Study and Distribution of Phytoplankton in Langer House Lake in Greater Hyderabad, Telangana State, India.

T. Uttara Phalguni[1*] And B. Rajkumar[2]

[1*]Assistant Professor of Botany, Department of Botany, Govt. Degree College, Shadnagar T.G., INDIA.
[2]Professor, Department of Botany, Osmania University. T.G., INDIA.

ABSTRACT
The present study aimed to evaluate the biodiversity, distribution, and seasonal variation of phytoplankton in Langer House Lake, located in Greater Hyderabad, Telangana State. Sampling was conducted at three different stations across the study site over a two-year period, from May 2006 to April 2008. The results revealed a dominance of Cyanophyceae, accounted 51.3% of the total phytoplankton population which included 12 genera and 35 species. Chlorophyceae with 30% represented by 20 genera and 34 species, followed by Euglenophyceae with 14.5% represented by 4 genera, 16 species and Bacillariophyceae with 5% including 11 genera, 21 species. Thus, Cyanophyceae emerged as the most dominant group, followed by Chlorophyceae, Euglenophyceae, and Bacillariophyceae. Among the Cyanophyceae, genera such as *Oscillatoria, Merismopedia, Chroococcus*, and *Microcystis* were predominant. In the Chlorophyceae group, *Scenedesmus, Pediastrum,* and *Tetraedron* were frequently observed. *Euglena, Phacus,* and *Trachelomonas* were dominant within Euglenophyceae, while *Gomphonema, Navicula, Nitzschia,* and *Cymbella* were the key representatives of Bacillariophyceae. These genera were consistently present throughout the study period.

KEY WORDS: -Phytoplanktons, Diversity, Distribution and Langerhouse lake.

INTRODUCTION: -
Phytoplanktons are the autotrophic members of plankton community. Their names are derived from the Greek word *phyton* (meaning "plant") and *planktos* (meaning "wanderer"or 'drifter' (Thurman 1997). Most phytoplanktons are microscopic and cannot be seen with the naked eye. The tiny, photosynthetic organisms float in aquatic environments, including both freshwater and marine systems. According to NASA scientists, around 3.5 billion years ago, the emergence of these sunlight-harnessing microorganisms transformed the planet. By using sunlight, heat, water and minerals to produce proteins, carbohydrates, vitamins and amino acids, they laid the foundation for all the life on earth. Phytoplankton, as single-celled plants are considered the primary producers in aquatic ecosystems and mostly found in sill waters (lentic habitats) and slow moving sections of larger rivers (Wetzel 1975).
Early phycological research in Hyderabad established a foundational understanding of algal ecology within the region's freshwater systems. Notably, Zafar (1959–1967) conducted ecological studies on algae in fishponds, with a particular emphasis on seasonal variations and the periodicity of the Euglenophyceae. Later, Rao (1971–1977) investigated phytoplankton communities across three freshwater ponds in the city, significantly contributing to the broader knowledge of algal diversity and distribution in the area.
Sampath Kumar (1977) investigated the ecological dynamics of algae in the Moosi River, focusing on the effects of pollution and its influence on water fertility. Building upon this work, Venkateswarlu and Seshadri (1981) emphasized the use of algae as bioindicators for assessing river water quality and contamination. Rao (1980) contributed to this body of research with studies on algal communities in Hyderabad's Hussain Sagar and Fox Sagar lakes. In a related effort, Janardhan Rao (1982) examined algal ecology in the polluted waters of the Moosi River. Additionally, Venkateswarlu conducted extensive research on algal distribution in urban freshwater systems, highlighting the significant impact of anthropogenic activities on algal diversity and water quality.
The most commonly observed groups of freshwater algae are Cyanophyceae, Chlorophyceae, Euglenophyceae, and Bacillariophyceae. Among these, Cyanophyceae, comprising unicellular, colonial, and filamentous forms, are considered particularly significant due to their substantial influence on water quality. Elevated concentrations of Cyanophyceae in heavily polluted waters have been reported by Palmer (1969) and Manikya Reddy &Venkateshwarlu (1992). Furthermore, several studies, including those by Vijaya (1999), Tiwari & Chauhan (2006), and Padmavathi (2007), have emphasized the role of temperature as a key factor influencing their growth and proliferation.
Chlorophyceae represent a large and important group of freshwater green algae. The optimal temperature range for their growth is between 30°C and 35°C (Rodhe, 1948). High light intensity and elevated temperatures have been found to favor the growth of green algae (Cairns, 1956). Recent studies on Chlorophyceae include Misra *et al.*, (2002), who investigated filamentous green algae in the Basti district; Vaishali *et al.*, (2003), who examined the dynamics of Chlorophyceae within the phytoplankton community of Lake Masunda in Thane and Sreelatha and Raja Lakshmi (2005), who studied the seasonal dynamics of Chlorophyceae in the Goutami Godavari River at Yanam, Puducherry.

Phytoplanktons form the foundation of the aquatic food web and play a vital ecological role in sustaining all forms of aquatic life. In addition to their ecological importance, they are significant contributors to the Earth's atmospheric oxygen. Through the process of photosynthesis, these microscopic organisms absorb carbon dioxide from the atmosphere meaning that larger phytoplankton populations contribute to greater carbon dioxide removal. According to Whitford and Schumacher (1963), Wetzel (1975), and Crayton and Sommerfield (1979), key factors influencing the development of phytoplankton populations include water age, light availability, and temperature. In addition, a range of physico-chemical parameters and interacting environmental factors significantly affect their distribution and seasonal dynamics.

Phytoplankton are highly sensitive to environmental changes and are widely distributed across various freshwater habitats, including pools, ponds, lakes, and streams. They are capable of surviving under a broad range of temperatures, salinity levels, and water chemistries. Phytoplankton consists of a diverse array of algal taxonomic groups, with Cyanophyceae, Chlorophyceae, Bacillariophyceae, and Euglenophyceae being the most frequently encountered in lake ecosystems.

MATERIAL AND METHODS:-

Study Area:-This lake is adjacent to west of the village, Langer house. It is situated at a latitude of 17^0-23'-0 and longitude of 78^0 – 25'-0. ". The extent of water spread is about 29.50 acres at a FTL of 506.76. The tank is used for all purposes except drinking water. The upper source for the tank is from Sosthar tank, Langer house and lower source is from Oora-cherugunta, Shaikpet. STP of 0.8 Mld capacity is established here and it is functioning successfully since June, 2003.There is constant traffic over the road, being a journalist centre, parapet walls are constructed on both sides of bund. To collect the samples three different points were identified at the lake. Station I: It is located near the main entrance of the lake, Station II: It is located towards Ahmednagar, Station III: It is located towards Langerhouse. (Fig-1 to Fig-4).

Collection of water samples and identifications:-

Water samples were collected from the surface at all designated sampling sites of the lake using reagent bottles. These samples were immediately preserved in 4% formalin solution and observed monthly over a two-year period, from May 2006 to April 2008, during the early morning hours. Upon return to the laboratory, the samples were stored at low temperatures following the procedure described by Mittal and Sengar. Algal identification was carried out using standard reference literature and related sources, Fritsch, F.E., (1935). Smith, G. M., (1950), Prescott, G.W.,(1951), Desikachary, T.V.,(1951), Venkataraman, G.S., (1951) and Phillipose, M.T., (1967). The water samples were collected from three specific locations—Sampling Station I, Sampling Station II, and Sampling Station III—between 8:00 AM to 10:00 AM. Phytoplankton species were identified using standard literature and monographs, including works by Desikachary (1951), Iyengar (1940) and Anand (2010).

Fig-1: LANGER HOUSE LAKE- SATELLITE VIEW

Fig-2: LANGER HOUSE LAKE STATION – I

Fig-3: LANGER HOUSE LAKE STATION – II

Fig-4: LANGER HOUSE LAKE STATION – III

RESULT AND DISCUSSIONS: -In the present study, the periodicity and distribution of planktonic algae in Langer House Lake were assessed throughout the investigation period. Four major algal groups were identified: Cyanophyceae, Chlorophyceae, Bacillariophyceae, and Euglenophyceae (Table-1). Among these, Cyanophyceae emerged as the most dominant group, consistently occupying the top position across all sampling stations. Chlorophyceae was the second most abundant, followed by Bacillariophyceae and Euglenophyceae in third and fourth positions, respectively. Detailed findings are presented in Tables 3 to 5.

Cyanophyceae:-In the present investigation Cyanophyceae group dominates over the other groups by constituting about 51.3% of the total phytoplankton. The Cyanophyceae population has been represented by 12 genera and 35 species. Among the genus *Oscillatoria* was represented by 8 species, *Merismopedia* was represented by 5 species, *Chroococcus* was represented by 3 species, *Microcystis* was represented by 3 species, *Anabaena, Arthrospira, Phormidium* and *Spirulina* were represented by 2 species each.

Chlorophyceae: -The Chlorophyceae members constituted 30% of the total phytoplankton. This was the second dominant group in the total phytoplanktons. The group was mainly constituted by the members of Volvocales, Chlorococcales and Desmids. It was represented by 20 genera and 34 species. Out of which *Scenedesmus* was represented by 5 species, *Pediastrum* was represented by 5 species, *Tetraedron* was represented by 4 species *Closterium, Cosmarium and Selenastrum* were represented by 2 species each. (Srinivas,M and Aruna,M., 2018).

Euglenophyceae:-Euglenophyceae constituted 14.5% of the total phytoplankton. It occupied third position among all the other groups and is represented by 4 genera and 16 species. Among them the genus *Euglena* was represented by 6 species, *Phacus* was represented by 5 species, *Trachelomonas* was represented by 3 species *Lepocinclis* was represented by 2 species.

Bacillariophyceae: -This is the least represented group among all the phytoplankton. It constitutes about 5% of the phytoplankton and is represented by 11 genera and 21 species. The genus *Gomphonema* was represented by 4 species, *Navicula* was represented by 4 species *Nitschizia, Cymbella* were represented by 3 species each.

DISTRIBUTION AND PERIODICITY OF CYANOPHYCEAE: -According to Venkateshwarlu (1969b), Smet and Evans (1972), Cyanophyceae are most abundant in habitats rich in organic matter such as polluted lakes and rivers, shallow bodies of water, it also flourished well in warm waters with high pH. Vijitha (1995) and Venugopal Rao (1997) pointed out that their growth was influenced by different concentration of organic matter. They have shown that the population of blue-green's increase with the increase of organic matter, which is in agreement with the present findings.
The Cyanobacteria are most abundant in habitats rich in organic matter such as polluted lakes and rivers, shallow bodies of water (Sampath Kumar, 1977). Franklin (1972) opined that the blue greens are general indicators of eutrophy of water. Paramasivam and Sreenivasan (1981) have reported that the polluted water bodies exhibit heavy growth of Blue-green algae which also dominate over Chlorophyceae and Bacillariophyceae. Thus the present data confirms the same. Langerhouse lake was rich in organic matter and exhibited heavy growth of Blue-greens over the other members of algae.
The dominance of blue-greens during summer months can be attributed to the presence of bright sunshine required for their growth. The present study is in agreement with Laxmaiah *et al.* (1994). Swarnalatha (1990) have also reported similar observation in the lakes around Hyderabad city. The species in lake were represented by *Arthrospira platensis, Microsystis aeruginosa, Chroococcus minutus, Merismopedia punctata, Oscillatoria chalybea.* In these lake the blue green algae have attained their highest magnitude in the months of March, April, May and June when the water temperatures were quite high (Raju Potharaju and Aruna.M.,2022). Their representation during summer season indicates clearly that they can tolerate wide ranges of temperatures. Tiwari and Chauhan (2006) and Padmavathi (2007) have reported the role of temperature on the growth of Cyanophyceae.

DISTRIBUTION AND PERIODICITY OF CHLOROPHYCEAE:- Chlorophyceae occupied second position in the order of dominance in lake under study. Many authors who have worked on the distribution and periodicity of this group include Misra, *et al.,*(2002), Jena (2007). According to Pearsall (1921 and 1930) the waters harbouring green algae are different in chemical composition than those favouring diatoms and blue-green algae in larger lakes. Cairns (1956) reported that high light and high temperatures favour the growth of green algae. Supporting the above findings in the present study Chlorophyceae was found to be dominant in summer. According to Nygaard (1949) Volvocales are abundant in eutrophic waters; however desmids were comparatively less in these water.
This group was represented by less numbers of *Eudorina elegans, Chlamydomonas angulosa* and *Pandorina morum.* It is also in agreement with Sudha Rani (2004) who found the similar findings during her work on Hussain Sagar Lake. Their population decreased when the temperature rose in the summer months. Temperature dependent periodicity was also observed by Cynthia (1980) and Sudha Rani (2004). Among the Chlorophyceae Chlorococcales flora dominated the lake. This group is represented by the species of *Chlorella, Scenedesmus, Pediastrum,Tetraedron* and *Selenastrum.* Desmids are cosmopolitan microorganisms of tropical to arctic water bodies. Jena *et al*. (2007) have carried out remarkable studies on ecology of desmids. The most common genus found is *Closterium*. The relatively high total solids content of the lakes has supported lower percentage of desmids.

Langerhouse Lake is dominated by the group Cyanophyceae which constituted about 51.67% and it is represented by the species of *Oscillatoria, Merismopedia, Chroococcus, Microcystis,Anabaena, Arthrospira, Phormidium* and *Spirulina.* It was followed by the group Chlorophyceae which constituted about 30.3%. It is represented by the species of *Scenedesmus, Pediastrum, Tetraedron, Chlamydomonas, Pandorina, Eudorina* and *Crucigenia.* The third dominant group is Euglenophyceae and constituted about 14.6%. It is represented by the species of genus *Euglena, Trachelomonas, Phacus* and *Lepocinclis.* The fourth dominant group in the lake is Bacillariophyceae and is constituted by 4.09%. The group is represented by the species of *Gomphonema, Navicula, Synedra, Cocconeis* and *Nitschizia.* (Srinivas,M and Aruna,M., 2019).

In the present study the lake exhibit a eutrophic nature owing to the predominance of Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae which are said to be present in eutrophic water bodies according to Wetzel (1975). In the Langerhouse Lake the Cyanophyceae group has occupied the first position. In this lake *Microcystis aeruginosa* was present. According to Prescott (1951) and Singh (1953) *Microcystis aeruginosa* is the best indicator of organic pollution. Thus the water is polluted in this lake at all the stations as is evident by the presence of blue-green algae throughout the period of investigation.

The Chlorophyceae of this lake were represented by the species of the genera *Scenedesmus, Ankistrodesmus, Chlorella, Pediastrum* and *Closterium.* (Rajyalaxmi,K., and Aruna,M., (2019). Euglenophyceae members were represented by species of *Euglena* and *Phacus*. Euglenoids are dwellers of polluted water which are deficient in oxygen. The present data is in conformity with their views. The Bacillariophyceae were represented by *Gomphonema parvulum, Nitzschia palea* and *Nitzschia hungarica*. (Raju Potharaju and Aruna., M.,2021)

Phytoplanktonic organisms were mainly represented by four groups of algae i.e., Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. Cyanophyceae dominated over other groups in the lake. It constitutes about 51.4%, 50.33% and 53.3% at station I, II and III of Langerhouse Lake respectively. The dominant species of Cyanophyceae recorded in this lake were of the species of *Arthrospira, Microcystis* and *Oscillatoria. (*Naga Sameera and Aruna, M., 2019)

Chlorophyceae occupied the second position at all the three stations of the lake. It constituted about 30.47%, 29.73% and 30.19% at station I, II and III of Langerhouse Lake respectively. It is mostly represented by the species of *Chlorella, Pediastrum, Scenedesmus* and *Actinastrum.* Euglenophyceae occupied third position. In Langerhouse Lake it constituted about 14.62%, 16.12% and 13.26% at stations I, II and III respectively. The dominant species of Euglenophyceae in the lake are *Phacus* and *Euglena.* It is found that Euglenoids prefer high organic content and low dissolved oxygen.

Bacillariophyceae occupied the fourth position the lake. It has been observed that it is 4.2% at station I, 4.46% at station II and 3.61% at station III of Langerhouse lake. It is represented by the species of *Navicula* and *Pinnularia.* It is evident not only from the chemical nature of water but also from the existence of continuous blooms of Cyanobacteria. (Fig-5 & 6)

CONCLUSION: -

Nygaard proposed four indices to assess the organic pollution levels of water bodies based on the composition of algal groups: the Myxophycean Index, Chlorophycean Index, Diatom Index, and Euglenophycean Index. These indices are based on the premise that different algal groups exhibit varying tolerance levels to organic pollution and nutrient enrichment. For example, phytoplankton belonging to Cyanophyceae, Euglenophyceae, centric diatoms, and most Chlorococcales are typically found in eutrophic waters, whereas pinnate diatoms and desmids are more characteristic of oligotrophic conditions. The trophic status of a water body can thus be inferred by comparing observed values with the reference values provided by Nygaard.

In the present study, all four Nygaard indices were evaluated, and the results are presented in Table 2. Based on these findings and comparison with Nygaard's reference values, it is evident that Langer House Lake exhibits a eutrophic nature.

Table-1: Showing the list of phytoplankton recorded in the Langerhouse lake.

Cyanophyceae	Chlorophyceae	Euglenophyceae	Bacillariophyceae
Oscillatoria angusta,	*Scenedesmus dimorphus*	*Euglena acusEuglena*	*Gomphonema gracile*
Oscillatoria princeps	*Scenedesmus armatus*	*maxima*	*Gomphonemaparvulum*
Oscillatoria amoena,	*Scenedesmus acuminatus*	*Euglena rostrata*	*Gomphonema*
Oscillatoria prolifica	*Scenedesmus quadricauda*	*Euglena viridis*	*acuminatum*
Oscillatoria sancta	*Scenedesmus obliquus*	*Euglena obtuse*	*Gomphonemamontanum*
Oscillatoria tenuis	*Pediastrum duplex,*	*Euglena minuta.*	*Navicula cuspidate*
Oscillatoria limnetica	*Pediastrum tetras,*	*Phacus orbicularis*	*Naviculasubtillissima*
and *Oscillatoria curviceps*	*Pediastrum obtusum*	*Phacuscircumflexus*	*Naviculahustedtii*
Merismopedia glauca	*Pediastrum simplex*	*Phacus longicauda*	*Naviculapupula*
Merismopedia minima	*Pediastrum tetras var. tetraedron*	*Phacus acuminata*	*Nitschizia acuminate*
Merismopedia punctata	*Tetraedronmuticum*	*Phacuscurvicauda*	*Nitschiziahungarica*
Merismopediatenuissima	*Tetraedronhistatum*	*Trachelomonas armata*	*Nitschizia palea*
Chroococcusminimus	*Tetraedron minimum*	*Trachelomonas hispida*	*Cymbella aspera*
Chroococcus minutus	*Tetraedron trigonum*	*Trachelomonasplanktonica*	*Cymbellacymbiformis*
Chroococcusturgidus	*Closterium lanceolatum*	*Lepocinclis ovum*	*Cymbellacuspidata*

Microcystis aeruginosa *Microcystis flos-aquae* *Microcystis irregularis* *Anabaenacircinalis* and *Anabaena spiroides* *Arthrospirajenneri* *Arthrospira platensis* *Phormidium gracile* *Phormidiummicrotomum* *Spirulina gigantean* *Spirulina major* *Gloeocapsa compacta* *Rhabdoderma irregular* *Coelosphaerium dubium* *Nostoc verrucosum* *Aphanocapsagrevillei* *Anacystis rupestris* *Aphanizomenonflos-aquae* *Lyngbya spiralis*	*Closterium lineatum* *Cosmariumcontractum* *Cosmariumtumidum.* *Selenastrum gracile* *Selenastrumbibraianum* *Chlamydomonas angulosa* *Pandorina morum,* *Eudorina elegans,* *Crucigenia irregularis* *Tetrasporagelatinosa* *Gloeocystis gigas* *Coelastrum microporum* *Chlorella vulgaris* *Dictyosphaeriumehrenbergianum* *Oocystiscrassa* *Ankistrodesmusfalcatus* *Kirchneriellacontarta* *Actinastrumhantzschii* *Spirogyra condensate*	*Lepocinclisfusiformis*	*Cyclotella meneghianiana* *Melosira granulate* *Synedra ulna* *Cocconeisplacentula* *Rhopalodiagibba* *Mastogloia smithii* *Pinnularia biceps*

Table-:2 NYGAARD ALGAL INDICES

Index	Calculation	Oligotrophic lake	Eutrophic lake	Langerhouse Lake
Cyanophyceae	CyanophyceaeDesmids	0.0 - 0.4	0.1 - 3.0	0.1-2.0
Chlorophyceae	ChlorococcalesDesmids	0.0 - 0.7	0.2 - 9.0	0.2 - 6.5
Bacillariophyceae	Centric diatoms Pennate diatoms	0.01 - 0.3	0.0 - 1.75	0.0 - 1.05
Euglenophyceae	EuglenophyceaeMyxophyceae + Chlorococcales	0.0 - 0.7	0.0 - 1.0	0.0 - 0.75
Compound	Cyanophyceae + Chlorococcales + Diatoms + Euglenophyceae Desmids	0.01 - 1.0	1.2 - 2.5	1.2 - 2.2

Table-3: PHYTOPLANKTON LANGERHOUSE LAKE STATION – I

(Expressed as no. of organisms per ml)

S.No.	Month & Year	Cyanophyceae	Chlorophyceae	Euglenophyceae	Bacillariophyceae
1	**May'06**	**143**	**88**	12	**6**
2	**Jun'06**	**90**	**49**	14	**0**
3	**Jul'06**	**50**	**32**	19	**5**
4	**Aug'06**	**40**	**35**	15	**0**
5	**Sep'06**	**35**	**31**	10	**8**
6	**Oct'06**	**40**	**24**	24	**0**
7	**Nov'06**	**36**	**18**	31	**10**
8	**Dec'06**	**45**	**30**	20	**11**
9	**Jan'07**	**48**	**20**	16	**10**
10	**Feb'07**	**67**	**26**	25	**14**
11	**Mar'07**	**106**	**35**	12	**5**

12	**Apr'07**	**138**	**76**	13	**2**
13	**May'07**	**125**	**66**	13	**5**
14	**Jun'07**	**51**	**50**	15	**2**
15	**Jul'07**	**32**	**33**	18	**0**
16	**Aug'07**	**38**	**36**	10	**0**
17	**Sep'07**	**35**	**29**	19	**3**
18	**Oct'07**	**48**	**20**	26	**2**
19	**Nov'07**	**30**	**28**	30	**7**
20	**Dec'07**	**60**	**26**	25	**8**
21	**Jan'08**	**62**	**24**	18	**10**
22	**Feb'08**	**60**	**32**	23	**8**
23	**Mar'08**	**78**	**51**	16	**9**
24	**Apr'08**	**110**	**70**	22	**4**
	Total	**1567**	**929**	**446**	**129**
	Percentage	**51.03%**	**30.25%**	**14.52%**	**4.20%**

Table-4: PHYTOPLANKTON LANGERHOUSE LAKE STATION – II

(Expressed as no. of organisms per ml)

S.No.	Month & Year	Cyanophyceae	Chlorophyceae	Euglenophyceae	Bacillariophyceae
1	**May'06**	**104**	**65**	12	**2**
2	**Jun'06**	**88**	**51**	22	**11**
3	**Jul'06**	**67**	**39**	15	**0**
4	**Aug'06**	**48**	**20**	18	**5**
5	**Sep'06**	**34**	**15**	12	**9**
6	**Oct'06**	**40**	**21**	34	**0**
7	**Nov'06**	**56**	**19**	35	**5**
8	**Dec'06**	**49**	**29**	32	**0**
9	**Jan'07**	**51**	**24**	18	**4**
10	**Feb'07**	**68**	**38**	19	**10**
11	**Mar'07**	**74**	**46**	26	**8**
12	**Apr'07**	**89**	**64**	16	**6**
13	**May'07**	**95**	**58**	14	**4**
14	**Jun'07**	**75**	**49**	20	**8**
15	**Jul'07**	**34**	**31**	13	**2**
16	**Aug'07**	**40**	**35**	11	**4**
17	**Sep'07**	**38**	**27**	12	**5**
18	**Oct'07**	**53**	**25**	28	**9**
19	**Nov'07**	**45**	**32**	32	**7**
20	**Dec'07**	**58**	**28**	12	**3**
21	**Jan'08**	**69**	**24**	20	**5**
22	**Feb'08**	**55**	**32**	25	**12**
23	**Mar'08**	**73**	**50**	15	**8**
24	**Apr'08**	**95**	**63**	19	**6**
	Total	**1498**	**885**	**480**	**133**
	Percentage	**50.00%**	**29.54%**	**16.02%**	**4.44%**

Table-5: PHYTOPLANKTON LANGERHOUSE LAKE STATION – III

(Expressed as no. of organisms per ml)

S. No.	Month & Year	Cyanophyceae	Chlorophyceae	Euglenophyceae	Bacillariophyceae
1	**May'06**	**120**	**80**	15	**4**
2	**Jun'06**	**110**	**58**	14	**3**
3	**Jul'06**	**67**	**32**	19	**0**
4	**Aug'06**	**38**	**35**	10	**0**
5	**Sep'06**	**40**	**28**	18	**5**
6	**Oct'06**	**42**	**24**	28	**7**
7	**Nov'06**	**35**	**18**	18	**0**
8	**Dec'06**	**32**	**20**	16	**8**
9	**Jan'07**	**75**	**29**	24	**12**

10	**Feb'07**	**88**	**43**	12	**9**
11	**Mar'07**	**110**	**58**	13	**11**
12	**Apr'07**	**135**	**62**	14	**6**
13	**May'07**	**128**	**63**	18	**2**
14	**Jun'07**	**60**	**55**	14	**0**
15	**Jul'07**	**30**	**23**	15	**3**
16	**Aug'07**	**38**	**33**	9	**2**
17	**Sep'07**	**32**	**25**	18	**0**
18	**Oct'07**	**50**	**32**	20	**4**
19	**Nov'07**	**48**	**24**	33	**2**
20	**Dec'07**	**54**	**32**	18	**5**
21	**Jan'08**	**60**	**29**	23	**6**
22	**Feb'08**	**76**	**34**	19	**9**
23	**Mar'08**	**80**	**45**	12	**7**
24	**Apr'08**	**115**	**60**	14	**8**
	Total	**1663**	**942**	**414**	**113**
	Percentage	**53.10%**	**30.08%**	**13.22%**	**3.61%**

Fig-5*:* PERCENTAGE OF VARIOUS GROUPS OF ALGAELANGER HOUSE LAKE STATION – I

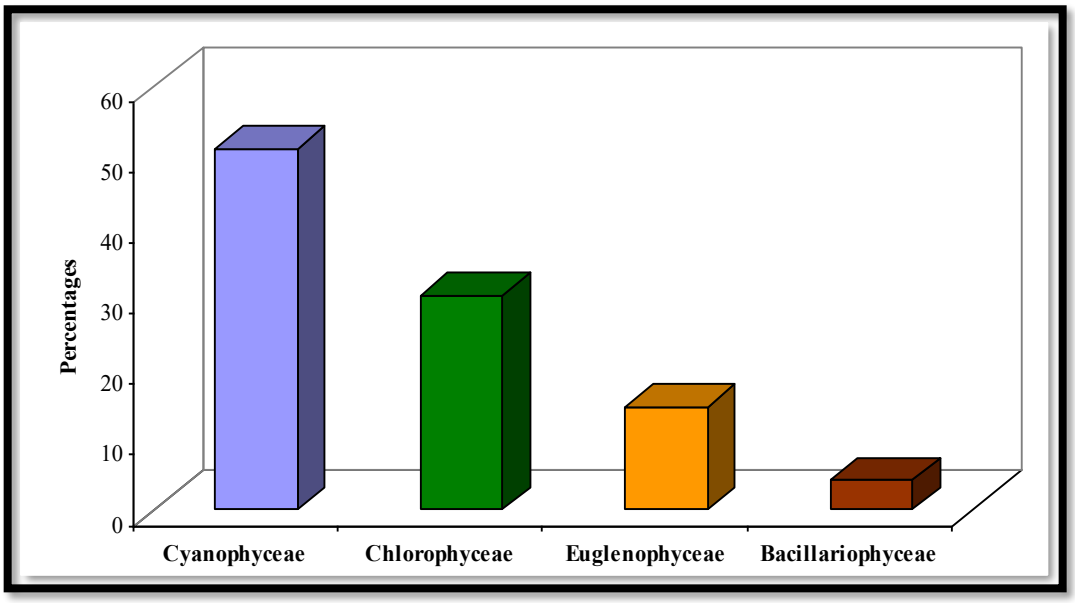


Fig-6: PERCENTAGE OF VARIOUS GROUPS OF ALGAELANGER HOUSE LAKE STATION – II

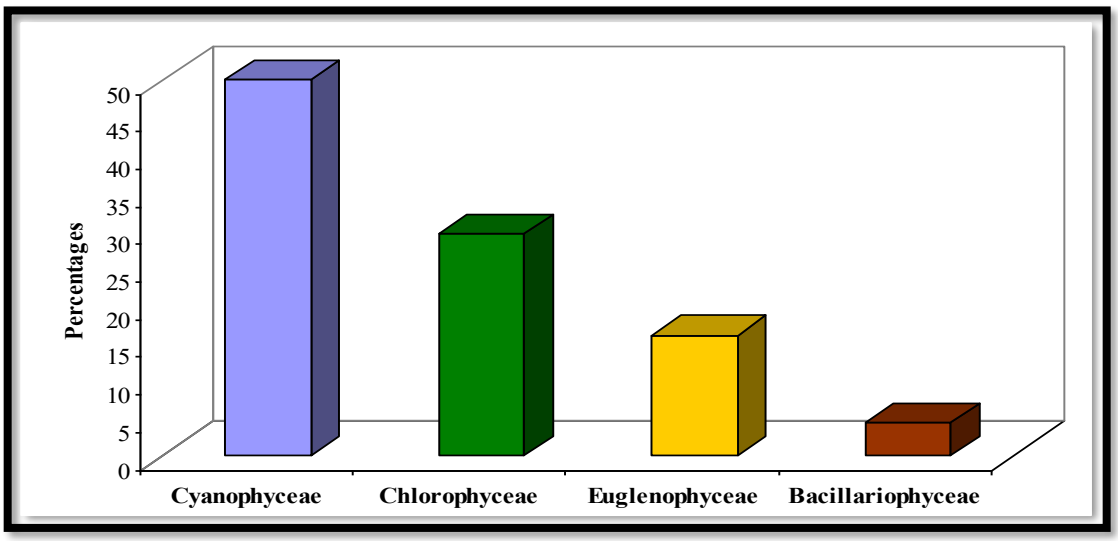


Fig-7: PERCENTAGE OF VARIOUS GROUPS OF ALGAELANGER HOUSE LAKE STATION – III

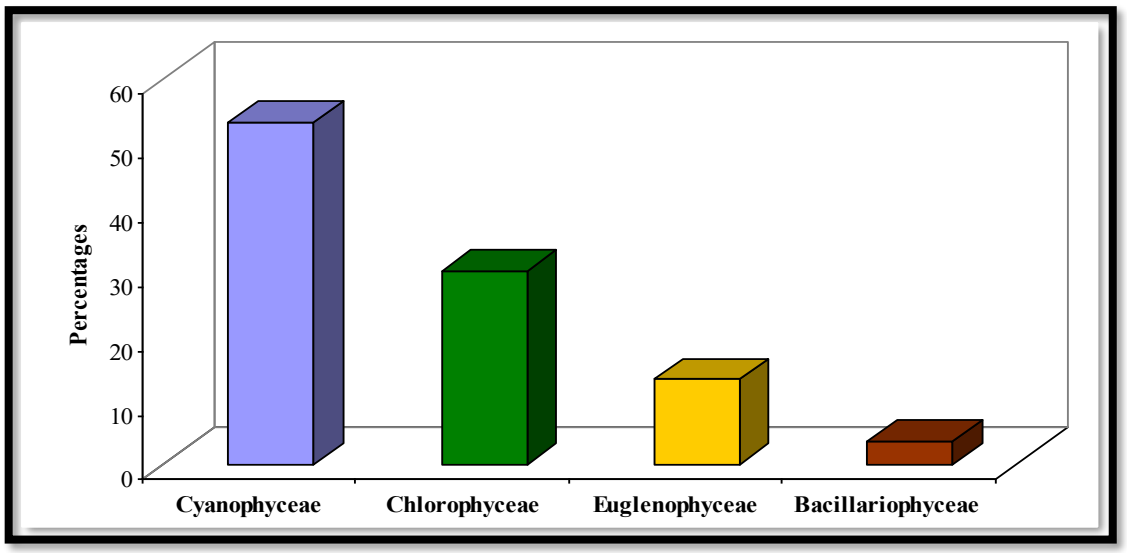
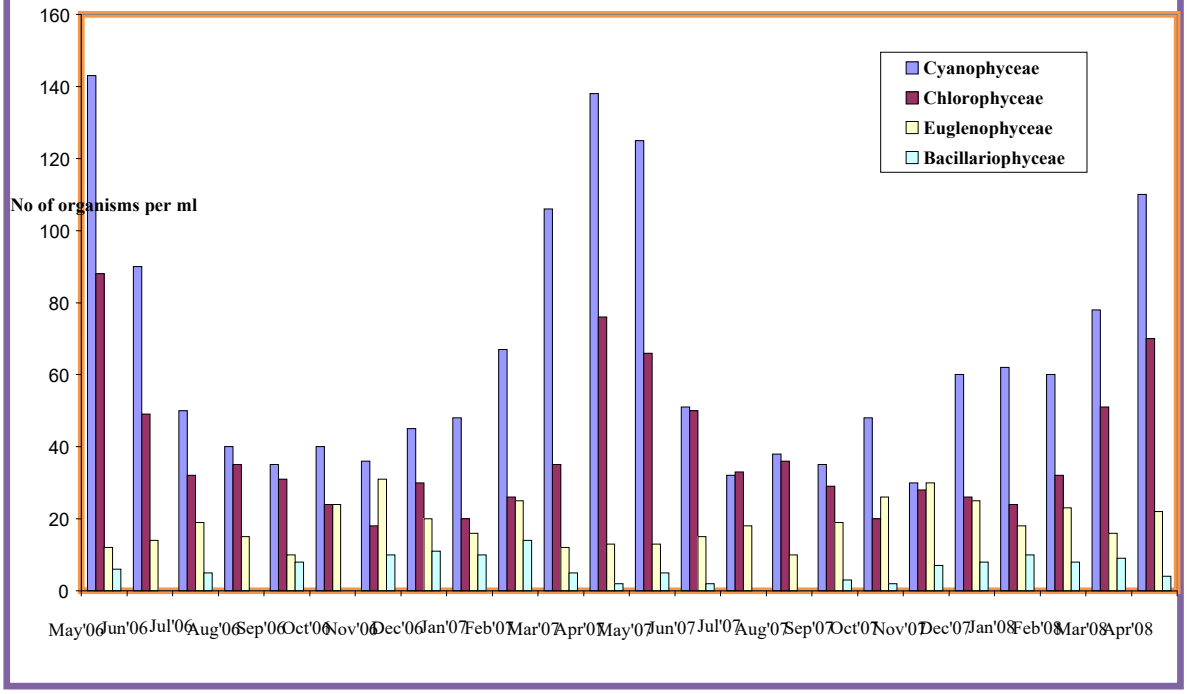
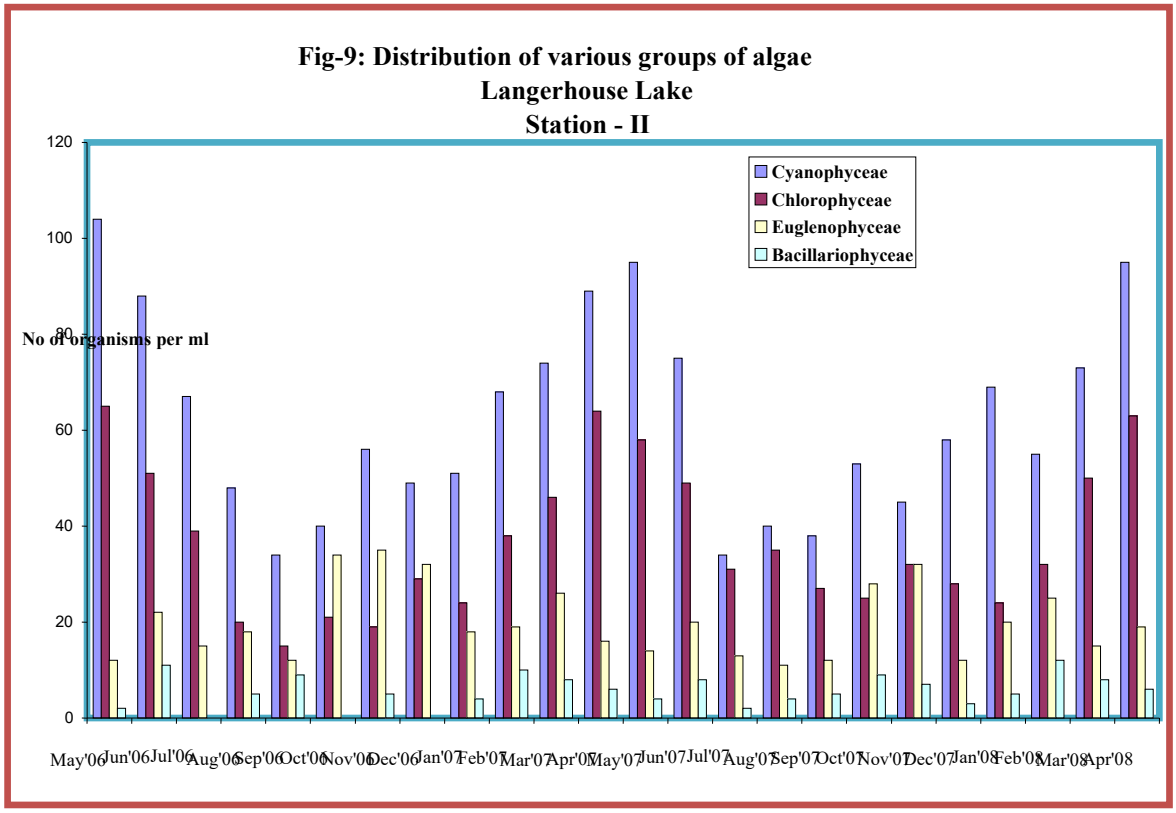
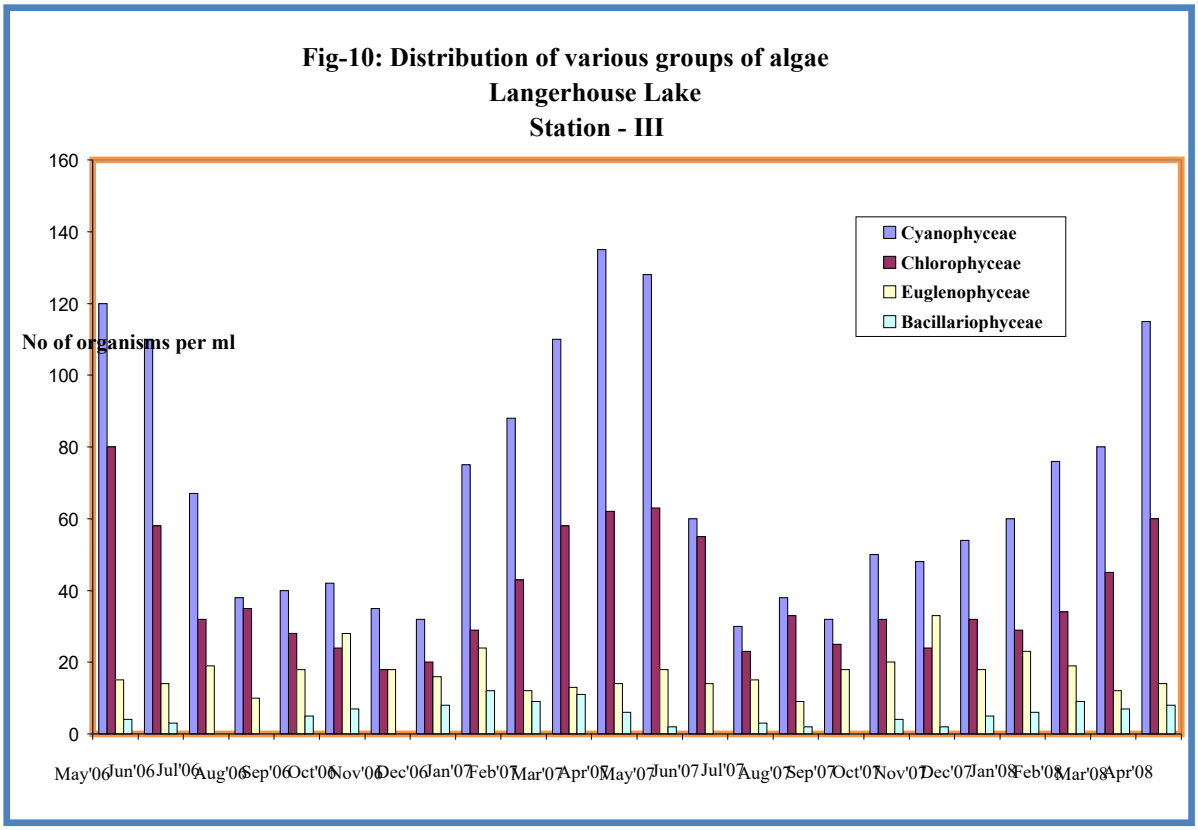


Fig-8: Distribution of various groups of algae
Langerhouse Lake
Station - I







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