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ECOLOGICAL SURVEY OF PHYTOPLANKTON IN FRESH WATER LAKE BAKAR DISTRICT SANGHAR SINDH, PAKISTAN

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Abstract

Ecological Survey of Phytoplankton in Fresh Water lake Bakar was carried out from August 1993 to July 1996. A total of 216 species of phytoplankton belonging to 90 genera were recorded. Out of them 14 species are for the first time recorded from this region (mark astrik) Physical and chemical parameters were recorded.

Introduction

Phytoplankton are essential component of aquatic environment, especially from production aspect. Phytoplankton the primary producers of the water reservoirs, are the chief source of food both directly and indirectly to the fish population ecological survey of phytoplankton species in Bakar lake was therefore carried out to gain knowledge about plytoplan composition of this lake. This lake is subtropical (Micheal 1967). It is located in desert area, at Left bank falls of Indus delta (Blatter, *et al.* 1929, at altitude = 50 M, latitude =26.06 North, longitude 68.10 East, width = 2.5 K.M. Length = 45 K.M).

Materials and Method

Collection of phytoplankton species was carried out regularly once in a month through August 1993 to July 1996, usually between 11 a.m. to 3 p.m. with the help of boat by toeing of fine phytoplankton net of mesh size 5 to 10 M.M. Water samples were collected every time from the surface and from 2-3 meters depth using water sampler (Nansen Bottle) for the study of physico chemical factor and identification of phytoplankton. Samples were preserved in 4% formalin solution (Mason, 1967), Phytoplankton identification was made of using

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inverted electric microscope (PZ0) Poland 10x40) and literature. Tilden, 1910 Husted, 1930, Majeed 1935, Smith, 1950; Deskiachary, 1959; Prescott, 1962 patrick, 1966, Tiffany, 1971. Akiyama & Yamagishi 1981 and Vinyard's, 1979 Keys were used.

Table 1

Snowing Physico-Chemical Properties

		Minimum	Maximum
1.	Soil temperature ^{O}C	11	26
2.	Air temperature ^{O}C	17	39
3.	Water surface Temp. ^{O}C	15	31.3
4.	Water Bottom Temp. ^{O}C	16	30.3
5.	PH	7.7	8.9
6.	Turbidity in NTU Range on 100	0.3	6.8
7.	T.D.S. in PPM	220	330
8.	Conductivity M.ohms X10	40	103
9.	Salinity Nacl Ppt	0.1	0.7
10.	Humidity %	33	77
11.	Light transparency by sechi disc in Meters	1.2	3.6
12.	Dissolved Oxygen Mg/L	5	11.5
13.	Saturation %	40.5	91
14.	CO_2 m	15	77
15.	Ammonia Nitrogen NH_3 N_2 Ppm	0.02	0.11
16.	Density on $30^{O}C$ g/v	1.002	1.005
17.	Water colour in Numbers	12	17
18.	Orthophosphate in Mg/L	0.002	0.2
19.	Total Hardness $Caco_3$	110	180
20.	Ca^{+} Hardness Ppm	60	120
21.	Mg Hardness Ppm	40	81
22.	$Cacl_2$ Hardness Ppm	66.6	119.9
23.	Mg cl_2 Ppm	57	109.3
24.	Grain per Gallon GPG	6.4	10.44

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25.	Refractive indiex on 30°C	1.33		1.33
26.	Total Depth of Lake water in meter	3		7.8
27.	Wave in inch	2		18
28.	Test	Testless		Tastless
29.	Odour	Odourless		Fishy
30.	Wind	Cold		Dry hot
31.	Day	Cloudy		Clear
32.	Weather	Fogy		Dry clear
33.	Wind in winter	North	to	South
34.	Wind in Summer	South	to	North
35.	Soil	Sandy banks and bottom Muddy		
36.	Zone	Sub tropical.		

Class: Cyanophyceae

1	*Aphanocapsa elachista*	W & West
2	*A. endophytica*	G.M. Smith
3	*Aphanothece castagnei*	(Breb) Rolena
4	*A. microscopica*	Naegeli
5	*A. nidulans*	P. Richter
6	*A. Sexicola*	Naegeli
7	*Chroococcus bituminosus*	(Bory) Hansgirg
8	*C. cohaerens*	(Breb) Naegeli
9	*C. endophticus*	Copeland
10	*C. giganteus*	W.West
11	*C. limneticus*	Lemmermann.
12	*C. membraninus*	(Meneghini) Naegeli
13	*C. minor*	(küetz) Naegeli
14	*C. minutus*	(Küetz) Naegeli
15	*C. minutus var. thermalis*	Copeland
16	*C. prescotti*	Drouet and Daily

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17	*C. turicensis*	(Naeg) Hansgirg.
18	*C. turgidus*	(Küetz) Naegeli var. turgidus
19	*Coelosphaerium dubium*	Grunow
20	*Cyanarcus hamiformis*	Pascher.
21	*Eucapsis minuta*	Fritsch
22	*Gloeocopsa atrata*	(Turpin) küetz.
23	*G. dermochroa*	Naegeli
24	*G. granosa*	(Berkeley) küetz.
25	*G. magma*	(Breb) Küetz
26	*G. montana*	Küetz
27	*G. montana f. fenestralis*	(Küetz) Gollerback
28	*G. rupestris*	Küetz.
29	*Gloeothece rupestris*	(Lyngb) Bornet.
30	*Gomphosphaeria aponina*	Küetz
31	*G. aponina var. cordiformis*	Wolle.
32	*G. aponina var. delicatula*	Virieux.
33	*G. lacustris*	Chod.
34	*G. lacustris var. compacta*	(Lemm) Elenk.
35	*Merismopedia convoluta*	Breb.
36	*M. glucum*	(Ehr) Naegeli.
37	*M. tenuissima*	Lemm.
38	*Microcystic aeruginosa*	Küetz.
39	*M. marginata (Meneg)*	Küetz
40	*Pseudoholopedia convoluta*	(Breb) Elekin.
41	*Rhabdoderma sigmoidea f. minor*	Moore & Carter
42	*Synechococcus minevae*	Copeland.
43	*Synechocystis aquatilis*	Sauv (Geitler)

Class: Chlorophyceae

44	*Ankistrodesmus convolutus*	Corda

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45	*A. falcatus*	(Corda) Ralfs
46	*A. falcatus var. stipitatus*	(Chod) Lemm
47	*Arthrodesmus incus var. extensus*	Anderson
48	*Characium obtusum*	A. Braun
49	*Chlamydomonos ehrenbergii*	Gorosh Pascher
50	*C. epiphytica*	G.M. Smith
51	*C. polyperenoideum*	Prescott.
52	*C. pseudopertyi*	Pascher
53	*Chlorella vulgaris*	Beyerinck
54	*Chodatella baltonica*	Scherfell
55	*Closteriopsis longissima var. tropica*	W. & West.
56	*Closterium dianae*	Ehr.
57	*Cl. leiblinii*	Küetz
58	*Closterium praelongum var. porosum*	Krieger
59	*Cl. ralfsii var. hybridium*	Rabenk.
60	*Coelastrum cambricum*	Archer.
61	*C. microporum Naegeli*	A. Braun.
62	*C. scabrum*	Reinsch.
63	*C. sphaericum*	Naegeli
64	*Cosmarium contractum*	kirchner
65	*C. contractum var. ellipsoideum*	West & West
66	*C. excavatum*	Nordstedt
67	*C. gibberulum*	Lutkem.
68.	*C. granatum*	Breb.
69	*C. margaritatum*	(Lundell) Roy et Bisset
70	*C. maximum*	(Borgesen) W. West
71	*C. moniliforme f. pandriforme*	Heimerdl
72	*C. moniliforme var. limneticum*	West & West.
73	*C. pachydermum*	Lund
74	*C. subtumidum*	Nordst.

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75	*C. sulcatum*	Nordstedt.
76	*C. tinctum var. tinctum*	Ralfs.
77	*C. turpinii*	Breb.
78	*Cosmocladium constricum*	Archer.
79	*Cosmocladium constrictum*	Archer.
80	*Crucigenia apiculata*	(Lemm) Schmidle.
81	*C. quadrata*	Morren
82	*C. rectangularis*	(A. Broun) Gay
83	*C. tetrapedia*	(Kirch) W & West
84	*Dictyosphaericum pulchellum*	Wood
85	*Dimorphococcus lunatus*	A. Braun
86	*Euastrum binale*	(Turpin) Ehr.
87	*E. dubium var. tropicum*	(W. G.S. West) Krieger
88	*E. pectinatum*	Breb.
89	*Eudorina elegans*	Ehr
90	*Excentrosphaera viridis*	Moore
91	*Gloeocystis ampla*	Küetz Legerheim
92	*G. major*	Gerneck ex Lemm
93	*G. vesiculosa*	Naegeli
94	*Gloeotaenium loitelsbergerianum*	Hansgirg
95	*Gloiococcus mucosus*	West
96	*Golenkinia paucispina*	West & West.
97	*Kirchneriella lunaris*	(Kirch) Moebius
98	*Micrasterias pinnatifida*	Ralfs
99	*Nephrocytium obesum*	West & West
100	*Oocystis borgei*	Snow
101	*O. crassa*	(West & West) Nordstedt.
102	*O. elliptica*	W. West
103	*O. eremosphaeria*	Smith.
104	*O. gigas*	Archer.

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105	*O. lacustris*	Chodat.
106	*O. marsonii*	Lemm.
107	*O. parva*	West & West.
108	*O. pyriformis*	Prescott.
109	*O. solitaria*	Wittrock & Nordjtedt.
110	*Palmella miniata*	Naegeli
111	*Panodorina morum*	Bory.
112	*Pediastrum boryanum*	(Turp) Meneghini
113	*P. tetras*	(Ehr) Ralfs
114	*Penium polymorphum*	Perly
115	*Phachus orbicularis*	Huebner
116	*Planktosphaeria gelatinosa*	Smith
117	*Pleurotaenium ehrenbergii*	(Breb) De. Bary
118	*Scenedesmus arcuatus*	Lemm
119	*S. arcuatus var. platidisca*	Smith
120	*S. bijuga*	(Turp) Lagerheim
121	*S. ecornis var. deciformis f. obiciturus*	Uherkovich
122	*S. hystrix*	Legerheim
123	*S. quadricauda var. parvus*	Smith
124	*Schizochlamys compacta*	Prescott.
125	*S. gelatinosa*	A. Brown
126	*Sphaerocystis schroeteri*	Chodat
127	*Staurastrum brevispinum*	Breb.
128	*S. inflexum*	Breb
129	*S. hexacerum*	Ehr) Wittr
130	*S. hexacerum*	(Ehr) forma pentagona
131	*S. iotanum var. longatum*	Hirano.
132	*S. orbiculare var. ralfsii*	West & West
133	*Tetraedron asymmetricum*	Prescott.
134	*T. caudatum*	(Corda) Hansgirg

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135	*T. muticum*	(A. Broun) Hansgirg.
136	*T. regulare var. incus forma major*	Prescott
137	*T. regulare var. torsum*	(Turner) Brunnthaler
138	*T. trigonium*	(Naegeli) Hansgirg
139	*T. tumidulum*	(Reinsch) Hansgirg.
140	*T. victoriae*	Woloszynska
141	*Tetraspora cylindrica*	(Wahl) Agardh.
142	*Trochiscia hirta*	West.
143	*T. granulata*	(Renisch) Hansgirg
144	*Trochiscia obtusa*	(Renisch) Hansgirg
145	*Trochiscia reticularis*	(Reinsch) Hansgirg.
146	*Volvox aureus*	Ehr.
147	*Westella botryoides*	(West) Wildemann.

Class: Bacillariophyceae

148	*Achnanthes biasolettinana*	küetz.
149	*A. hungarica*	Grum.
150	*A. lanceolata*	(Breb) Grunow
151	*A minutissima*	(Küetz) Cleve
152	*Amphora coffeaeformis*	Pascher
153	*A delicatissima*	Krab
154	*A. ovalis*	Küetz
155	*A. ovalis var. gracilis*	Meister
156	*Cyclotella glomerata*	Bachmann
157	*C. küetzingiana var. radiosa*	Fricke.
158	*C. michiganiana*	Skvortzow
159	*Cymbella amphicephalla*	Naegeli
160	*C. minuta Hilse ex-Rabh*	
162	*C. tumida*	(Breb) van Heurck.
163	*C. turgida*	Gregory

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164	*C. ventricosa*	Küetz
165	*Denticula tenuis*	Küetz
166	*Diatoma anceps*	(Ehr) Kirchner
167	*D. vulgare*	Bory
168	*Epithemia argus*	Küetz
169	*E. sorex var. graclis*	Husted.
170	*E. zebra*	(Ehr) Küetz
171	*Eunotia pectinalis*	Küetz Rabh.
172	*Fragillaria capucina*	Desmazieres.
173	*Frustulia rhomboides*	(Ehr) de Toni
174	*Gomphonema ghosea*	n.sp
175	*G. olivoceum var. calcarea*	Pascher
176	*Gyrosigma acuminatum*	(Küetz) Cleve.
177	*G. scalproides*	(Rabh.) Cl.
178	*Melosira distans*	(Ehr) Küetz.
179	*M. granulata*	(Ehr) Ralfs
180	*Navicula cryptocephala var.*	intermedia Grun
181	*N. confervacea*	(Kuetz) Grunow
182	*N. gracilis*	Ehr.
183	*N. incerta*	Grun.
184	*N. longirostis*	Hust.
185	*N. protracta*	(Grunow) Cleve.
186	*N. radiosa*	Küetz
187	*N. radiosa*	Küetz var. tenella
188	*Neidium dubium*	(Ehr) Pfitzer
189	*Nitzschia vermicularis*	Hantzsch.
190	*Pinnularia gibba*	(van Heurck) Boyer
191	*P. tabellaria*	Ehr
193	*Rhopaldia gibba*	(Küetz) Mueller,
194	*Synedra acus*	Küetz.

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195	*S. affinis*	(Küetz) Pascher.
196	*S. affinis. var. fasciculata*	(Küetz) Pascher
197	*S. capitata*	(Ehr) Hustedt.
198	*S. ulna*	(Nitzsch) Ehr.
199	*S. ulna var. amphirhynchus*	(Ehr) Grun.
200	*Tabellaria flocculosa*	(Roth) Küetz

Class Chryso phycdee

201	*Chrysocapsa planctonica*	(West & West) Pascher.
202	*Dinobryon divergens*	Imhof.
203	*D. sertularia*	Ehr.
204	*Mallomonas caudata*	Iwanoff.
205	*Spiniferomonas trioralis*	Takakashi

Class: Dinophyceae

206	*Ceratium hirundinella*	(O.F. Muller) Dujardin
207	*Peridinium cinctum*	(Muell) Ehr.
208	*P. gatunense*	Nygaard
209	*P. tabulatum*	Ehr.

Class: Xanthophyceae

210	*Botryococcus braunii*	küetz.
211	*Chlorellidiopsis separabilis*	Pascher
212	*Goniochloris sculpta.*	Geitler.
213	*Ophiocytium majus*	Naegeli

Class: Euglenophyceae

214	*Euglena acus*	Ehr.
215	*E. intermedia*	(Klebs) Schmitz.
216	*Trachelomonas volvocina*	Ehr.

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Result & Discussion

216 species belonging to 90 genera of seven algal groups, *Cyanophyceae* (43 specieis belonging to 15 genera) *Chlorophyceae* (104 species belonging to 42 genera) *Bacillariophyceae* (53 species belonging to 21 genera) Chrysophyceae (5 species belonging to 2 genera) *Xanthophyceae* (4 species belonging to 4 genera) *Euglenophyceae* (3 species belonging to 2 genera) were recorded from this lake.

As a whole phytoplankton seems to be strongly related to water level fluctuation. From the climatoloical features it seems reasonable to hypothesize that abiotic factors e.g. flooding dewatering, light, temperature, turbidity, rain and, wind, mainly affected the phytoplanktons composition in the study period inhibiting or delaying the development to that biotic relationship (i.e. fry predation efficiency) which commonly takes place in aquatic environments.

- The species of Cyanophyceae were found to be of epilimnion flora in summer season.
- The species of Chrysophyceae were dominent as hyplomnion flora of the water in winter season.
- The species of Bascillariophyceae were dominent through out the year.
- The species of Chrysophyceae and Dinophyceae were found dominent as meta limnion flora in autumon & spring.
- Result of parameters and phytoplankton composition of this lake indicate that this lake is of Eutrophic nature.

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