Some species of Chlorophyta found in Paplae Lake (Madaya Township)

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Abstract

Algae specimens were collected from two stations of Paplae Lake during December 2016 to February 2017. The total of 48 species belonging to 23 genera and 12 families, which were distributed under 5 orders in the class Chlorophyceae, were identified and their morphological characters have also been described. In December 2016 *Coelastrum*, *Scenedesmus*, *Closterium* and *Cosmarium* were abundantly occurred in station 1 and *Pediastrum* in station 2, while *Tetraedron*, *Pediastrum*, *Mougeotia* and *Euastrum* were commonly occurred in station 1, and *Coelastrum*, *Scenedesmus*, *Zygnema* and *Cosmarium* in station 2. In January 2017, *Pediastrum* commonly found in station 1 and *Tetraedron*, *Coelastrum*, *Pediastrum* and *Scenedesmus* in station 2. In January 2017, *Pediastrum* commonly found in station 1 and *Tetraedron*, *Coelastrum*, *Pediastrum* and *Scenedesmus* in station 2. In February 2017 *Pandorina*, *Coelastrum* and *Spirogyra* were abundantly occurred in station 1, while *Chlamydomonas*, *Scenedesmus*, *Zygnema* and *Cosmarium* were commonly found in station 1, and *Pandorina*, *Oocystis*, *Tetraedron*, *Scenedesmus* and *Spirogyra* in station 2.

Key words: Some species of algal flora

Introduction

Green algae are one of the most diverse groups of eukaryotes, showing morphological forms ranging from flagellated unicells, coccoids, branched or unbranched filaments, to multinucleated macrophytes and taxa with parenchymatic tissues.

They are characterized by the presence of chloroplasts with two envelope membranes, stacked thylakoids and chlorophyll *a* and *b* (Pröschold & Leliaert, 2007).

To the present time, algae have been divided into 14 divisions: Rhodophyta (red algae), Euglenophyta (euglenoids), Cryptophyta (cryptomonads), Dinophyta (dinoflagellates), Raphidophyta (Chloromonadophyta), Haptophyta, Chrysophyta (golden-brown algae), Xanthophyta (yellow-green algae), Eustigmatophyta, Bacillariophyta (diatoms), Phaeophyta (brown algae), Prasinophyta, Chlorophyta (green algae) and Glaucophyta (John *et al.* 2002).

An increasing numbers of the important of freshwater algae in environmental management and monitoring has led to an increased demand for their accurate naming. Besides, their potential utilization as a food supply and an alternative energy source has also been triggered us to perform the correct identification of algae in unexplored areas.

In this study, algal specimens were collected from surface water bodies of the two stations in Paplae Lake during December 2014 to February 2015. The Lake, approximately 161874.40 m^2, is situated between 22º 21' N Latitude and 96º 05' and 96º 20' E Longitude, and is surrounded by Paplae village, Shwe Gone Daing village, Bo Daw Taung and Magway Tayar village at the East, West, South and North, respectively.

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The aim of this study were to record the some species of Chlorophyta growing in Paplae Lake and to provide the information for those who interest in managing and monitoring the aquatic ecosystems and in application of algae as a food supply.

Materials and Methods

Water samples containing algae were collected from the upper surface of sites 1 (i.e. Eastern part) and 2 (i.e. Southern part) in Paplae Lake from December 2016 to February 2017 (Figure 1 & 2).

The collected algal specimens were observed by using a compound light microscope (Olympus, Japan) and photomicrographs of the specimens recorded in this study have been taken by a digital camera (Nikon).

The first step in identifying an unknown sample is to determine to which family it belongs.

The second step in identifying the unknown sample is to decide to which genus it belongs, and lastly to identify species, the morphological characteristics of such unknown sample was compared with the descriptions and illustration of Skuja (1949), Prescott (1962), Philipose (1967), Dillard (1982–2000), Hoke *et al.* (1995), Graham & Wilcox (2000) and John *et al.* (2002). Temperature and pH of the water body in each station were measured by thermometer and pH meter respectively (Table 2).

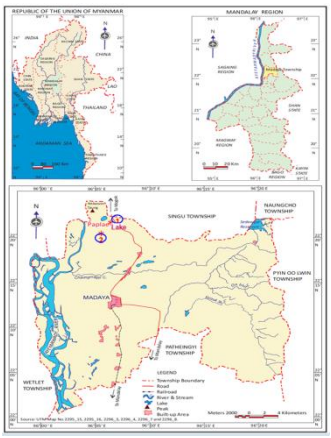


Figure 1.Location map of Paplae Lake in Madaya Township

Results

The 48 species confined to the division Chlorophyta were reported in two sampling sites of Paplae Lake. More precisely, 3 species assigned to 3 genera and 2 families, which were distributed under the order Volvocales, 22 species assigned to 10 genera and 6 families, which were distributed under the order Chlorococcales, 1

species assigned to 1 genera and 1 family, which were distributed under the order Oedogoniales, 1 species assigned to 1 genus and 1 family, which were distributed under the order Cladophorales, 21 species assigned to 8 genera and 2 families, which were distributed under the order Zygnematales (Table 1-3 & Figure 3- 6).

Table 1.Classification of some species of Chlorophyta found in Paplae Lake

No	Class	Order	Family	Genus	Species
1.	Chlorophyceae	1. Volvocales	1. Chlamydomonadaceae	1. *Chlamydomonas*	1. *C. snowiae* Printz
			2. Volvocaceae	2. *Pandorina*	2. *P. morum* (Muell). Bory
				3. *Eudorina*	3. *E. elegans* Ehrenberg
		2. Chlorococcales	3. Chlorococcaceae	4. *Chlorococcum*	4. *C. hypnosporum* Starr
				5. *Crucigenia*	5. *C. rectangularis* (Brun) Gay
			4.Oocystaceae	6. *Ankistrodesmus*	6. *A. falcatus (*Corda) Ralfs
				7. *Kirchneriella*	7. *K. lunaris* (Kirch) Moebius
				8. *Oocystis*	8. *O. borgei* Snow
				9. *Tetraedron*	9. *T. minimum* (Braun) Hansgirg
					10. *T. trilobulatum* (Reinsch) Hansgirg
			5. Botryococcaceae	10. *Botryosphaerella*	11. *B. sudetica* (Lemmermann) Silva
			6. Coelastraceae	11. *Coelastrum*	12. *C. astroideum* Notaris
					13. *C. proboscideum* Bohlin
					14. *C. reticulatum* (Dangeard) Senn
					15. *C. sphaericum* Nageli
			7. Hydrodictyaceae	12. *Pediastrum*	16. *P. duplex* var. *clathratum* (Braun) Lagerheim
					17. *P. duplex* var. *gracillimum* West & West
					18. *P. duplex* var. *rugulosum* Raciborski
					19. *P. simplex* var. *duodenarium* (Bailey) Rabenhorst
					20. *P. tetras* (Ehrenberg) Ralfs
			8.Scenedesmaceae	13. *Scenedesmus*	21. *S. acuminatus* (Lagerheim) Chodat.
					22. *S.arcuatus* Lemmermann
					23. *S. communis* Hegewald
					24. *S. dimorphus* (Turp.) Kützing
					25. *S. protuberans* Fritsch *et* Rich
		3. Oedogoniales	9. Oedogoniaceae	14. *Oedogonium*	26.*O. kjellmanii* var. *granulosa* Prescott
		4. Cladophorales	10. Cladophoraceae	15. *Cladophora*	27. *C. glomerata* (L.) Kützing
		5. Zygnematales	11.Zygnemataceae	16. *Mougeotia*	28. *M.scalaris* Hassall
				17. *Spirogyra*	29. *S. aequinoctialis* West & West
					30. *S. exilis* West & West
					31. *S. strictica* (Engl.) Wille
				18. *Zygnema*	32. *Z. pectinatum* (Vaucher) Agardh
			12. Desmidiaceae	19. *Closterium*	33. *C.acutum* Brebisson in Ralfs
					34. *C. baillyanum* Brebisson
					35. *C. idiosporum* West & West
					36. *C. parvulum* Nageli
					37. *C. venus* var. *crassum* Croasdale
				20. *Cosmarium*	38. *C. cucumis* Corda
					39. *C. obsoletum* (Hantzsch) Reinsch
					40. *C. polygonum* forma *rectum* Bicudo

Table 1. Continued

No	Class	Order	Family	Genus	Species
					41. *C. retusiforme* var. *alpinum* Schmidle
					42. *C. subarctoum* (Lagerheim) Raciborski
					43. *C. trilobulatum* Reinsch
				21. *Euastrum*	44. *E. evolutum* var. *reductum* Scoatt & Prescott
					45. *E. sphyroides* forma *granulata* Scoatt & Prescott
				22. *Staurastrum*	46. *S. bieneanum* var. *ellipticum* Wille
					47. *S. proboscideum* (Brebisson) Archer
				23. *Pleurotaenium*	48. *P. trabecula* var. *elongatum* Cedergren

Table 2. Temperature and pH of surface water body in two sampling sites

Sampling Site	Temperature			pH		
	December 2016	January 2017	February 2017	December 2016	January 2017	February 2017
1 (Eastern part)	28°C	23°C	25°C	8.3	8.2	8.4
2 (Southern part)	30°C	25°C	27°C	8.0	8.1	8.3

Table 3. Distribution of the genera examined in PaplaeLake

Genus	December		January		February	
	S_1	S_2	S_1	S_2	S_1	S_2
Chlamydomonas	+	+	–	+	++	+
Pandorina	+	+	+	+	+++	++
Eudorina	–	+	–	–	+	+
Chlorococcum	–	+	+	–	–	–
Crucigenia	+	–	+	–	+	–
Ankistrodesmus	+	–	+	–	+	–
Kirchneriella	–	–	+	–	–	+
Oocystis	+	–	–	+	–	++
Tetraedron	++	–	+	++	–	++
Botryosphaerella	–	–	+	–	+	–
Coelastrum	+++	++	+	++	+++	+
Pediastrum	++	+++	++	++	+	+
Scenedesmus	+++	++	+	++	++	++
Oedogonium	+	+	–	+	+	+
Cladophora	+	–	+	–	+	–
Mougeotia	++	+	–	–	+	–
Spirogyra	+	+	–	+	+++	++
Zygnema	+	++	–	–	++	+
Closterium	+++	+	+	+	+	+
Cosmarium	+++	++	+	–	++	–
Euastrum	++	+	+	–	+	–
Staurastrum	–	–	–	+	+	–
Pleurotaenium	–	–	+	–	–	+

+++ = abundant S_1=Site 1
++ = commonS_2= Site 2
\+ = a few
– = absent

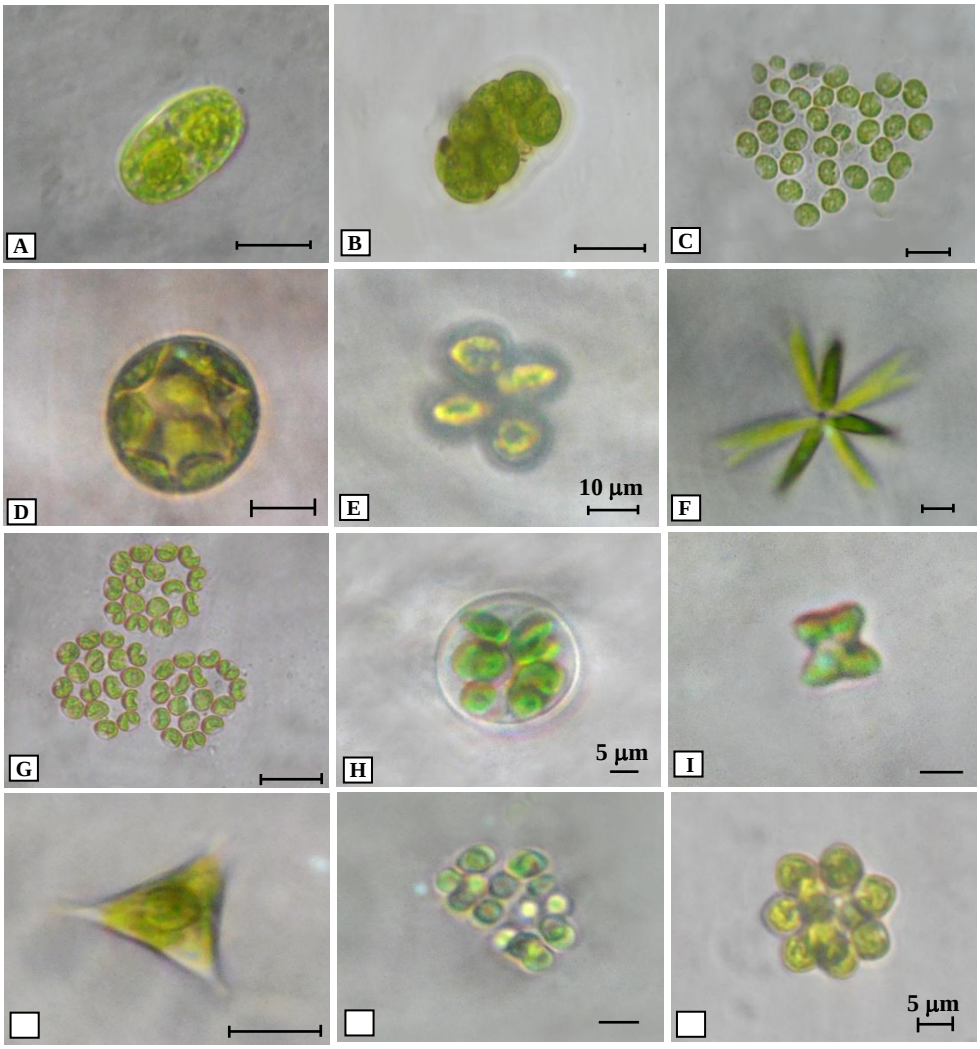
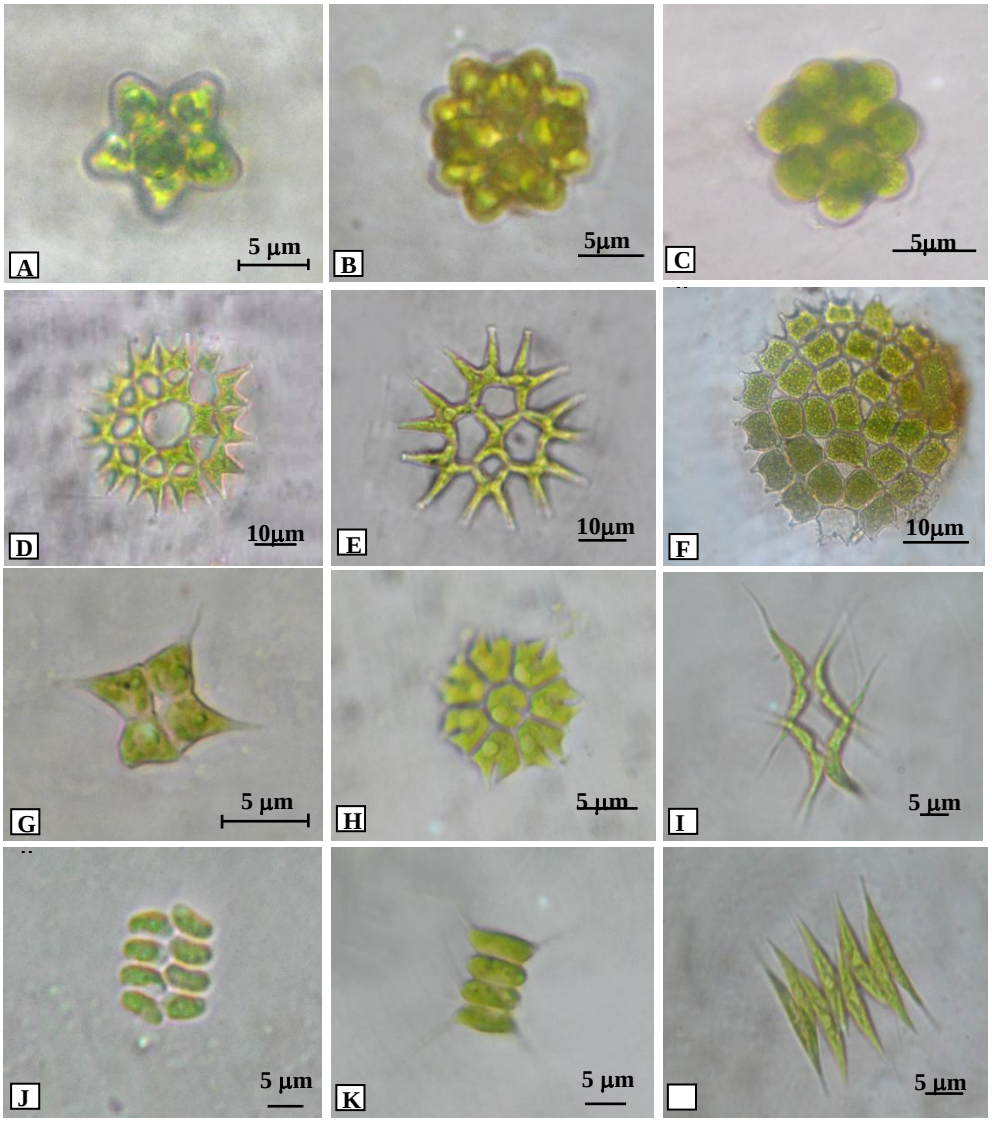


Figure 3. **A.** ***Chlamydomonas snowiae*** **Printz** **B.** ***Pandorina morum*** **(Muell.) Bory** **C.** ***Eudorina elegans*** **Ehrenberg** **D.** ***Chlorococcum hypnosporum*** **Starr** **E.** ***Crucigenia rectangularis*** **(Braun) Gay** **F.** ***Ankistrodesmus falcatus*** **(Corda) Ralfs** **G.** ***Kirchneriella lunaris*** **(Kirch) Moebius** **H.** ***Oocystis borgei*** **Snow** **I.** ***Tetraedron minimum*** **(Braun) Hansgirg** **J.** ***Tetraedron trilobulatum*** **(Reinsch) Hansgirg** **K.** ***Botryosphaerella sudetica*** **(Lemmermann) Silva** **L.** ***Coelastrum astroideum*** **Notaris**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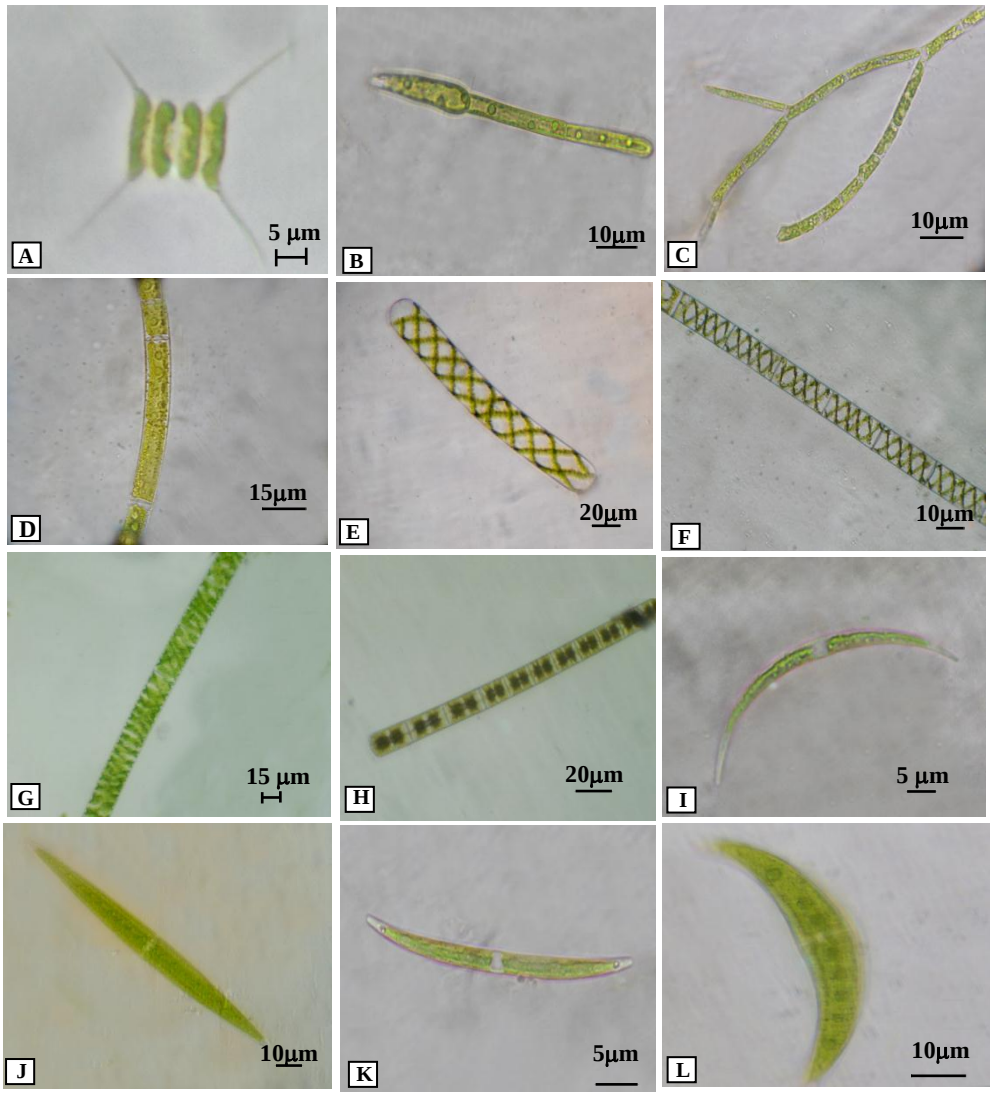

Figure 5. **A.** ***Scenedesmus protuberans*** **Fritsch *et* Rich** **B.** ***Oedogonium kjellmanii*** **var. *granulosa* Prescott.**

C. ***Cladophora glomerata*** **(L.) Kützing** **D.** ***Mougeotia scalaris*** **Hassall**

E. ***Spirogyra aequinoctialis*** **West & West** **F.** ***Spirogyra exilis*** **West & West**

G. ***Spirogyra strictica*** **(Engl.) Wille** **H.** ***Zygnema pectinatum*** **(Vaucher) Agardh**

I. ***Closterium acutum*** **Brebisson in Ralfs** **J.** ***Closterium baillyanum*** **Brebisson**

K. ***Closterium idiosporum*** **West & West** **L.** ***Closterium parvulum*** **Nageli**

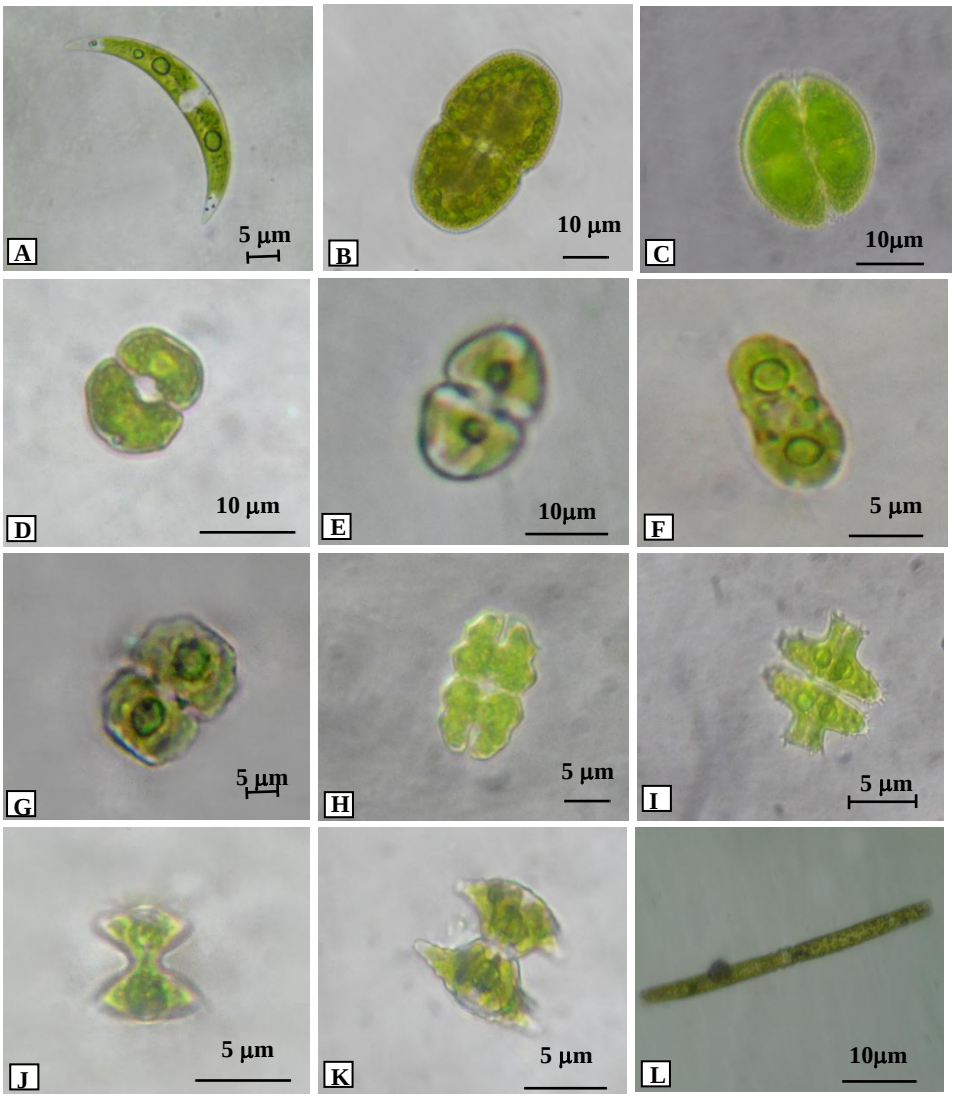

Figure 6. **A.** ***Closterium venus*** **var.** ***crassum*** **Croasdale** **B.** ***Cosmarium cucumis*** **Corda**
C. ***Cosmarium obsoletum*** **(Hantzsch) Reinsch** **D.** ***Cosmarium polygonum*** **forma** ***rectum*** **Bicudo**
E. ***Cosmarium retusiforme*** **var.** ***alpinum*** **Schmidle** **F.** ***Cosmarium subarctoum*** **(Lagerheim) Raciborski**
A. ***Cosmarium trilobulatum*** **Reinsch** **B.** ***Euastrum evolutum*** **var.** ***reductum*** **Scoatt & Prescott**
C. ***Euastrum sphyroides*** **forma** ***granulata*** **Scoatt & Prescott** **D.** ***Staurastrum bieneanum*** **var.** ***ellipticum*** **Wille**
E. ***Staurastrum proboscideum*** **(Brebisson) Archer.** **F.** ***Pleurotaenium trabecula*** **var.** ***elongatum*** **Cedergren**

Discussion and Conclusion

In the present study, the algal specimens observed were belonged to 48 species, 23 genera, 12 families, 5 orders, 1 class in the division Chlorophyta. The morphological characteristics of the species documented here are highly consistent with the description of Skuja (1949), Prescott (1962), Philipose (1967), Dillard (1982–2000), Hoke *et al.* (1995), Graham & Wilcox (2000) and John *et al*. (2002).When the number of algal species assigned to respective orders was taken into consideration, it was displayed that Chlorococcales comprised 45.84%, followed by Zygnematales 43.75%, Volvocales 6.25%, Oedogoniales and Cladophorales 2.08% each.

Temperature of surface water body in sampling sites 1 and 2 revealed differences not only in individuals but also within each site, but pH of both sites was similar throughout the study period.

Among the 23 genera recorded, 6 genera, *Pandorina*, *Coelastrum*, *Scenedesmus*, *Spirogyra*, *Closterium* and *Cosmarium*, with abundant growth were occurred in site 1, while only 1 genus, *Pediastrum*, with abundant growth was found in site 2.

Moreover, all genera reported here were observed in the site 1, but all genera, apart from *Crucigenia*, *Ankistrodesmus*, *Botryosphaerella* and *Cladophora*, in site 2 within December 2016-February 2017. Interestingly, no genera were grown abundantly in both sites during January 2017. The above mentioned data suggests that uneven distribution and abundance of taxa examined in Paplae Lake is generally attributed to environmental heterogeneity in both space and time.

Temperature was 28°C in station 1 and 30°C in station 2 in December 2016, during which the taxa abundantly observed were *Coelastrum*, *Scenedesmus*, *Closterium* and *Cosmarium* in site 1 and *Pediastrum* in site 2. When temperature was dropped into 23°C in station 1 and 25°C in station 2 in January 2017, in which no taxa were observed abundantly.

In February 2017, temperature in site 1 and 2, respectively, was 25°C and 27°C, at that time the taxa abundantly observed were *Pandorina*, *Coelastrum* and *Spirogyra* in site 1, whereas no taxa observed abundantly in site 2.

Therefore, temperature appears to have had a moderate influence on the abundance of algae collected in each month.

In this study, *Coelastrum*, *Pediastrum*, *Scenedesmus*, *Closterium* and *Cosmarium* were abundantly occurred in Paplae Lake under the temperature range from 28°–30° C in December 2016; this finding is highly agreeable with the report of Philipose (1967), who stated that those genera can grow well under the temperature usually ranged from 26.5°–29.5°C.

It has been stated that some members of green algae can be used as a food supply in many parts of the world.

Therefore, it is hoped that those two genera recorded in this work have potential utilization as a food. Some members of algae (e.g. diatoms and euglenoids) and cyanobacteria were also detected in the course of microscopic observation; indicating that further studies are required to describe the remaining taxa in Paplae Lake.

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