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# Primary Checklist of Phytoplankton Genera in Sunye Lake, Mandalay Region, Myanmar

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***Authors' contributions***

*This work was carried out in collaboration among all authors. We hereby confirm that the article has been managed, the analyses of the study, managed the literature searches and reviewed by all authors. Author PS designed the study and wrote the first draft of the manuscript. author NAW approved the final manuscript. All authors read and approved the final manuscript.*

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## ABSTRACT

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 secrete 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), Baciliophyceae (11 genera); Cyonophyceae (nine

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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 (28%), Bacillariophyceae 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 early morning once a week throughout the study period.

**Place and Duration of Study:** These 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 results of phytoplanktons were checked with phytoplankton identification key, taxonomic database site.

**Results:** In the present study, 47 genera belong to the six different classes of phytoplanktons 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.

*Keywords: algae; chlorophyte; freshwater; ecosystem.*

## 1. INTRODUCTION

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 fixed carbon dioxide, produce oxygen and are important key element in the basis of various food chains [1]. Phytoplankton are mentioned as pollution indicator species [2] and presence of phytoplankton reflected the status of water quality [3]. Phytoplankton are renewable, sustainable and economical sources of biofuels, bioactive medicinal products and food ingredients [4]. Species composition of algae formed under the influence of nutrient source, morphometry the chemistry and history of the use of each of the lakes [5]. Many featured such as width, discharge, substratum size, light, temperature and depth also affect the species compositions and productivity of lotic environments [2].

Check list is important for ecological study, monitoring and conservation ecosystem and need to be updated, without baseline information it is difficult to study any changes. A regular checklist species occurs to quickly determine the presence of new and possibly, invasive species in the freshwater system [6]. Regular checklist species is vital in monitoring existence of native species. Study phytoplankton help understand such as changes in fish stocks, pollution and climate.

Sunye Lake, Mandalay Region, it has been formed as a natural freshwater lake in central dry zone (typically 500-1000 mm of rain per year) [7,8] since 11 centaury AD. This area covered has 537ha with 150m above sea level. The maximum depth of the lake is 3.1m and the average depth is 1.5m. Many hills and hillocks surrounded to the lake which forms the natural reservoirs. Mainly water sources are come from Zawgyi river that flows into the Thin Dwe canal and directly to the lake. It is providing important water resources for household usage and irrigation. The present study is first time investigation and checklist of basic aquatic phytoplankton genera. The aim of study is to record and give the information's of phytoplankton existence and useful data for further study and lake ecosystem.

## 2. MATERIALS AND METHODS

### 2.1 Study Area and Procedure

These samples were collected during January 2020 to December 2020 for one-year period. Geographically, this lake lies between N 21° 40′ 40.84″ longitude and E 96° 13′ 45.96 ″ latitude, location figure is generated with QGIS 3.28.13

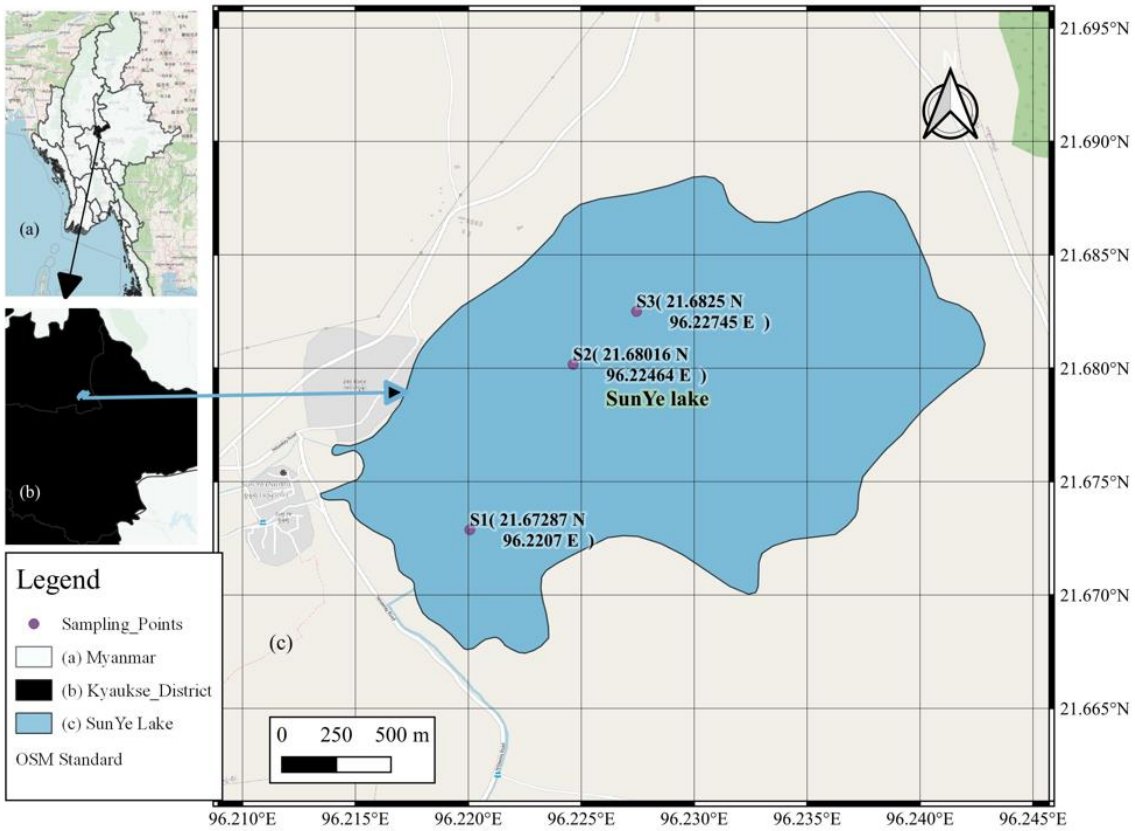


**Fig. 1. Location map of the Sunye Lake**

version (Fig. 1). The water sample was collected once a week monthly and early morning at 8;00 Am to 9 ;00 Am throughout the study period. Phytoplankton samples were taken approximately 16 inches to 18 inches from the surface water of three different sampling areas. 20 liters of water sample was filtered and passed through in 100mL polythene bottles which tightly tied with 25 µm mesh the plankton net. Collected 100mL phytoplankton sample to be analyzed and it was preserved in a Lugol's solution immediately packing with black plastic bag. The Preserved sample was kept in refrigerated condition about 48 hours for further study.

## 2.2 Phytoplankton Identification

The sample was identified and took photograph by using the light microscope (OPTIKA) and images were taken photographs with a 60X objective. The results of phytoplankton were checked with phytoplankton identification key, taxonomic database site algae base.com and monograph. Easy identification of the most common freshwater algae by [9] was used as main reference book.

## 3. RESULTS AND DISCUSSION

In the present study, 47 genera belong to the six different classes of phytoplanktons were recorded in Table 1 and species compositions is shown in Fig. 2. Microscopic image of phytoplanktons are shown in Figs. 3, 4 and 5. Thirteen different genera of chlorophyceae class were found, they are *Colostrum* sp, *Quadrigula* sp, eight different *Scendesmus* sp., three different *Pedistrum* sp., *Selenastrum* sp., *Chlorella* sp., *Monoraphidium* sp., *Chlorogonium* sp., *Chlorococcum* sp., *Golenkinia* sp., *Dictyosphaeria* sp., *Oocystis* sp., *Westella* sp.

Chlorophyceae were the highest species composition with 45%. The Chlorophyceae, freshwater green algae are a large and important group, they include some common species and many members are important both ecologically and scientifically. The Chlorophyceae encompass the widest range of morphologies in the green algae and included nearly all green algae [10,11]. A total of 99 phytoplankton taxa belonging to 50 genera were recorded from Yezin Dam, 12 belonged to Chlorophyceae [12].

Four types of phyla, 37 algal species were recorded in Mya Kan Thar Lake, Loilem Township, Chlorophyta, Chlorophyceae groups was also highest [13]. Total 18 Chlorophyta algal species were recorded in Naung-yar Lake Loikaw city [14].

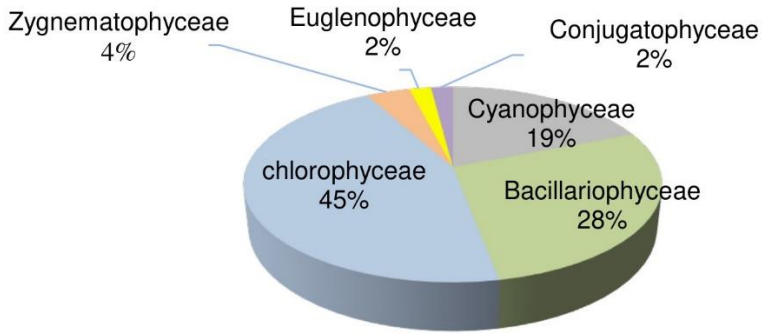


**Fig. 2. Percentage of phytoplankton composition by class in Sunye Lake**

**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* | Hydrodictyaceae | Sphaeropleales | Chlorophyceae |
| 5 | *Selenastrum* | Selenastraceae | Sphaeropleales | Chlorophyceae |
| 6 | *Chlorella* | Chlorellaceae | Chlorellales | Chlorophyceae |
| 7 | *Monoriphidium* | Selenastraceae | Sphaeropleales | Chlorophyceae |
| 8 | *Chlorogonium* | Haematococcaceae | Chlamydomonadales | Chlorophyceae |
| 9 | *Chlorococcum* | 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 | Bacillariophyceae |
| 15 | *Synedra* | Fragilariaceae | Fragilariales | Bacillariophyceae |
| 16 | *Pinnularia* | Pinnulariaceae | Naviculales | Bacillariophyceae |
| 17 | *Cyclotella* | Stephanodiscaceae | Thalassiosirales | Bacillariophyceae |
| 18 | *Craticula* | Stauroneidaceae | Naviculales | Bacillariophyceae |
| 19 | *Navicula* | Naviculaceae | Naviculales | Bacillariophyceae |
| 20 | *Aulacoseria* | Aulacoseria | Centrales | Bacillariophyceae |
| 21 | *Merismopedia* | Chrococcaceae | Centrales | Bacillariophyceae |
| 22 | *Phormidium* | Ocillatoriaceae | Centrales | Bacillariophyceae |
| 23 | *Cymbella* | Cymbellaceae | Cymbellales | Bacillariophyceae |
| 24 | *Nitzschia* | Bacillariaceae | Bacillariales | Bacillariophyceae |
| 25 | *Oscillatoria* | Oscillatoriaceae | Oscillatoriales | Cyanophyceae |
| 26 | *Anabaena* | Nostoceae | Nostocales | Cyanophyceae |
| 27 | *Spirulina* | Spirulinaceae | Spirulinales | Cyanophyceae |
| 28 | *Microcystis* | Microcystaceae | Chroococcales | Cyanophyceae |
| 29 | *Tetraedron* | hydrodictyaceae | Shaeropleales | Cyanophyceae |
| 30 | *Gloeocapsa* | Chrococcaceae | Chrococcales | Cyanophyceae |
| 31 | *Nostoc* | Nostocaceae | Nostocales | Cyanophyceae |
| 32 | *Arthrospira* | Microcoleaceae | Oscillatoriales | Cyanophyceae |
| 33 | *Chrococcus* | Chroococcaceae | Chroococcales | Cyanophyceae |
| 34 | *Staurastrum* | Desmidiaceae | Desmidiales | Zygnematophyceae |
| 35 | *Zygnema* | Zygnemataceae | Zygnematales | Zygnematophyceae |
| 36 | *Euglena* | Euglenaeae | Euglenida | Euglenophyceae |
| 37 | *Closterium* | Closteriaceae | Desmidiales | Conjugatophyceae |

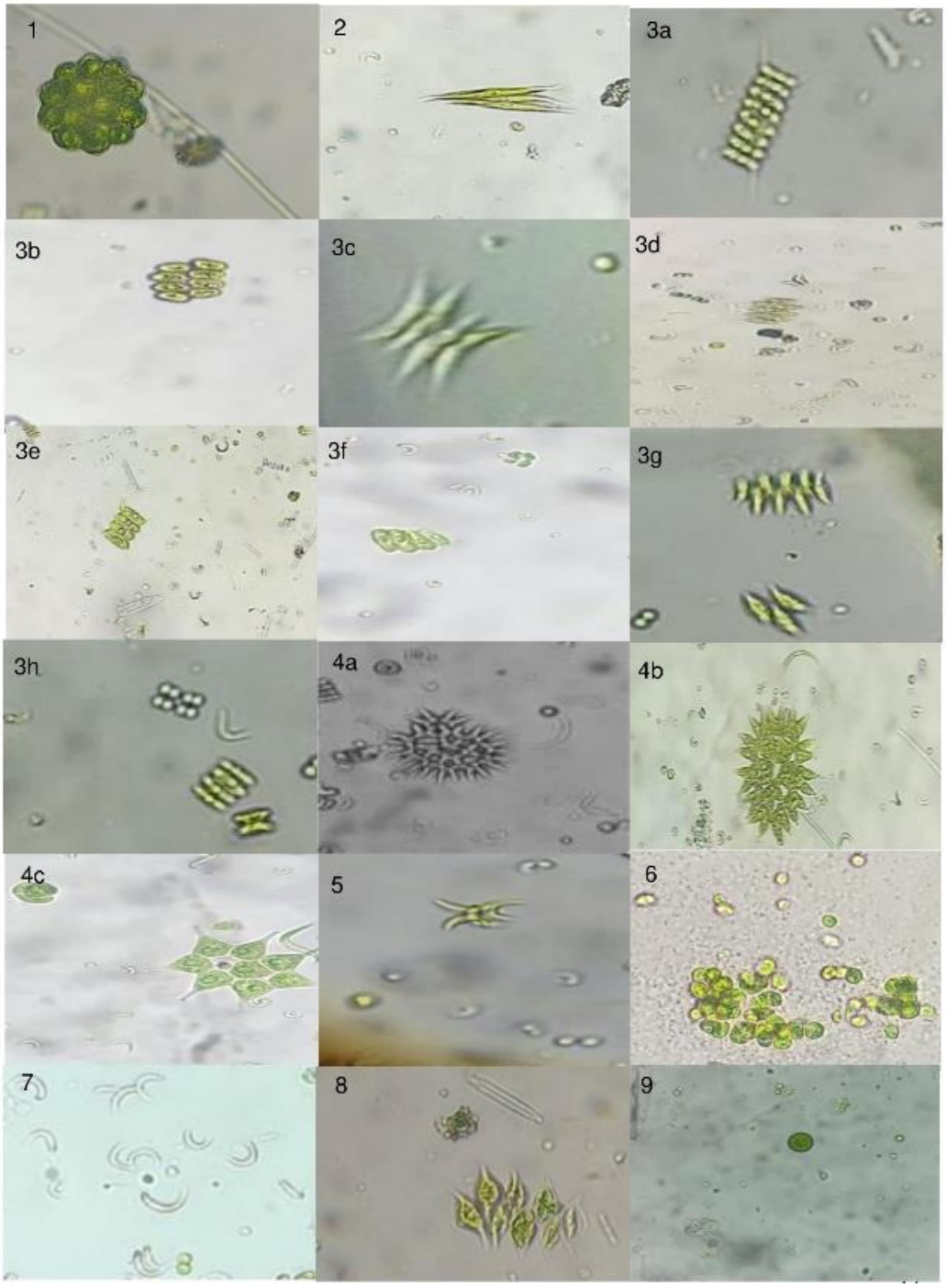


**Fig. 3. The list of recorded phytoplankton species in Sunye Lake (60X-magnification), 1*. Coelastrum* sp*., 2. Quadrigula* sp., 3a.3b.3c.3d.3e.3f.3g,3h. *Scendesmus* sp., 4a.4b.4c*. Pedistrum* sp., 5*. Selenastrum* sp., 6. *Chlorella* sp., 7*. Monoriphidium* sp., 8*. Chlorogonium* sp., 9*. Chlorococcum* sp**

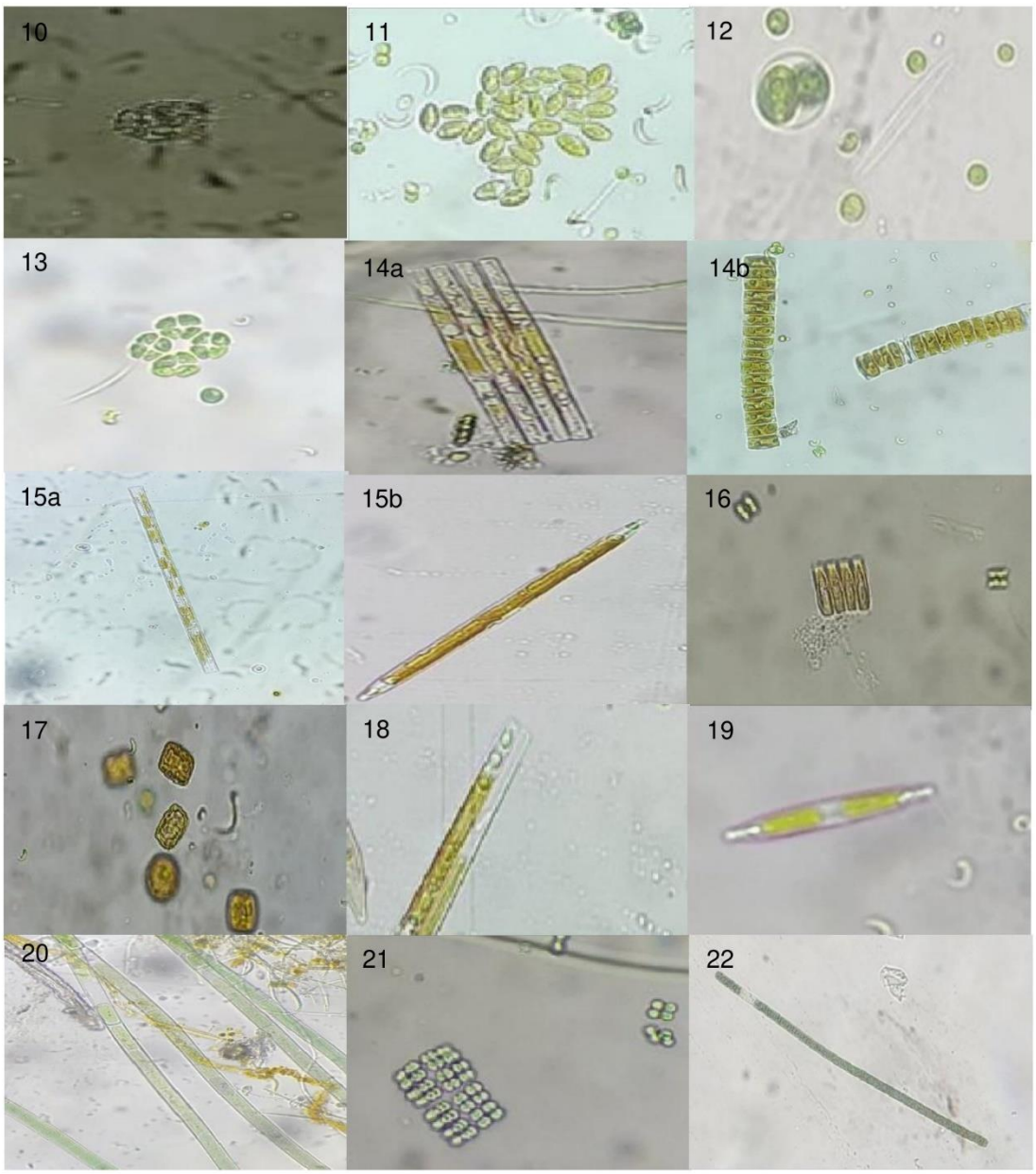


**Fig. 4. The list of recorded phytoplankton species in Sunye Lake(60X-magnification), 10. *Golenkina* sp.,11. *Dictyosphaerium* sp., 12. *Oocystis* sp., 13. *Westella* sp., 14a.14b. *Fragilaria* sp., 15a.15b. *Synedra* sp.,*16. Pinnularia* sp., *17. Cyclotella sp.,18. Navicula* sp., *19. Craticula* sp., *20. Aulacoseria* sp., 21*. Merismopedia* sp.,*18. Navicula* sp., *19. Craticula* sp., *20. Aulacoseria* sp., 21*. Merismopedia* sp., 22*. Phormidium* sp**

Bacillariophyceae were the second highest number of species with 28% in present study. These group is also called diatom. Eleven Bacillariophyceae class record are two *Fragilaria* sp., two *Synedra* sp., two *Pinnularia* sp., *Cyclotella* sp., *Craticula* sp., *Navicula* sp., *Aulacoserioa* sp., *Merismopedia* sp., *Phormidium* sp., *Cymbella* sp. *and Nitzchia* sp. Current research finding was similar with report from Indawgyi Lake in which the Chlorophyceae showed the highest number of species, diatom is the second highest [15]. Diatoms are found both in the marine and fresh water column as phytoplankton as well as on the bed as benthic microalgae or microphytobenthos [16]. Diatom are reported as pollution indicator of wetland and reservoir [17]. Applications of diatom analysis is now commonly used in archaeology [18]. In this

study, nine Cyanophyceae, *Oscillatoria* sp., *Anabaena* sp., *Spirulina* sp., *Mycrocystissp.*, two different *Tetraedron* sp., *Gloeocapsa* sp., *Nostoc* sp., *Arthrospira* sp., and *Chrococcus* sp. were recorded with 19%. Some other freshwater phytoplankton studied have been reported in Myanmar. A total of 70 algal species were recorded from Indawgyi Lake in 2020, species of cyanobacteria were the most abundantly occurred, the most present cyanobacterial species were *Microcystis* [15,19]. 13 family of algae were reported and cyanobacteria were the dominant group in Meiktila lake in 2017 [20]. Cyanobacteria is great nitrogen fixer with photosynthetic capabilities useful by-products and bio-fuels, enhancing the soil fertility and reducing greenhouse gas emissions. These are offered bio-agents as the precious bio-resource for sustainable development [21]. Cyanophyceae can contaminate surface water supplies mostly during warm summer months. The toxic component is microcystin. Blooms of some species release toxins and lead to anoxia in the habitat of biota. Cyanobacteria that inhabit a wide variety of habitats as free living, epiphytic, symbiotic or parasitic plants [22]. Species composition is highly sensitive to water quality and many species are habitat specific [23] and they may be reliable indicator organisms [24]. Current study finds the pollution indicator species like *Microcystic* species but no pollution was occurred due to macrophyte.

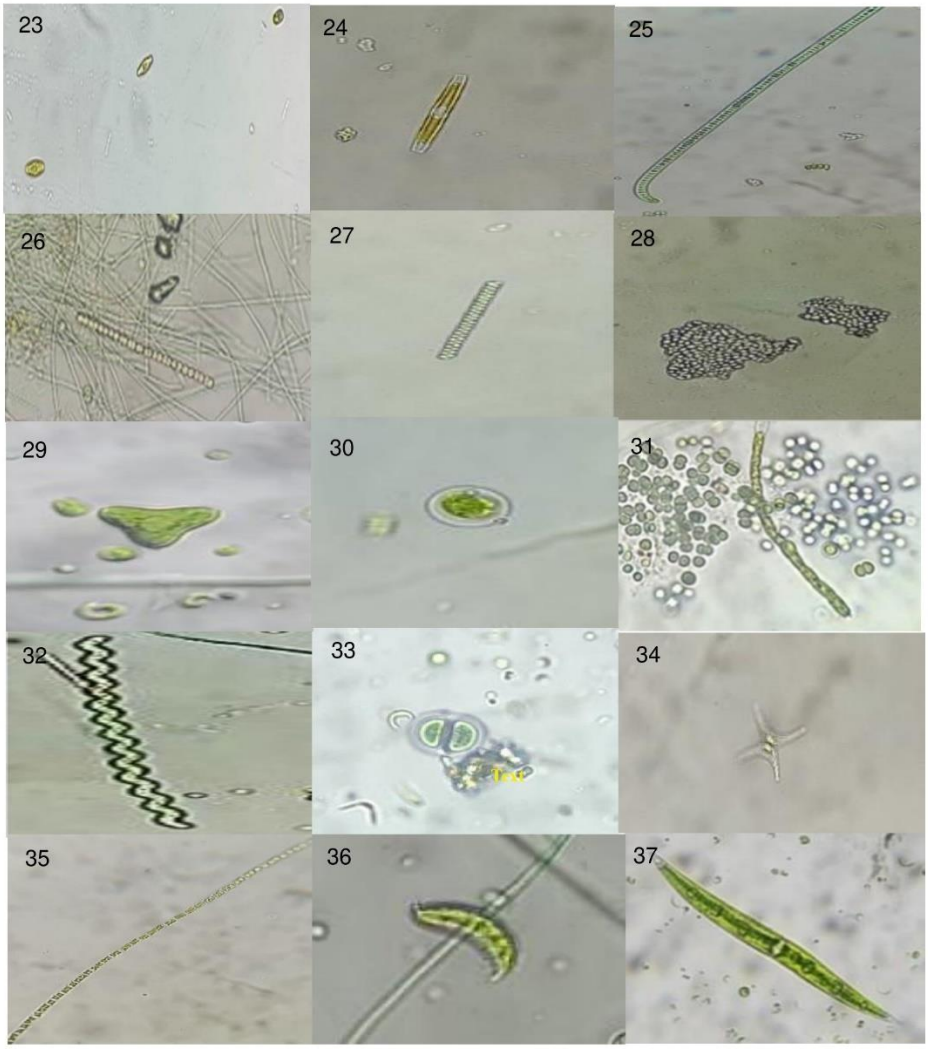


**Fig. 5. The list of recorded phytoplankton species in Sunye Lake(60X-magnification), 23. *Cymbella sp.,* 24. *Nitzchia* sp.*, 25. Oscillatoria* sp., 26. *Anabaena* sp., 27. *Spirulina* sp.*,* 28. *Microcystis* sp., 29*. Teradon* sp., 30*. Gloeocapsa* sp., 31. *Nostoc* sp., 32*. Arthrospir* sp., 33*. Chroococcus* sp., *34. Starastrum* sp.*, 35. Zygnema* sp.*,* 36. *Euglena* sp., 37. *Closterium* sp**

Zygnematophyceae, *Staurastrum* sp. and *Zygnema* sp. were found in this study with 4% in species composition. Zygnematophyceae, are the most diverse green algae, the closest lineage to land plants and are useful model organisms for plant evolution study due to their morphology, cell wall and sexual reproduction [25,26,27]. They consist of unicellular and filamentous algae, occupying freshwater and terrestrial habitats, whose developmental features are very difficult to compare with the complexity of land plant [28].

Euglenophyceae can be considered as useful bio-indicators in assessing the health and extent of deterioration of a lake ecosystem [29], *Euglena* genera was recorded in the month of January and July in 2020, composition was 2% during this study.

In this study, species composition of Conjugatophyceae, *Closterium* sp. was 2%. The genus *Closterium*, which is the closest unicellular relative to land plants, is the best characterized charophycean green algae with respect to the process of sexual reproduction [30] and reported as bio-catalyst used for fuel and chemical production [31].

## 4. CONCLUSION

Check list of phytoplankton is important for ecology study and conservation of the Lake. The current study is first time to study the checklist of phytoplankton in Sunye Lake and help to provide checklist data of phytoplankton genera and their compositions for further study and lake ecosystem management.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that CloudConvert have been used during editing of manuscripts.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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