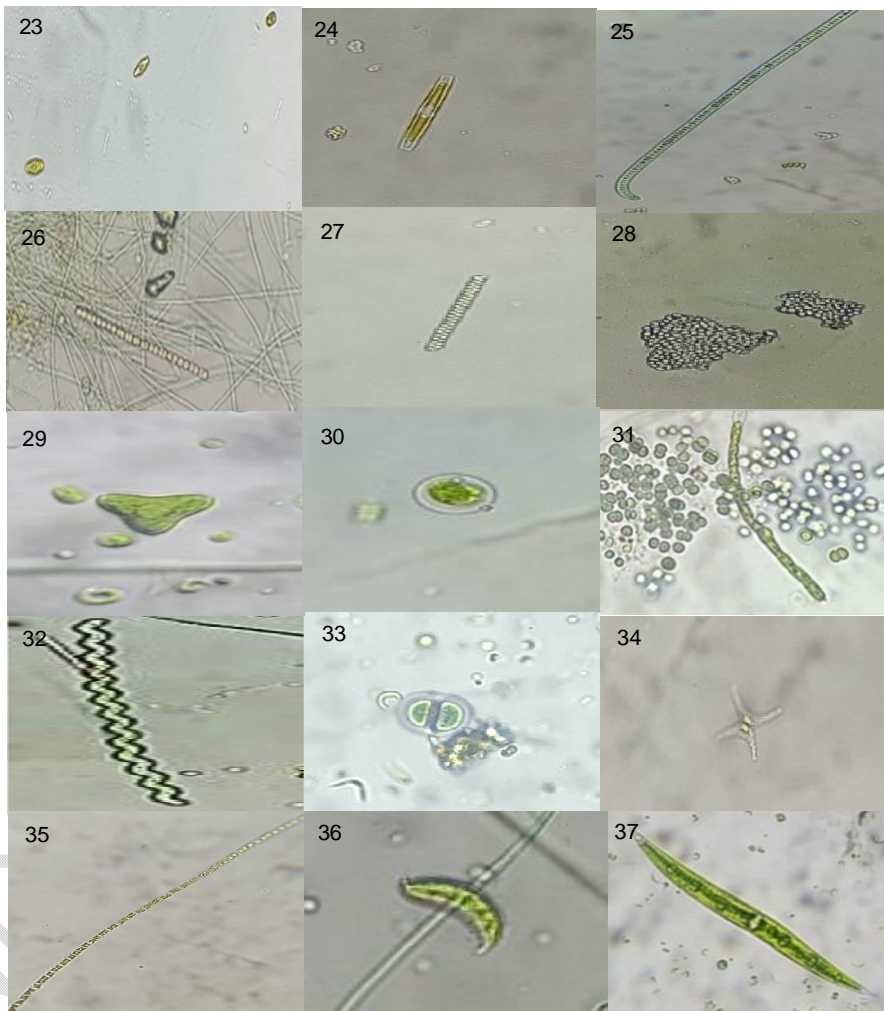
Fig. 3. The list of recorded phytoplankton species in Sunye Lake, 1. *Coelastrum* sp., 2. *Quadrigula* sp., 3a. 3b. 3c. 3d. 3e. 3f. 3g. 3h. *Scendesmus* sp., 4a. 4b. 4c. *Pedistrum* sp., 5. *Selenastrum* sp., 6. *Chlorella* sp., 7. *Monoriphidium* sp., 8. *Chlorogonium* sp., 9. *Chlorococcum* sp.

112 2020, species of cyanobacteria were the most abundantly occurred, the most present cyano-
 113 bacterial species were *Microcystis* [10] [4]. 13 family of algae were reported and cyano-
 114 bacteria were the dominant group in Meiktilal lake in 2017 [5]. Cyanobacteria is great
 115 nitrogen fixer with photosynthetic capabilities useful by-products and bio-fuels, enhancing
 116 the soil fertility and reducing greenhouse gas emissions. These are offered as bio-agents as the
 117 precious bio-resource for sustainable development [26]. Cyanophyceae can contaminate



118
 119 Fig.4. The list of recorded phytoplankton species in Sunye Lake, 10. *Golenkinasp.*, 11.
 120 *Dictyosphaerium* sp., 12. *Oocystis* sp., 13. *Westella* sp., 14a. 14b. *Fragilaria* sp.,
 121 15a. 15b. *Synedra* sp., 16. *Pinnularia* sp., 17. *Cyclotella* sp., 18. *Navicula* sp., 19.
 122 *Craticula* sp., 20. *Aulacoseria* sp., 21. *Merismopedia* sp., 18. *Navicula* sp., 19. *Craticula*
 123 sp., 20. *Aulacoseria* sp., 21. *Merismopedia* sp., 22. *Phormidium* sp.

124 surface waters supplies mostly during warm summer months. The toxic component is
 125 microcystin. Blooms of some species release toxins and lead to anoxia in the habitat of
 126 biota. Cyanobacteria that inhabit a wide variety of habitats as free living, epiphytic, symbiotic
 127 or parasitic plants [19]. Species composition is highly sensitive to water quality and many
 128
 129



130
 131 **Fig.5.** The list of recorded phytoplankton species in Sunye Lake, 23. *Cymbella* sp., 24.
 132 *Nitzschia* sp., 25. *Oscillatoria* sp., 26. *Anabaena* sp., 27. *Spirulina* sp., 28. *Microcystis*
 133 sp., 29. *Teratospira* sp., 30. *Gloeocapsa* sp., 31. *Nostoc* sp., 32. *Arthrospira* sp., 33.
 134 *Chroococcus* sp., 34. *Staurastrum* sp., 35. *Zygnema* sp., 36. *Euglenella* sp., 37. *Closterium*
 135 sp.

136 species are habitat specific [14] and they may be reliable indicator organisms [22]. Current
137 study finds the pollution indicator species like microcystic species but no pollution was
138 occurred due to macrophyte.

139
140 Zygnemphyceae, *Staurastrum* sp. and *Zygnema* sp. were found in this study with 4% in
141 species composition. Zygnemphyceae, are the most diverse green algae, the closest
142 relatives of land plants and are useful model organisms [13][12][28]. They consist of
143 unicellular and filamentous algae, occupying freshwater and terrestrial habitats, whose
144 developmental features are very difficult to compare with the complexity of land plant [9].
145

146 Euglenophyceae can be considered as useful bio-indicators in assessing the health and
147 extent of deterioration of a lake ecosystem [1], euglenid genera is recorded as rarely in this
148 study with 2%.

149
150 In this study, species composition of Conjugatophyceae, *Closterium* sp. was 2%. The
151 genus *Closterium*, which is the closest unicellular relative to land plants, is the best
152 characterized charophyte green algae with respect to the process of sexual reproduction
153 [25] and reported as bio-catalyst used for fuel and chemical production [18].
154

155 4. CONCLUSION

156
157 Checklist of phytoplankton is important for ecology study and conservation of the Lake. The
158 current study is first time to study the checklist of phytoplankton in Sunye Lake and should
159 be continuously study to update the checklist data of phytoplankton genera and seasonally
160 abundance which is important indicators of lake ecosystem.
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Comment [U3]: Untuk model apa?, bisa dijelaskan lebih detail?

Comment [U4]: Bisa dijelaskan munculnya pada bulan berapa? Apakah persentase sebesar 2% ini sudah membahayakan kehidupan biota pada Danau Sunye?

Comment [U5]: It should be adjusted to the research objectives

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