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Diversity of Phytoplankton in Chilika Lagoon, Odisha, India

Sairendri Maharana, Biswajita Pradhan, Mrutyunjay Jena, Malaya Kumar Misra

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Abstract In this study the phytoplankton diversity of Chilika Lagoon, Odisha, India was investigated during 2014 to 2015. A total of 66 phytoplankton species were reported from nine different sites under four sectors of Chilika Lagoon. These species belong to Cyanobacteria (11 species), Chlorophyta (25 species), Bacillariophyta (27 species) and Dinophyta (3 species). In this paper, 29 phytoplankton species were newly reported from the Chilika Lagoon. The new species recorded are *Amphora sabiniana, Ankistrodesmus bernardii, Ankistrodesmus falcatus, Bacteriastrum delicatulum, Chlamydomonas* sp., *Chlorococcum* sp., *Cosmarium quadrum, Cosmarium pseudophasolus, Cosmarium subcircularii, Cosmarium tumidum, Cylendrocystis brebissonii, Dictyosporium* sp., *Dimorphococcus lunatus, Gomphonema angustum, Gomphonema intricatum* var *vibrio, Gomphonema parvulum Kirchneria irregularis, Melosira dickaei, Navicula elegans, Navicula gracilis, Navicula viridula, Oocystis kumaonensis, Pinnularia subcapitata, Pleurosigma salinarum, Scenedesmus obliquus, Scenedesmus similageneus, Staurastrum contactum, Staurastrum gracile* and *Staurastrum sexagulare.* The finding of the present study showed significant similarities with the all previous reports that Bacillariophyta was the largest and most diverse division in Chilika Lagoon, particularly dominant in the Southern sector due to increased salinity. The next dominant species belong to Chlorophyta, followed by Cyanophyta. *Coscinodiscus* sp. was distributed in all the sites of Chilika Lagoon while *Dictyosporium* sp. was confined only in one site (Badakuda).

Keywords Bacillariophyta, Chilika Lagoon, Chlorophyta, Cyanobacteria, Dinophyta.

Introduction

Chilika is the largest brackish water lagoon of Asia and 2nd largest coastal lagoon in the world. The lagoon is situated in the East Coast of India, Odisha, India between 19°28'–19°54'N; 85°05'–85°38'E. In the year 1981, under the Convention on Wetlands of international Importance Chilika was declared as a

Sairendri Maharana, Biswajita Pradhan, Mrutyunjay Jena*, Malaya Kumar Misra
Post Graduate Department of Botany, Berhampur University, Bhanja Bihar, Berhampur 760007, Odisha, India
e-mail : mrutyunjay.jena@gmail.com
*Corresponding author

Ramsar Site. The shape of the Lagoon is pear shaped and water spread area varies between 906 to 1105 km^2 during summer to monsoon. The river Daya and Bhargavi and other rivulets fall into Chilika in the Northern sector, which supply major fresh water input to the lagoon during monsoon and the post monsoon periods. High tide near the inlet mouth of Outer Channel sector drivers in salt water during the dry months, from December to June. With onset of rain, the rivers falls in to Northern zone are in space, causing fresh water currents that gradually push the sea water out. A distinct salinity gradient is maintained as a result of extensive mixing of saltwater from the sea and freshwater from rivers in different seasons. The varying salinity regime and depth divides the lagoon in to four natural sectors viz., Northern, Central, Southern and Outer Channel sector. It has a variety of habitats such as marshes, mudflats, fresh water and open water with varying depths, salinity and coastal vegetation areas. Phytoplankton, being the primary producers in the food chain of aquatic ecosystem, plays a key role in bio-monitoring the ecological disturbances caused by a number of physico-chemical factors. The overall loss of biodiversity is due to degradation of phytoplankton diversity in the lagoon. Much work has been carried out on phytoplankton and physico-chemical characteristics of Chilika Lagoon (Adhikary and Sahu 1992, Devasundararn and Roy 1954, Dube and Jayaraman 2008, Mohanty and Adhikary 2013, Mukherjee et al. 2015, Mukherjee et al. 2016, Mukherjee et al. 2018, Nayak et al. 2004, Nayak and Behera 2004, Panigrahi et al. 2007, Panigrahi et al. 2009, Jha et al. 2009, Patnaik 1973, 1978, Raman et al. 1990, Rath and Adhikary 2005, Roy 1954, Patra 2010). However, with changing environment the phytoplankton diversity changes in time and space. The objective of the present paper was to assess the phytoplankton diversity of Chilika Lagoon during 2014 to 2015.

Materials and Methods

Collection sites and sample collection : The map of Chilika Lagoon along with sample collection sites is presented in Fig. 1. Water samples were collected trice during 2014 to 2015 from nine collection sites (S) from four sectors viz. Mangalajodi (S1), Barkul (S2), Nalaban (S3), Kalijai (S4), Rambha (S5), Ghantasila

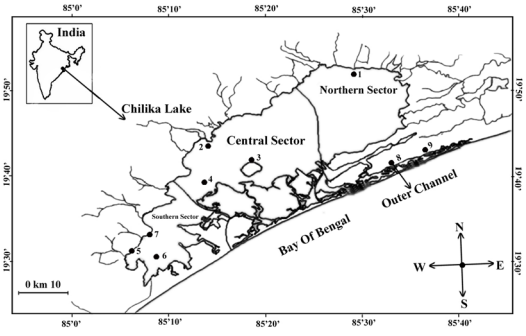

Fig. 1. Map of Chilika Lagoon showing different collection sites: Mangalajodi, Barakul, Nalaban, Kalijai, Rambha, Ghantasila, Badakuda, Sipakuda, Arkhakuda.

(S6), Badakuda (S7), Sipakuda (S8), Arkhakuda (S9). In Northern sector samples were collected from one site (S1), in Central sector samples collected from three sites (S2, S3, S4), in Southern sector samples collected from three collection sites (S5, S6, S7) and in Outer Channel sector samples collected from two collection sites (S8, S9). The samples were collected by using plankton net (Hydro-Bios, Model no. 438001) of 25 µm pore size and kept in sterilized Tarson make specimen tubes. All the samples were preserved on the spot by adding 4% (V/V) formaldehyde and voucher number was given to each sample. Microphotography and Identification : Micrographs of phytoplankton species were taken using digital camera (Brand : Magnus, Model-15H1379,5 MP) fixed on Light Microscope (Brand : Olympous, Model no. *CH20i*). Magnification of each organism was determined using ocular and stage micrometer. Each phytoplankton species was described and identified with the help of following literature (Desikachary 1959, 1987, 1988, 1989, Philipose 1967, Al-Kandari et al. 2009, Komárek and Fott 1983, Komárek and Anagnostidis 1998, 2005, Rath and Adhikary 2005. Jena and Adhikary 2007, Jena et al. 2006, 2008, Verlencar and Desai 2004).

Results and Discussion

Distribution of phytoplankton species from nine collection sites of four sectors of Chilika Lagoon presented in Table 1 and the micrographs of all species are given in Figs 2. (1-35) and 3. (36-66). In the pres-

Table 1. Distribution of phytoplankton at different sites of Chilika Lagoon, Odisha 2014-2015.

Sl. No.	Algal taxa	Northern sector Mangalajodi (S1) (Pooled value)	Central sector Barakul (S2)	Nalaban (S3)	Kalijai (S4)	Pooled value	Southern sector Rambha (S5)	Ghantasila (S6)	Badakuda (S7)	Pooled value	Outer channel sector Sipakuda (S8)	Arkhakuda (S9)	Pooled value
	Cyanobacteria												
1.	*Cyanobacterium diachloros* (Skuja) Komárek, J Kopecký & Cepák	+		+		+				–			–
2.	*Synechocystis* sp.	+	+	+	+	+				–			–
3.	*Merismopedia elegans* A Braun ex Kutzing	–		+		+	+		+	+			–
4.	*Merismopedia glauca* (Ehrenberg) Kützing	+	+		+	+				–			–
5.	*Microcystis aeruginosa* (Kützing) Kützing	–	+	+		+				–			–
6.	*Chroococcus turgidus* (Kützing) Nageli	+	+	+		+	+		+	+			–
7.	*Spirulina labyrinthiformis* Gomont	+	+	+	+	+	+	+	+	+			–
8.	*Spirulina subtilissima* Kützing ex Gomont	–	+	+	+	+	+			+			–
9.	*Oscillatoria princeps* Vaucher ex Gomont	+	+	+		+	+			+	+		+
10.	*Phormidium* sp.	+	+	+	+	+	+			+	+	+	+
11.	*Lyngbya aestuarii* Liebman ex Gomont	+	+	+		+	+	+	+	+	+	+	+
	Sub total	8	9	10	5	11	7	2	4	7	3	01	03
	Chlorophyta												
12.	*Chlorococcum* sp.	–				–	+		+	+			
13.	*Pediastrum simplex* Meyen	–			+	+			+	+			
14.	*Tetrahedron triangulare* Kors	+	+	+		+				–			
15.	*Chlorella protothecoides* Krüger	+	+	+		+	+		+	+			
16.	*Oocystis kumaonensis* K.P.Singh	+				–			+	+			
17.	*Dictyosporium* sp.	–				–			+	+			
18.	*Dimorphococcus lunatus* A. Braun	+				–	+		+	+			
19.	*Ankistrodesmus bernardii* Komárek	+	+			+				–			
20.	*Ankistrodesmus falcatus* (Corda) Ralfs	+				–	+	+		+			
21.	*Kirchneria irregularis* (G.M.Smith) Hindák		+		+	+	+			+			
22.	*Coelastrum cambrium* vax. intermediatum (Bohlin) G.S. West	+	+	+		+	+			+			
23.	*Scenedesmus obliquus* (Turpin) Kützing	+	+	+		+	+		+	+			
24.	*Scenedesmus similageneus* Hortob	+	+	+		+	+		+	+			
25.	*Cosmarium lundellii* Delponte	+	+	+		+				–			
26.	*Cosmarium pseudophasolus* Brul and Biswas	+		+		+	+			+			
27.	*Cosmarium punctulatum* Brébisson	+	+	+		+				–			
28.	*Cosmarium quadrum* P. Lundell	+	+	+		+		+		+			
29.	*Cosmarium subcircularii* Turner	+	+	+		+	+		+	+			
30.	*Cosmarium tumidum* P. Lundell	+	+	+		+		+	+	+			

Table 1. Continued.

Sl. No.	Algal taxa	Northern sector Mangalajodi (S1) (Pooled value)	Central sector Barakul (S2)	Nalaban (S3)	Kalijai (S4)	Pooled value	Rambha (S5)	Southern sector Ghantasila (S6)	Badakuda (S7)	Pooled value	Outer channel sector Sipakuda (S8)	Arkhakuda (S9)	Pooled
31.	*Cylendrocysis brebissonii brebissonii* (Ralfs) De Bary		+			+			+	+			
32.	*Staurastrum contactum* Turner	+	+			+	+	+	+	+			
33.	*Staurastrum gracile Ralfs* ex Ralfs	+	+	+		+	+			+			
34.	*Staurastrum sexagulare* (Bruhl)Lundell		+	+	+		+	+		+			
35.	*Chlamydomonas* sp.		+	+	+	+	+	+		+			
36.	*Spirogyra* sp.	+	+	+	+	+	+		+	+			
	Sub total	19	18	14	4	20	15	5	12	21	00	00	00
	Bacillariophyta												
37.	*Cyclotella menighiniana* Kützing					–	+		+	+	+	+	+
38.	*Coscinodiscus gigas* Ehrenberg					–	+	+	+	+	+	+	+
39.	*Coscinodiscus marginatus* Ehrenberg			+	+	+	+		+	+	+	+	+
40.	*Coscinodiscus* sp.	+	+	+	+	+	+	+	+	+	+	+	+
41.	*Thalassiosira subtilas* (Ostenfeld) Gran	+	+			+		+	+	+		+	+
42.	*Melosira dickiei* (Thwaites) Kützing		+	+		+	+	+	+	+	+		+
43.	*Odontella mobiliensis* (Bailey) Grunow					–	+			+	+	+	+
44.	*Bacteriastrum delicatulum* Cleve			+	+	+		+		+		+	+
45.	*Bacteriastrum hyalinum* Lauder			+	+	+	+	+		+	+	+	+
46.	*Chaetoceros lorenzianus* Grunow					–				–	+	+	+
47	*Ulnaria ulna* (Nitzsch) Compere	+	+	+	+	+		+	+	+	+	+	+
48.	*Asterionellopsis glacialis* (Castracane) Round		+			+	+	+		+	+	+	+
49.	*Grammatophora undulata* Ehrenberg	+	+	+	+	+				–	+	+	+
50.	*Fragilaria crotonensis* Kitton	+	+			+		+	+	+			–
51.	*Pinnularia nobilis* (Ehrenberg) Ehrenberg	+		+	+	+				–	+	+	+
52.	*Pinnularia subcapitata* W. Gregory	+			+	+	+	+		+	+	+	+
53.	*Gomphonema angustum* C. Agardh		+	+	+	+				–			–
54.	*Gomphonema intricatum* var vibrio (Ehrenberg) Cleve		+	+	+	+				–	+	+	+
55.	*Gomphonema parvulum* (Kützing) Kützing		+	+	+	+	+	+		+		–	–
56.	*Amphora elliptica* (C. Agardh) Kützing				+		+			–	+	+	+
57.	*Amphora ovum* Cleve		+		+	+	+	+		+	+	+	+
58.	*Amphora sabiniana* Reimer					–				–	+	+	+
59.	*Navicula elegans* W. Smith				+	+		+		+	+	+	+
60.	*Navicula gracilis* Ehrenberg					–				–	+	+	+
61.	*Navicula viridula* (Kützing) Ehrenberg					–				–	+	+	+
62.	*Pleurosigma salinarum* (Grunow) Grunow		+	+	+	+	+	+	+	+	+	+	+
63.	*Nitzschia sigmoide* (Nitzsch)W. Smith				+	+	+	+		+	+		+
	Sub Total	7	12	12	14	19	11	16	9	18	22	22	24
	Dinophyta												
64.	*Ceratium lineatum* (Ehrenberg) Cleve										+	+	+
65.	*Ceratium tripos* (O. F. Müller) Nitzsch										+	+	+
66.	*Dinophysis caudate* W.S. Kent								+	+	+	+	+
	Sub total	0	0	0	0	0	0	0	01	01	03	03	03
	Grand total	34	39	36	23	50	33	23	26	47	28	26	30

ent study, a total of 66 phytoplankton species under 44 genera were reported from different sites under the four sectors of Chilika Lagoon (Tables 1 and 2). The diversity of phytoplankton includes 4 divisions such as Cyanobacteria (11 species), Chlorophyta (25 species), Bacillariophyta (27 species) and Dinophyta (3 species).

In Northern sector Mangalajodi (Site 1) , 34 phytoplankton taxa under 24 genera were recorded and these species belong to Cyanobacteria (8 species), Chlorophyta (19) and Bacillariophyta (7 species). In Barkul area (S2), a total of 39 species were recorded, out of these nine species were from Cyanobacteria, 18 from Chlorophyta and 12 from Bacillariophyta. A Total of 36 species were recorded from Nalaban area (S3), of these ten species belong to Cyanobacteria, 14 species to Chlorophyta and 12 species to Bacillariophyta. In Kalijai (S4), 23 phytoplankton species were recorded. Out of these, five species were from Cyanobacteria, 4 from Chlorophyta and 14 from Bacillariophyta. The occurrence of pooled number of species of phytoplankton was 50 under 35 genera in Central Sector. Out of which Cyanobacteria was 11, Chlorophyta was 20 and Bacillariophyta was 19.

In Rambha (Site 5) total 33 species were recorded and of these seven species belong to Cyanobacteria, 15 belong to Chlorophyta and 11 belong to Bacillariophyta. In Ghantasila (S6), 23 phytoplankton species were recorded, out of these 2 were from Cyanobacteria, 5 from Chlorophyta and 16 from Bacillariophyta. In Badakuda (S7), total 26 phytoplankton species were recorded, out of these 4 were from Cyanobacteria, 12 from Chlorophyta, 9 from Bacillariophyta and 1 from Dinophyta. The pooled number of species of Southern sector was 47 under 37 genera. Pooled number of species of Cyanobacteria was 7, Chlorophyta was 21, Bacillariophyta was 18 and Dinophyta was 1.

In Sipakuda (S8), a total of 28 phytoplanktonsepcies were recorded, of these three species were from Cyanobacteria, 22 from Bacillariophyta and 3 from Dinophyta . Green phytoplankton was not observed in Sipakuda. In Arkhakuda (S9) the total phytoplankton species recorded were 26. In Arkhakuda, one species was from Cyanobacteria, 22 species from Bacillariophyta and three species from Dinophyta. The pooled number of species of outer channel was 30 under 21 genera. The pooled number of species of Cyanobacteria was 3, Bacillariophyta was 24 and Dinophyta was 3 (Tables 1 and 2).

Coscinodiscus sp. was present in all sites of Chilika Lagoon. This shows that the species have high ecological amplitude. Number of species confined to one site only was *Dictyosporium* sp. that was in Badakuda (S7). Number of algal species that were found only in two sites was 13. Number of algal species that were found in any three sites was 15 while in any four sites was 11. Number of algal species found in any five sites of Chilika Lagoon was 14. Algal species that were found in six sites of Chilika Lagoon was 6. Algae that were recorded in any seven sites of Chilika Lagoon was 3. Further, the significant finding of this study was 29 phytoplankton species were newly reported from the Chilika Lagoon. And these

Table 2. Total number of genera found at different sites under each sector of Chilika Lagoon 2014—2015.

	Northern sector Mangalajodi (S1)	Central sector					Southern sector			Outer channel sector (Lake mouth)		
Algal taxa	(Pooled value)	Barakul (S2)	Nalaban (S3)	Kalijai (S4)	Pooled value	Rambha (S5)	Ghantasila (S6)	Badakuda (S7)	Pooled value	Sipakuda (S8)	Arkhakuda (S9)	Pooled value
Cyanobacteria	8	8	9	4	9	6	2	4	6	3	01	03
Chlorophyta	10	11	08	4	12	11	4	10	15	00	00	00
Bacillariophyta	6	10	09	10	14	10	13	7	15	15	14	16
Dinophyta	0	0	0	0	0	0	0	1	1	2	2	2
Grand total	24	29	26	18	35	27	19	22	37	20	17	21

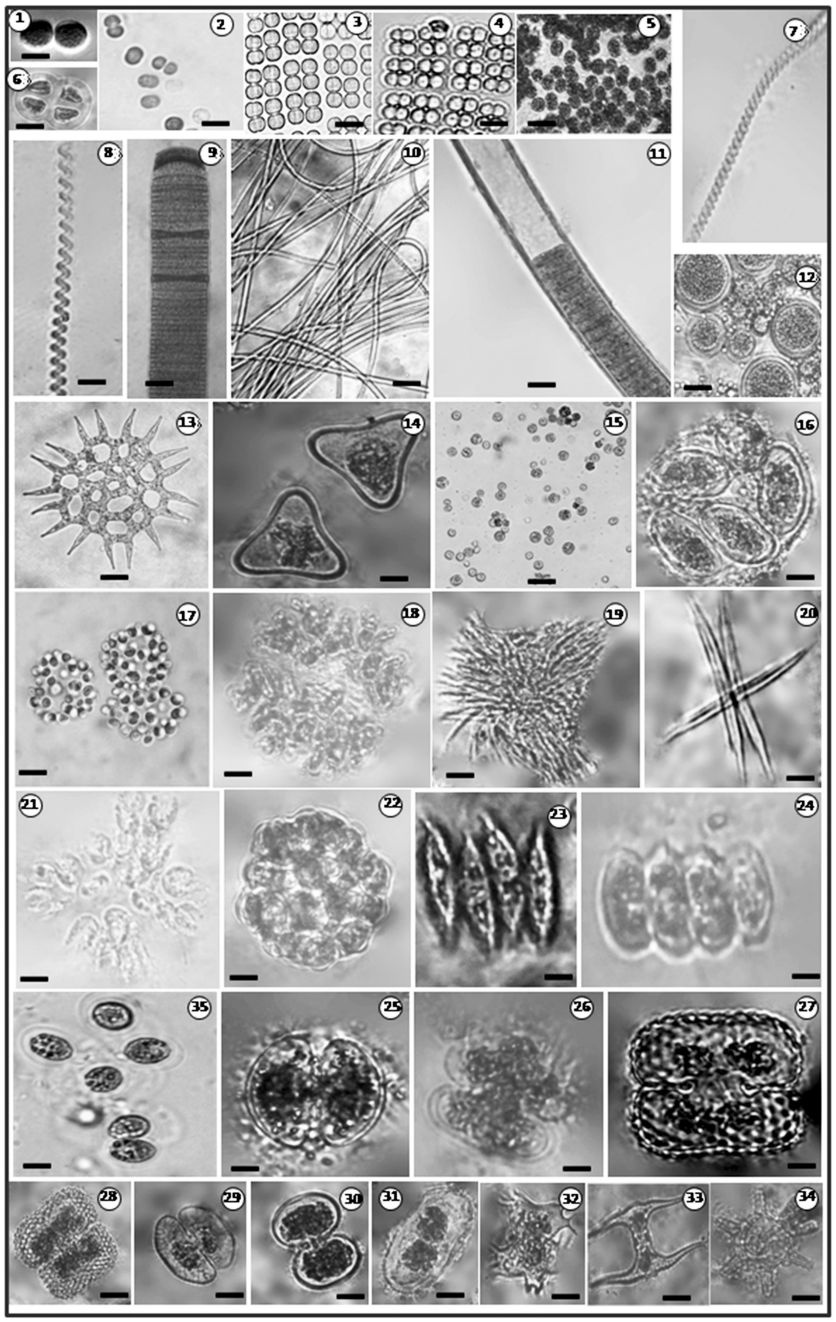

Fig. 2. (1—35) 1. *Cyanobacterium diachloros,* 2. *Synechocystis* sp., 3. *Merismopedia elegans,* 4. *Merismopedia glauca,* 5. *Microcystis aeruginosa,* 6. *Chroococcus turgidus,* 7. *Spirulina labyrinthiformis,* 8. *Spirulina subtilissima,* 9. *Oscillatoria princeps,* 10. *Phormidium* sp., 11. *Lyngbya aestuarii,* 12. *Chlorococcum* sp., 13. *Pediastrum simplex,* 14. *Tetrahedron triangulare,* 15. *Chlorella protothecoides,* 16. *Oocystis kumaonensis,* 17. *Dictyosporium* sp. 18. *Dimorphococcus lunatus,* 19. *Ankistrodesmus bernardii,* 20. *Ankistrodesmus falcatus,* 21. *Kirchneria irregularis,* 22. *Coelastrum cambrium* var *intermediatum,* 23. *Scenedesmus obliquus,* 24. *Scenedesmus similageneus,* 25. *Cosmarium lundellii,* 26. *Cosmarium pseudophasolus,* 27. *Cosmarium punctulatum,* 28. *Cosmarium quadrum,* 29. *Cosmarium subcircularii,* 30. *Cosmarium tumidum,* 31. *Cylendrocystis brebissonii,* 32. *Staurastrum contactum,* 33. *Staurastrum gracile,* 34. *Staurastrum sexagulare,* 35. *Chlamydomonas* sp.

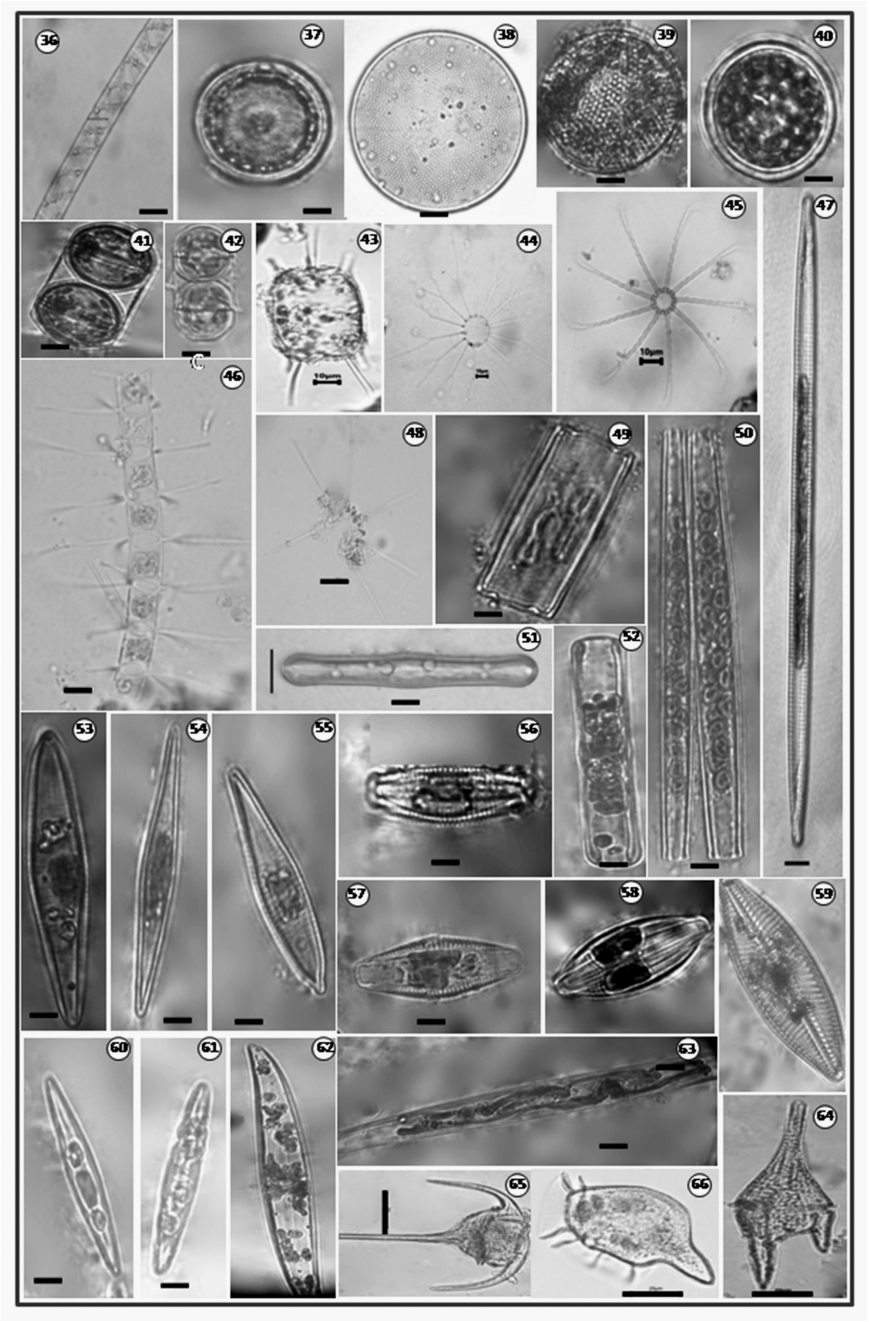

Fig. 3. (36—66). 36. *Spirogyra* sp., 37. *Cyclotella menighiniana,* 38. *Coscinodiscus gigas,* 39. *Coscinodiscus marginatus,* 40. *Coscinodiscus* sp., 41. *Thalassiosira subtilis* , 42. *Melosira dickiei,* 43. *Odontella mobiliensis,* 44. *Bacteriastrum delicatulum,* 45. *Bacteriastrum hyalinum,* 46. *Chaetoceros lorenzianus,* 47. *Ulnaria ulna,* 48. *Asterionellopsis glacialis,* 49. *Grammatophora undulata,* 50. *Fragilaria crotonensis,* 51. *Pinnularia nobilis,* 52. *Pinnularia subcapitata,* 53. *Gomphonema angustum* , 54. *Gomphonema intricatum* var *vibrio,* 55. *Gomphonema parvulum,* 56. *Amphora elliptica,* 57. *Amphora ovum,* 58. *Amphora sabiniana,* 59. *Navicula elegans,* 60. *Navicula gracilis,* 61. *Navicula viridula,* 62. *Pleurosigma salinarum,* 63. *Nitzschia sigmoide,* 64. *Ceratium lineatum,* 65. *Ceratium tripos,* 66. *Dinophysis caudate.*

were *Amphora sabiniana, Ankistrodesmus bernardii, Ankistrodesmus falcatus, Bacteriastrum delicatulum, Chlamydomonas sp. Chlorococcum* sp. *Cosmarium quadrum, Cosmarium pseudophasolus, Cosmarium subcircularii, Cosmarium tumidum, Cylendrocystis brebissonii, Dictyosporium* sp., *Dimorphococcus lunatus, Gomphonema angustum,Gomphonema intricatum* var *vibrio, Gomphonema parvulum, Kirchneria irregularis, Melosira dickaei, Navicula elegans, Navicula gracilis, Navicula viridula, Oocystiskumaonensis, Pinnularia subcapitata, Pleurosigma salinarum, Scenedesmus obliquus, Scenedesmus similageneus, Staurastrum contactum, Staurastrum gracile* and *Staurastrum sexagulare.*

The similarity indices of distribution of phytoplankton species calculated between the nine sites of four sectors of the Chilika Lagoon are shown in Table 3. Highest similarity index (80) was recorded between Sipakuda (S8) and Arkhakuda (S9) of Outer Channel sector. this may be due to similar Dsalinity gradient of the water as the sea mouth is nearer to these sites that provide similar environmental condition for the growth of same algal species. The second highest similarity index (63) was exhibited (S2) Barakul and (S3) Nalaban in the same Northern sector and followed by Mangalajodi (S1) of Northern sector and Barakul (S2) of Central sector (58.7). Further, the similarity index between Mangalajodi (S1) and Nalaban (S3) was 52.2 . The similarity index between other sites is less than 40. The similarity index was lowest between Mangalajodi (S1) and (S9) Arkhakuda (13.2). The low similarity index exhibited by different sites was due to differences in water quality and environmental conditions in different localities of the lagoon.

Biswas (1932) reported presence of 22 algal species while Roy (1954) reported 33 species of Bacillariophyta from Chilika Lagoon during the year 1950—1951. Patnaik (1973, 1978) reported presence of 57 algal species and Raman et al. (1990) reported 14 species of phytoplankton belonging to Cyanophyta (4), Chlorophyta, Bacillariophyta (10) and only one species of Dinophyta. Adhikary and Sahu (1992) reported 28 algal species from Chilika Lagoon. A total of 102 algal species were recorded in the Chilika Lagoon by Rath and Adhikary (2005) comprising 12 species of Cyanophyta, 23 species of Chlorophyta, 58 species of Bacillariophyta, five species of Dinophyta and four species of Rhodophyta. Mohanty and Adhikary (2013) reported 81 algal species in the Chilika Lagoon during 2011 and 2012. Mukherjee et al. (2016) reported 38 species of Dinophyceae in the Chilika Lagoon out of these 12 species were newly recorded from the Lagoon. Mukherjee et al. (2018) worked on micro-plankton dynamics with reference to the physio-chemical parameters in Chilika Lagoon and reported 233 species of micro-plankton. Of these the occurrence of Cyanobacteria, Bacillariophyta and Dinophyta phytoplankton members were specially analyzed for hydrological quality of Chilika Lagoon. The finding of previous published report have revealed that salinity increase in the lagoon due to influx of sea water through the new mouth resulted in change of the algal forms in the lagoon.

Rath and Adhikary (2005) reported 102 algal species including both micro and maro-algae. Species which were not recorded in the present study but found earlier was *Arthrospira platensis Anabaena torulosa, Anabaena flos-aquae, Fischerella* sp. and *Synechocystis aquatilis* under Cyanophyta. In Chlorophyta *Actinastrum hantzschii, Chadophora glomerata, Chaetomorpha linum, Cosmariun impressulum,*

Table 3. Matrix of similarity indices of distribution of phytoplankton species among the sites of Chilika Lagoon of Odisha, India 2014—2015.

Sites	S2	S3	S4	S5	S6	S7	S8	S9
S1	58.69	52.17	21.27	39.58	23.91	33.33	14.18	13.20
S2	0	63.04	34.78	46.93	31.91	32.65	19.64	16.07
S3		0	37.02	40.81	25.53	31.91	23.07	25.00
S4			0	27.27	35.29	16.66	30.76	32.43
S5				0	33.33	37.20	27.08	18.00
S6					0	28.94	34.21	32.43
S7						0	20.00	18.18
S8							0	80.00

Eudorine elegans. Pediastrum duplex. Pediastrum tetras, Scenedesmus quadricauda, Scenedesmus acuminatus, Selenenastrum gracile, Tetrahedron gracile, Tetrahedron trigonum, Xanthidium sexamamillinatum. In Baccilariophyta the species recorded by afore said authors were *Amphora gigantean, Auliscus sculptus, Bacillaria paxillifera, Biddulphia heteroceros, Chaetoceros curvisetus, Chaetoceros eibenii, Chaetoceros diversus. Chaetoceros affinis, Chaetoceros paradoxus, Climacosphaenia moniligera, Cocconeis pediculus, Coscinodiscus centralis, Craticula cuspidate, Cylindrotheca closterium, Cymbela* sp., *Diatoma elongatum, Ditylum brightwellii, Guinardia flaccida, Gyrosigma acuminatum, Lauderia annulata Leptocylindrus danicus, Lichmophora abbreviata, Melosira borreii, Navicula protracta, Navicula minuscule, Navicula lanceolata, Navicula salinarum, Nitzschia pandoriformis, Nitzschia obtusa, Pleurosigma narmanii, Rhizosolenia setigera, Skeltonema costatum, Stauroneis pusilla, Stephanopyxis turris, Tabellaria fenestrate* and *Thallassionema nitzschioides.* In Dinophyta species recorded was *Ceratium longipes* and *Gymnodium heterostriatum.*

Mohanty and Adhikary (2013) reported the following algae that were not recorded in the present study. The species belonging to Cyanophyta were *Anabaena variabilis, Aphanocapsa marina, Chroococcus limneticus, Chaetomorpha linum, Cosmarium decoratum, Cosmarium miscellum, Cosmarium awadhense, Cosmarium miscellum, Geitlerinema earlei, Merismopdeia punctata, Merismopedia warmingiana, Microcystis wesenbergii, Oscillatoria limosa, Oscillatoria perornata, Oscillatoria proteus, Oscillatoria simplicissima, Phormidium ambigum, Pseudanabaena limnetica, Pseudanabaena minima* and *Spirullina major.* In Chlorophyta, the species were *Closterium venus, Microspora willeana, Pediastrum tetras, Scenedsmus bijugatus, Scenedesmus calyptratus, Scenedesmus dimorphus, Scenedesmus protuberans, Uronema confevicolum, Uronema elongatum* . In Euglenophyta, the species were *Euglena acus, Euglena agilis, Euglena caudata, Lepocinclis playfairiana, Trachelomonas abrupt* and *Trachelomonas hispida.* In Bacillariophyta, the species recorded by Mohanty and Adhikary (2013) were *Chaetoceros decipiens. Cocconeis pediculus, Cyclotella maxima, Cyalotella maxima, Cymbella affinis, Epithemia gibberula Fragillaria crotonensis, Gomphonema micropus, Hantzschia amphioxys, Melosira decussate, Navicula amphirhynchus, Navicula major, Nitzchia acuta, Pinnularia nodosa, Pinnularia subismilis, Pleurosigma normanii, Pleurosigma javanicum, Synedra crystalline, Synedra radians, Synedra tabulata* and *Tabellaria flocculosa.*

The finding of present study showed significant similarities with all the previous reports that Bacillariophyta appeared as the largest and more diverse division in Chilika Lagoon dominant in the Southern sector due to increased salinity. The next dominant species belong to Chlorophyta followed by Cyanobacteria.

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