

A CHECK LIST OF ALGAE FROM CHILIKA LAKE, ORISSA

J. RATH AND S. P. ADHIKARY

Post Graduate Department of Botany & Biotechnology, Utkal University, Bhubaneswar- 751004

A B S T R A C T

A total of one hundred and two species of algae belonging to five divisions e.g. Cyanophyta, Chlorophyta, Bacillariophyta, Dinophyta and Rhodophyta were recorded from the Chilika lake during 2000-2001 of which fifty eight species belonging to four divisions were reported for the first time. *Enteromorpha usneoides* recorded in the Southern sector of the lake for the first time shows new and extended distribution range of *Enteromorpha* species in India. A checklist of algal species found in Chilika lake has been given.

INTRODUCTION

Algal flora of Chilika lake has been studied several times during the last century. Most of these works were repetitive in nature and none of the authors have studied the algae of the lagoon in every season covering the entire catchment area in a particular year. Algal flora of the lake was studied for the first time by Biswas (1932). He reported 22 species of algae comprising of 11 species of Cyanophyta, 5 species of Chlorophyta and 6 species of Rhodophyta. Biswas (1932) has mostly confined to the macro-algal species of the lake. During the subsequent periods Parija & Parija (1946), Ahmed (1969), Patnaik (1978) and Sahu & Adhikary (1999) have also concentrated their studies on the macro-algal forms. However, Roy (1954), Patnaik (1973), Patnaik & Sarkar (1976), and Raman (1990) studied the phytoplankton of the lake. But none of these reports contain information about all the algal forms including both macro and micro-algal species occurring in the Chilika lake during a particular time covering an year and also not given a detail taxonomic account of each of the species. In the present work the algal forms occurring throughout the lake in different seasons for two consecutive years was surveyed with a view to study the different algal forms occurring in the lake. Macro-algae as well as phytoplankton were collected in several collection trips during 2000-2001, analysed and an authentic algal distribution map of the lake was prepared.

STUDY AREA

Chilika is the largest brackish water lagoon in the east coast of India (18° 28'-19° 54' N and 85° 6'-85° 35' E) extending from the south east corner of Puri district to adjoining Ganjam district of Orissa state (Fig-1). The lake occupies an average area of 906 km² in summer and 1065 km² in rainy season with an average depth of approximately 2m. The lake receives flood water from deltaic

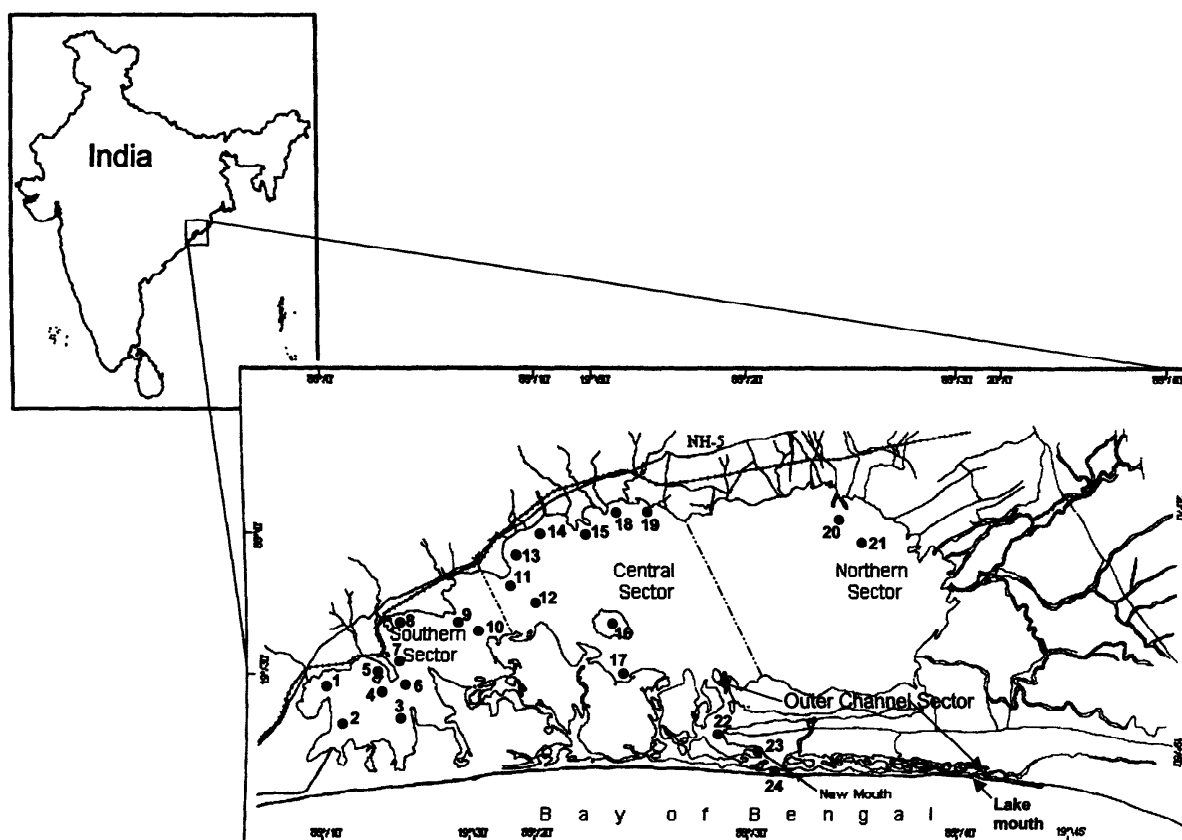


Fig 1. Location map of Chilika lake showing study sites: 1 = Rambha, 2 = Ghantasila, 3 = Talatala, 4 = Eastern side of Badakuda, 5 = Western side of Badakuda, 6 = Somola, 7 = Cherriakuda, 8 = Gopakuda, 9 = Pathara, 10 = Malatikuda, 11 = INS Chilika, 12 = Kalijai, 13 = Chandrapur, 14 = Balugaon jetty, 15 = Kalijugaswar, 16 = Asthana, 17 = Vasharamunda, 18 = Nalabana, 19 = Nuapada, 20 = Kalupada, 21 = Sorana, 22 = Satapada, 23 = Rambharatia, 24 = Chakanasi.

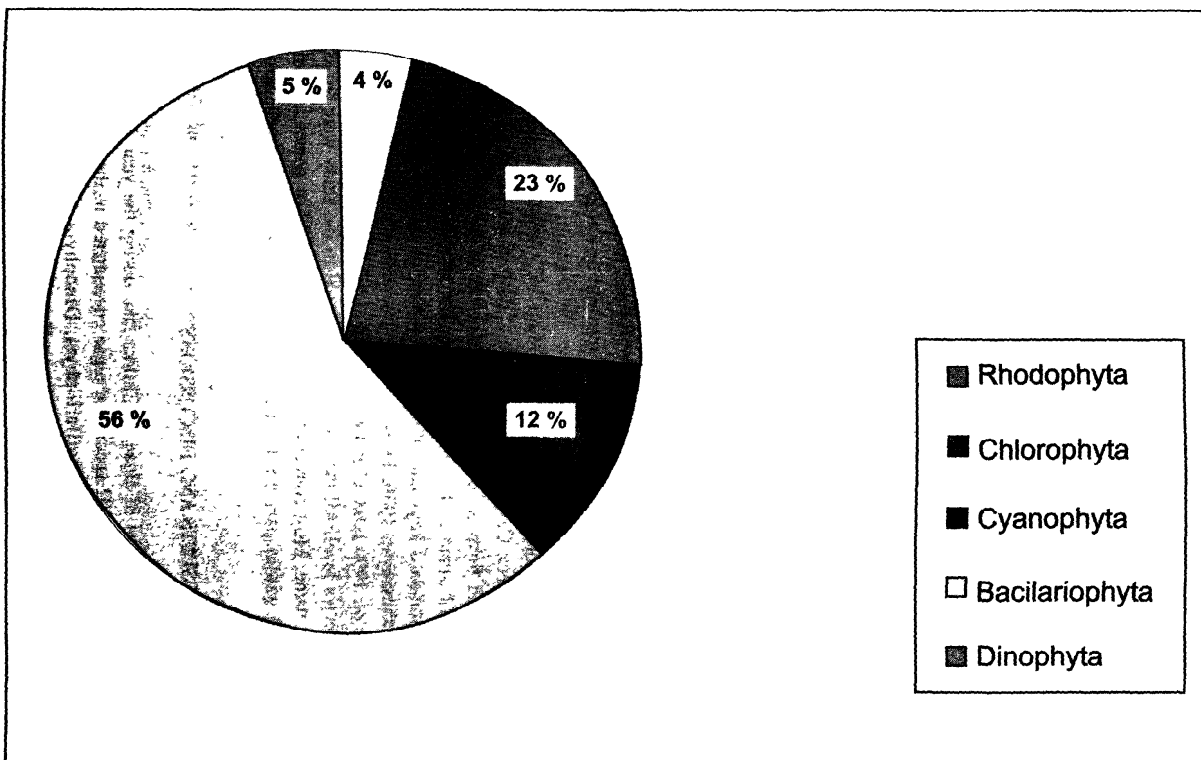


Fig 2. Pi chart showing the percentage of different groups of algae occurring in Chilika lake during 2000-2001.

branches of river Mahanadi, notably Daya and Bhargabi in the north-western sector diluting the lake water. It is connected to Bay of Bengal through a zig-zag 35 km long Outer channel running parallelly to the sea. In Chilika, a distinct salinity gradient is observed and based on salinity and depth of water it has been divided into four ecological sectors e.g. Southern, Central, Northern and Outer Channel sector. Southern sector is relatively undisturbed with negligible variation in salinity. Central sector shows a fluctuation of salinity according to seasons and is almost brackish in nature. In the Northern sector many rivers and rivulets fall making this sector almost a fresh water area except some sites in the summer season. Outer channel sector is almost marine having tidal influence.

MATERIALS AND METHODS

Study of algal diversity in Chilika lake was carried out for two consecutive years during 2000 and 2001. All the intertidal regions along the shore line including periphery of the islands, rocks, pebbles, logs and fishing nets etc. of all the four sectors were surveyed in all the three seasons. Macroscopic algal samples were immediately preserved after collection in 4 % formalin on the spot. Micro-algae were collected from all the 24 stations at regular intervals using a 10 μ m and 20 μ m mesh size KC Denmark phytoplankton net. These were not preserved using any preservatives, as they are quite sensitive to these chemicals leading to bleaching of pigments. Thus they were placed in an ice carrier and analysed soon after reaching the laboratory. Sample number was given to each species following the first letter "C" as Chilika lagoon, then the sectors (S, Ce, N, O) as, Southern, Central, Northern and Outer channel sectors respectively, then the first letter of the collection site, sample no. and date of collection in sequence. Herbarium of all the macro-algae was prepared and kept in the herbarium of the P.G. Department of Botany, Utkal University, Bhubaneswar. Photographs of all the species and microphotographs of the microscopic forms were taken in a Meiji ML- TH-05 trinocular research microscope fitted with F-50 Nikon camera. Camera lucida diagram of each of the microscopic forms and hand drawing in case of macro-algal form were drawn. Measurement of length and breadth of the microscopic forms was recorded with standard Erma micrometers. The morphological features of each species was compared with the standard keys and literature available in monographs and research publications (Biswas 1932, Subrahmanyam 1946, Prescott 1954, Desikachary 1959, Paragallo 1908, Desikachary 1989, Desikachary & *al.* 1990,1998, Cox 1996, Thomas 1997 & Krushnamurthy 1999) and identification was made up to species level. All the species encountered in the study were listed with correct author citation and family name. Most commonly used synonyms and / or names appearing in recent literature have been cited within parenthesis after the correct botanical names, wherever necessary.

RESULTS AND DISCUSSIONS

Basing on the resultant data a checklist of algae of Chilika lake during the year 2000-2001 has been prepared and presented in Table-I. The 102 species of algae encountered in the study belongs to five divisions e.g. Cyanophyta, Chlorophyta, Bacillariophyta, Dinophyta and Rhodophyta. The numbers of algal species under these divisions were as follows Cyanophyta 12 species, Chlorophyta 23 species, Bacillariophyta 58 species, Dinophyta 5 species and 4 species of Rhodophyta. The

Table 1. Checklist of algae of Chilika lake during 2000-2001.

Sl. no.	Algal species	Family	New Report in the present study
CYANOPHYTA			
1.	<i>Chroococcus turgidus</i> Naeg.	Chroococcaceae	+
2.	<i>Merismopedia elegans</i> A. Br.	Chroococcaceae	+
3.	<i>M. glauca</i> (Ehrenb.) Naeg.	Chroococcaceae	+
4.	<i>Synechocystis aquatilis</i> Sauv.	Chroococcaceae	
5.	<i>Spirulina subtilissima</i> Kütz. ex Gomont	Oscillatoriaceae	+
6.	<i>Arthrospira platensis</i> (Nordst.) Gomont	Oscillatoriaceae	+
7.	<i>Lyngbya aestuarii</i> Liebm.	Oscillatoriaceae	
8.	<i>Oscillatoria princeps</i> Vaucher ex Gomont	Oscillatoriaceae	+
9.	<i>Phormidium submembranaceum</i> (Ardissone & Strafforells) Gomont	Oscillatoriaceae	
10.	<i>Anabaena jlos-aquae</i> (Lyngb.) Breb.	Nostocaceae	+
11.	<i>A. torulosa</i> Lagerh	Nostocaceae	
12.	<i>Fischerella</i> sp.	Stigonemataceae	+
CHLOROPHYTA			
13.	<i>Eudorine elegans</i> Ehrenb.	Volvocaceae	+
14.	<i>Scenedesmus acuminatus</i> (Lagerheim) Chodat	Scenedesmaceae	+
15.	<i>S. quadricauda</i> (Turpin) Brebisson	Scenedesmaceae	+
16.	<i>Coelastrum cambricum</i> Archer var. <i>intermedium</i> (Bohlin) G. S. West	Coelastraceae	+
17.	<i>Actinastrum hantzschii</i> Lagerh.	Selenastraceae	+
18.	<i>Selenastrum gracile</i> Reinsch	Selenastraceae	+

Sl. no.	Algal species	Family	New Report in the present study
19.	<i>Pediastrum duplex</i> Meyen var. <i>reticulatum</i> Lagerh.	Hydrodictyaceae	+
20.	<i>P. duplex</i> Meyen var. <i>subgranulatum</i> Racib	Hydrodictyaceae	+
21.	<i>P. simplex</i> Meyen var. <i>duodenarium</i> (Bailey) Rabenhorst	Hydrodictyaceae	+
22.	<i>P. tetras</i> (Her.) Ralfs.	Hydrodictyaceae	+
23.	<i>Tetraedron gracile</i> (Reinsch) Hansgirg	Hydrodictyaceae	+
24.	<i>T. trigonum</i> (Naegeli) Hansgirg	Hydrodictyaceae	+
25.	<i>Cosmarium impressulum</i> Elfv.	Zygnemaceae	+
26.	<i>Spirogyra</i> sp.	Zygnemaceae	
27.	<i>Xanthidium sexmamillatum</i> W. & G. S. West	Zygnemaceae	+
28.	<i>Chaetomorpha linum</i> (O.F. Muller) Kutzing	Cladophoraceae	
29.	<i>Cladophora glomerata</i> (L.) Kutzing	Cladophoraceae	
30.	<i>Enteromorpha compressa</i> (L.) Nees	Ulvaceae	
31.	<i>E. intestinalis</i> (L.) Nees	Ulvaceae	
32.	<i>E. usneoides</i> (Bonnem.) J. Ag.	Ulvaceae	+
33.	<i>Viva lactuca</i> L.	Ulvaceae	
34.	<i>Chara</i> sp.	Characeae	
35.	<i>Nitella</i> sp.	Characeae	
BACILLARIOPHYTA			
36.	<i>Coscinodiscus</i> sp. I	Coscinodiscaceae	
37.	<i>Coscinodiscus</i> sp. II	Coscinodiscaceae	
38.	<i>C. centralis</i> Ehrenb.	Coscinodiscaceae	
39.	<i>C. gigas</i> Ehrenb.	Coscinodiscaceae	+
40.	<i>C. marginatus</i> Ehrenb.	Coscinodiscaceae	+

Sl. no.	Algal species	Family	New Report in the present study
41.	<i>Auliscus sculptus</i> (W. Smith) Ralfs.	Eupodiasceae	+
42.	<i>Lauderia annulata</i> Cleve	Thalassiosiraceae	
43.	<i>Skeletonema costatum</i> (Greville) Cleve	Thalassiosiraceae	
44.	<i>Thalassiosira subtilis</i> (Ostenfeld) Gran.	Thalassiosiraceae	
45.	<i>Melosira borreii</i> Grev.	Melosiraceae	+
46.	<i>Stephanopyxis turris</i> (Grev. & Am.) Ralfs.	Melosiraceae	
47.	<i>Guinardia flaccida</i> (Castracane) H. Peragallo	Rhizosoleniaceae	+
48.	<i>Rhizosolenia setigera</i> Brightwell	Rhizosoleniaceae	
49.	<i>Leptocylindrus danicus</i> Cleve	Leptocylindraceae	+
50.	<i>Odontella mobiliensis</i> (Bailey) Grunow (Synonym- <i>Biddulphia mobiliensis</i> Grunow)	Eupodiscaceae	
51.	<i>Biddulphia</i> sp.	Biddulphiaceae	
52.	<i>Biddulphia heteroceros</i> Grunow	Biddulphiaceae	
53.	<i>Ditylum brightwellii</i> (West) Grunow	Lithodesmiaceae	
54.	<i>Bacteriastrum furcatum</i> Cleve	Chaetoceraceae	
55.	<i>B. hyalinum</i> Lauder	Chaetoceraceae	+
56.	<i>Chaetoceros</i> sp.	Chaetoceraceae	
57.	<i>C. affinis</i> Lauder	Chaetoceraceae	
58.	<i>C. curvisetus</i> Cleve	Chaetoceraceae	
59.	<i>C. diversus</i> Laud. var. <i>tenuis</i> Cleve	Chaetoceraceae	
60.	<i>C. eibonii</i> Grunow	Chaetoceraceae	
61.	<i>C. lorenzianus</i> Grunow	Chaetoceraceae	
62.	<i>C. paradoxus</i> Cleve	Chaetoceraceae	+

Sl. no.	Algal species	Family	New Report in the present study
63.	<i>Asterionellopsis glacialis</i> (Castracane) Round (Synonym- <i>Asterionella japonica</i> Cleve)	Fragilariaceae	
64.	<i>Climacosphaenia moniligera</i> Ehrenb.	Fragilariaceae	+
65.	<i>Diatoma elongatum</i> Agardh	Fragilariaceae	+
66.	<i>Fragilaria</i> sp.	Fragilariaceae	+
67.	<i>F. crotonensis</i> Kitton	Fragilariaceae	+
68.	<i>Grammatophora undulata</i> Ehrenb.	Fragilariaceae	+
69.	<i>Lichmophora abbreviata</i> Agardh	Fragilariaceae	+
70.	<i>Synedra ulna</i> (Nitzsch) Ehr. var. <i>danica</i> (Kütz.) Grun.	Fragilariaceae	+
71.	<i>Thalassionema nitzschioides</i> Grunow	Thalassionemataceae	
72.	<i>Amphiprora gigantean</i> Grunow	Naviculaceae	+
73.	<i>Amphora</i> sp.	Naviculaceae	+
74.	<i>A. ovalis</i> Kützing	Naviculaceae	+
75.	<i>Craticula cuspidate</i> (Kützing) D. G . Mann	Naviculaceae	+
76.	<i>Cymbela</i> sp.	Naviculaceae	+
77.	<i>Gyrosigma acuminatum</i> (Kütz.) Rab.	Naviculaceae	+
78.	<i>Navicula</i> sp.	Naviculaceae	
79.	<i>N. lanceolata</i> (C.A. Agardh) Kützing	Naviculaceae	+
80.	<i>N. minuscule</i> Grunow	Naviculaceae	+
81.	<i>N. protracta</i> (Grunow) Cleve	Naviculaceae	+
82.	<i>N. salinarum</i> Grunow	Naviculaceae	+
83.	<i>Pinnularia alpina</i> W. Smith	Naviculaceae	+
84.	<i>P. nobilis</i> Ehrenberg	Naviculaceae	+

Sl. no.	Algal species	Family	New Report in the present study
85.	<i>Pleurosigma normanii</i> Ralfs.	Naviculaceae	+
86.	<i>Stauroneis pusilla</i> Cleve	Naviculaceae	+
87.	<i>Bacillaria paxillifera</i> (O.F. Muller) Hendey (<i>Bacillaria paradoxa</i> Gmelin)	Bacillariaceae	
88.	<i>Cylindrotheca closterium</i> (Ehrenb.) Lawin & Reimann. (<i>Nitzschia closterium</i>)	Bacillariaceae	
89.	<i>Nitzschia obtusa</i> W. Smith	Bacillariaceae	+
90.	<i>N. pandoriformis</i> Gregory	Bacillariaceae	+
91.	<i>N. sigma</i> (Kützing) W. Smith	Bacillariaceae	+
92.	<i>Cocconeis pediculus</i> Ehrenb.	Achnanthoideae	+
93.	<i>Tabellaria fenestrata</i> (Lyngbye) Kützing	Tabellariaceae	
DINOPHYTA			
94.	<i>Ceratium lineatum</i> (Ehrenb.) Cleve	Ceratiaceae	+
95.	<i>C. longipes</i> (Bailey) Gran.	Ceratiaceae	
96.	<i>C. tripos</i> (O.F.Müller) Nitzsch	Ceratiaceae	
97.	<i>Dinophysis caudate</i> Saville-Kent	Dinophysiaceae	
98.	<i>Gymnodinium heterostriatum</i> Kofoid & Swezy	Gymnodiniaceae	+
RHODOPHYTA			
99.	<i>Ceramium diaphanum</i> (Lightfoot) Roth var. <i>elegans</i> (Roth) Roth (<i>Ceramium elegans</i> Ducl.)	Ceramiaceae	
100.	<i>Grateloupia filicina</i> (Wulf.) Ag.	Hylymeniaceae	
101.	<i>Gracilaria verrucosa</i> (Hudson) Papenfuss	Gracilariaceae	
102.	<i>Polysiphonia subtilissima</i> Mont	Rhodomelaceae	

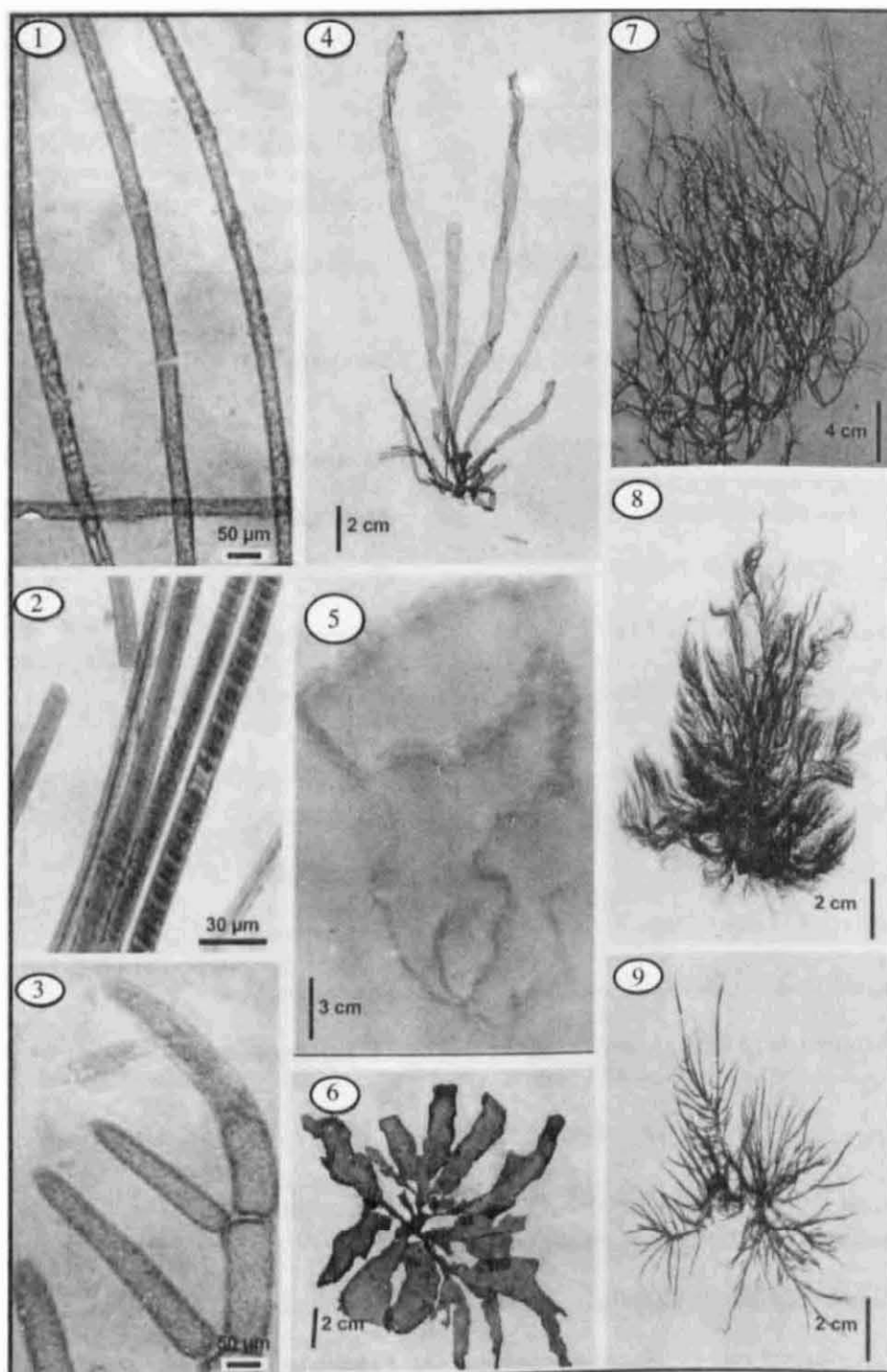


Plate I. [1-9]: Photograph of dominant species of algae in Chilika lake. 1-3: light microscopic photograph of, 1. *Chaetomorpha linum*, 2. *Lyngbya aestuarii*, 3. *Cladophora glomerata*, and photographs of naturally occurring 4. *Enteromorpha intestinalis*, 5. *Enteromorpha compressa*, 6. *Ulva lactuca*, 7. *Gracilaria verrucosa*, 8. *Grateloupia jilicina*, 9. *Polysiphonia subtilissima*.

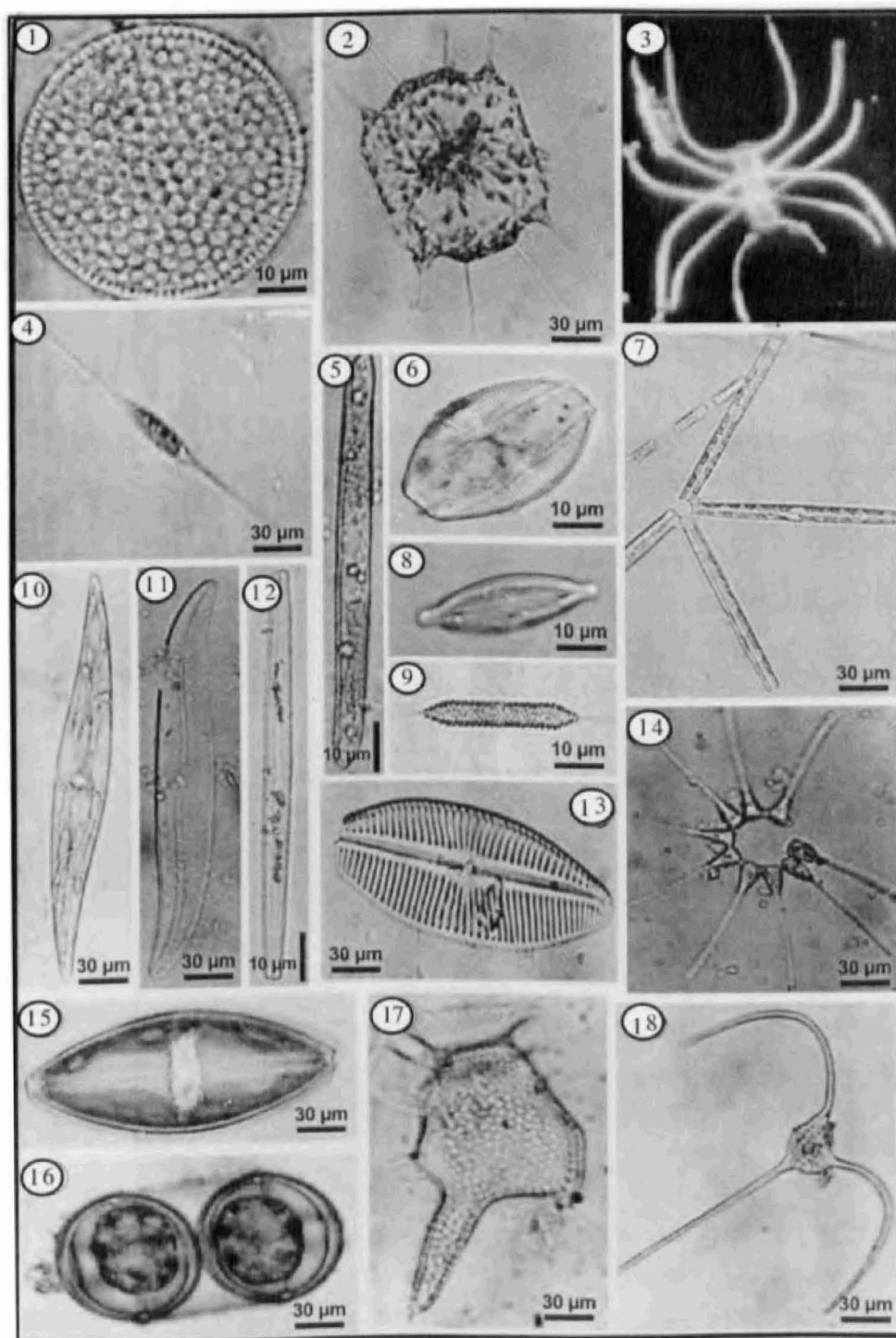


Plate II. [1-18]: Light microscopic photograph of widely occurring planktonic algae in Chilika lake 1. *Coscinodiscus centralis*; 2. *Odontella mobiliensis*; 3. *Chaetoceros diversus*; 4. *Cylindrotheca closterium*; 5. *Nitzschia obtusa*; 6. *Amphora ovalis*; 7. *Thalassionema nitzschioides*; 8. *Navicula salinarum*; 9. *Rhizosolenia setigera*; 10. *Pleurosigma normanii*; 11. *Gyrosigma acuminatum*; 12. *Synedra ulna*; 13. *Pinnularia alpine*; 14. *Asterionellopsis glacialis*; 15. *Stauroneis pusilla*; 16. *Melosira borrierii*; 17. *Dinophysis caudate*; 18. *Ceratium longipes*.

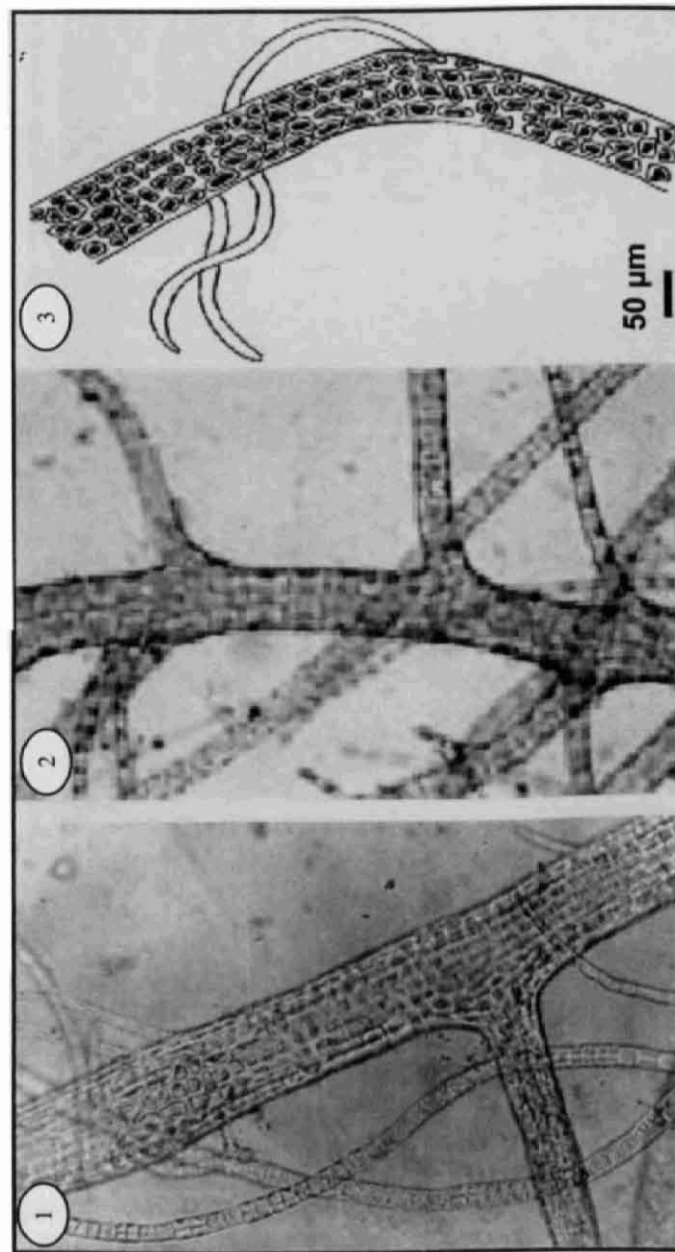


Plate III. [1-3]: 1. & 2. Microphotograph of *Enteromorpha usm eo ides*; 3. Cameralucida diagram of the same alga.

percentage occurrence of different algal groups with respect to total algal taxa has been given in Fig.- 2. Of these the dominant species of algae in the lake which occur in higher quantity were *Chaetomorpha linum*, *Enteromorpha intestinalis*, *Enteromorpha compressa*, *Lyngbya aestuarii*, *Ulva lactuca*, *Cladophora glomerata*, *Gracilaria verrucosa*, *Polysiphonia subtilissima* and *Grateloupia filicina* (Plate-I). In addition, many planktonic species also occurring widely in the lake in higher numbers. These were *Coscinodiscus centralis*, *Odontella mobiliensis*, *Chaetoceros diversus*, *Cylindrotheca closterium*, *Nitzschia obtuse*, *Amphora ovalis*, *Thalassionema nitzschioides*, *Navicula salinarum*, *Rhizosolenia setigera*, *Pleurosigma normanii*, *Gyrosigma acuminatum*, *Synedra ulna*, *Pinnularia alpine*, *Asterionellopsis glacialis*, *Stauroneis pusilla*, *Melosira borrerii*, *Dinophysis caudate* and *Ceratium longipes* (Plate- II).

In the present study total 58 species of algae not previously reported belonging to 4 divisions were recorded from the lake. Of these, 8 species belongs to Cyanophyta, 15 species to Chlorophyta, 33 species to Bacillariophyta and 2 species to Dinophyta group Table-I. Of the three species of *Enteromorpha*, *E. intestinalis* as well as *E. compressa* have been reported in the Chilika lake by several authors since the first report of Biswas (1932). However, in the present study another species of *Enteromorpha* viz. *E. usneoides* was observed in the Southern sector of the lake for the first time, which is new distribution range for this species in India. This species is characterized by its well developed branching patterns (Plate-III) and is quite different from *Enteromorpha intestinalis* and *Enteromorpha compressa*. Bliding (1963) described this species as *Enteromorpha compressa* var. *usneoides* but Koeman & Hoek (1982) described the organism from Netherlands as *Enteromorpha usneoides*.

ACKNOWLEDGEMENTS

We thank Dr. A. K. Pattnaik, Chief executive, Chilika Development Authority for providing facility for sample collection. Thanks' are also due to the Head of the Department of Botany, Utkal University, Bhubaneswar for laboratory facilities.

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चिल्का झील, उड़ीसा से शैवाल की एक चेक लिस्ट

जे. रथ, एस. पी. अधिकारी

सार संक्षेप

2000-2001 अवधि में चिल्का झील से *साइनोफाइटा*, *क्लोरोफाइटा*, *बेसिलेरियोफाइटा*, *डिनोफाइटा* एवं *रोडोफाइटा* प्रभाग के 102 जातियों के शैवाल के अभिलेख हुए। इनमें से चार प्रभागों के 58 जातियों का उल्लेख पहली बार हुआ है। झील के दक्षिणी भाग से प्राप्त *इंटररोमोर्फा युसन्वाइडिज* भारत में इस जाति का व्यापक विस्तार दर्शाता है। चिल्का झील में पाए गए शैवाल जातियों का चेक लिस्ट दिया गया है।