



Algal Biodiversity of the Arid Region of Rajasthan

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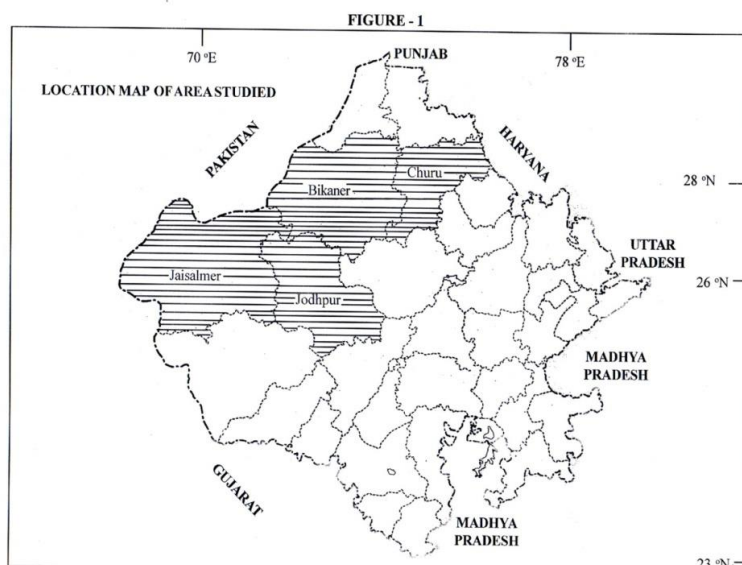
Abstract

The region covered in the present study lies in the north-west and middle- north part of the Rajasthan state. It includes the arid tracts of the district of Jaisalmer, Jodhpur, Bikaner and Churu. A vast number of algal diversity was reported during the study period. A total 323 algal species of 93 genera were identified from arid region of Rajasthan. Chlorophyceae was observed to be dominant over the Cyanophyceae, Bacillariophyceae, Euglenophyceae, Xanthophyceae and Dinophyceae in respect of number of algal species.

Key words: Biodiversity, Arid region, Algae, Jaisalmer, Jodhpur, Bikaner, Churu.

Introduction

The Great Indian Desert forms the eastern extremity of the great arid and semi-arid region of the world. More than 60% of the desert lies in the State of Rajasthan. Rajasthan State has four major physiographic regions, viz. the western desert (Thar Desert), the Aravalli hills, the eastern plains and the south-eastern plateau. North-West part of the Rajasthan forms an important region of the Great Indian Desert, extending between latitudes 24°35' N to 30°10' N and Longitudes 69°30' E to 76°0' E. It covers 12 districts of the state i.e., Ganganagar, Hanumangarh, Bikaner, Jaisalmer, Barmer, Jodhpur, Jalore, Pali, Sikar, Jhunjhunu, Churu and Nagaur. The desert region of Rajasthan is very fragile and is subjected to excessive stresses due to frequent drought and low rainfall, which occurs once in two or three years in the region, causing extreme stress to fauna and flora of desert ecosystem. It is one of the smallest deserts of the world but owing to strong variations in climatic, edaphic, physiographic, topographic and geological characteristics, this region exhibits a wide variety of habitats and a high biodiversity.



Biodiversity is the full complexity and variety of life at all scales, from genetic diversity, up to species and even ecosystem diversity. So, the term “biodiversity conservation” means to conserve any parts of the natural bio-diversity. Plant biodiversity is a major part of global biodiversity and among these, algal biodiversity is largest sources of photosynthetic activities in our planet. Algae are an extremely diverse group of organisms that make up the lower phylogenetic echelons of the plant kingdom. Floristic study of the algae is very important to our

knowledge about the aquatic water bodies like tropical rivers, lakes, reservoirs and ponds. In addition, it reflects the seasonal variation, evolutionary processes, ecological functions and stability of aquatic ecosystem. Sensitivity and large variations in species composition of algae are often a reflection of significant alternation in ambient condition within an ecosystem. Hence for any scientific utilization of water resources, algal study is of primary interest. It is essential to document the diversity of algal flora for biodiversity mapping of the water body.

Our information regarding the algal diversity is known through the work of many workers (Agarkar and Agarkar, 1973; Gandhi, 1961; Ralfs, 1948, Scott and Prescott, 1961; Suxena and Venkateshwarlu, 1970). A very little attention has been paid to study the algal diversity of desert water of by some workers (Bhandari, 1951; Gandhi, 1955; Goyal, 1964; Srivastava and Nigam, 1979; Soni and Bhardwaj, 1980, 1988; Srivastava and Odhwani, 1991; Odhwani, 1992; Gehlot and Barupal, 2010; Barupal and Prakash Narayan, 2016, Barupal and Meghwal, 2017, 2018). In the present study, Jaisalmer, Jodhpur, Bikaner and Churu district were selected to find out the algal diversity of arid Rajasthan (Fig.-1).

Material and Methods

In the present study, all the forms i.e. planktonic, attached and mud algae were observed. Algal samples were collected simultaneously with water samples from freshwater bodies of Jaisalmer, Jodhpur, Bikaner and Churu region, randomly. In the present study, bottle samples and plankton nets were used. Bottle samples method is a simplest method as generally used to obtain a correct picture of the quantitative composition of the phytoplankton. A water bottles sample contains all but the rarest organisms in the water mass sampled and includes the whole size spectrum from the largest entities, like diatom colonies to the smallest single cells. After the collection, some of the material was preserved in iodine solution and 4% formalin and rest of the material was used with living state for the study because many characteristics are lost during preservation. Different stains were also used for the detailed identification like general morphology, characters, various cell contents, mucilaginous structure, flagella to differentiate blue green and green algae and striations in case of diatoms.

The systematic identification of phytoplanktons and other algae was done with the help of different monographs and standard work. These are Cyanophyta (Desikachary 1959), Zygnemaceae (Randhawa 1959), Chlorococcales (Philipose 1967), Volvocales (Iyengar and Desikachary 1981), Charophyta (Pal *et al.* 1962), Structure and Reproduction of Algae (Fritch 1935), Fresh Water Algae of the United State (Smith 1950), Algae of Western Great Area (Prescott 1962), Die Sussawasser flora (Diatomaceae) (Pascher 1930), Ulotrichales (Ramanathan 1964) and Diatom (Hendey 1964).

Results and Discussion

In the present study, total 323 species belonging to 93 genera of algae were observed from several habitats of various fresh water bodies of arid Rajasthan (Table-1). Out of these, 136 species distributed over 40 genera belongs to Chlorophyceae, 68 species of 20 genera belongs to Bacillariophyceae, 25 species of 4 genera to Euglenophyceae, 92 species of 28 genera to Cyanophyceae and a single species to Xanthophyceae and Dinophyceae. Among the orders of Chlorophyceae, Chlorococcales (76 species) represented highest number of species and Oedogoniales and Ulotrichales (each one species) least number of species. Conjugales (Desmids) showed its presence by 40 species, Conjugales (Filamentous) by 8 species, Volvocales by 5 species, Chaetophorales, Cladophorales and Charales by 2 species each. In Bacillariophycean diversity, algae of Thalassiophysales, Naviculales, Cymbellales, Achnanthes, Fragilariales, Licmophorales, Bacillariales and Thalassiosirales orders were observed. Order Naviculales was observed to be represented by maximum 20 species and Licmophorales, Eunotiales and Rhopalodiales by least number of species (each one species). Total 25 species belongs to 4 genera (*Euglena*, *Phacus*, *Trachelomonas* and *Lepocinclis*) of Euglenales order of class Euglenophyceae were recorded during the study period. Cyanophyceae group was observed to be represented by 92 species of 28 genera in fresh water ponds of arid region of Rajasthan. The maximum number of Cyanophycean algae were represented by order Nostocales (62 species) followed the decreasing order by Chroococcales (29 species) and Pleurocapsales (1 species). Botrydiales order of Xanthophyceae (*Botrydium* sp.) and Dinoflagellata order of Peridinales (*Peridinium cintum*) were represented by a single species each. So, it is apparent from the present finding that aquatic bodies of Great Indian Desert are very rich in algal biodiversity with arid climatic conditions of the region suitable for adaptation of different species in the region.

Table 1. List of the Algal Species Observed from Arid Region of Rajasthan

CHLOROPHYCEAE

Order : Volvocales

Family: Chlamydomonadaceae

Chlamydomonas sp.

Chlorogonium elongatum (Dang.) France

Family: Volvocaceae

Eudorina illinoisensis (Kofoid) Pascher
Gonium pectorale Mull.
Pandorina morum (Mull.) Bory

Order : Chlorococcales

Family : Selenastraceae

Ankistrodesmus convolutus Corda
Ankistrodesmus falcatus (Corda) Ralfs
Ankistrodesmus falcatus var. *acicularis* (A.Braun) G.S.West
Ankistrodesmus spiralis (Turner) Lemmermann
Ankistrodesmus spiralis var. *fasciculatum* G. M. Smith
Ankistrodesmus sigmoides (Rabenh.) Bruhl et Biswas
Nephrochlamys subsolitaria (G. S. West) Korshikov
Kirchneriella contorta (Schmidle) Bohlin
Kirchneriella obesa (W. West) Schmidle
Kirchneriella lunaris (Kirchner) Moebius
Selenastrum minutum (Naegeli) Collins
Selenastrum gracile Reinsch
Selenastrum westii G.M.Smith

Family : Botryococcaceae

Botryococcus braunii Kuetzing

Family : Characiaceae

Characium acuminatum A. Braun ex Kuetzing
Characium ambiguum Hermann ex Rabenhorst
Characium apiculatum Rabenhorst
Characium nasutum Rabenhorst
Characium anophelesi Iyenger, M.O.P. et Iyenger, M.O.T.

Family : Chlorococcaceae

Chlorococcum infusionum (Schrank) Meneghini
Chlorococcum humicolo (Naegeli) Rabenhorst

Family : Coelastraceae

Coelastrum cambricum Archer
Coelastrum cambricum var. *intermedium* (Bohlin) G. S. West
Coelastrum microporum Naegeli

Family : Oocystaceae

Oocystis borgei Snow
Oocystis solitaria Wittrock
Oocystis gigas Archer
Chlorella vulgaris Beijerinck
Gloeotaenium loitlesbergerianum Hansgirg
Nephrocytium agardhianum Naegeli

Family : Dictyosphaeriaceae

Dictyosphaerium ehrenbergianum Naegeli

Family : Hydrodictyaceae

Hydrodictyon reticulatum (Linn.) Lagerheim
Closteridium siamensis (W. et G.S.West) G.M.Smith
Pediastrum simplex Meyen
Pediastrum simplex var. *duodenarium* (Bailey) Rabenhorst
Pediastrum simplex var. *echinulatum* Wittrock
Pediastrum duplex Meyen
Pediastrum duplex var. *genuinum* (A.Braun) Hansgirg
Pediastrum duplex var. *reticulatum* Lagerheim
Pediastrum duplex var. *gracillimum* Meyen
Pediastrum tetras (Her.) Ralfs
Pediastrum tetras var. *exisum* (Rabenh.)
Pediastrum tetras var. *tetraodon* (Corda) Hansgirg
Pediastrum integrum Naegeli
Pediastrum boryanum (Turpin) Meneghini

Tetraedron gracile (Reinsch) Hansgirg
Tetraedron enorme (Ralfs) Hansgirg
Tetraedron regulare Kuetzing
Tetraedron minimum (A. Braun) Hansgirg
Tetraedron tumidulum (Reinsch) Hansgirg
Tetraedron hastatum (Reinsch) Hansgirg
Tetraedron limneticum var. *gracile* Prescott
Tetraedron simmeri Schmidle

Family : Scenedesmaceae

Scenedesmus acuminatus (Lagerheim) Chodat
Scenedesmus bijugatus var. *alternans* (Reinsch) Hansgirg
Scenedesmus bijugatus var. *alternans* f. *parvus* G.M.Smith.
Scenedesmus bijugatus var. *bicellularis* (Chodat) comb. nov.
Scenedesmus bijugatus var. *gravenitzii* (Bernard) comb. nov.
Scenedesmus bijugatus var. *disciformis* (Chodat) Fott et Komarek
Scenedesmus bijugatus var. *flexuosus* Lemmermann
Scenedesmus ecornis (Ehrenberg ex Ralfs) Chodat
Scenedesmus obliquus (Turpin) Kuetzing
Scenedesmus platydiscus (G.M.Smith) Chodat
Scenedesmus protuberans Fritsch et Rich
Scenedesmus arcuatus (Lemmermann) Lemmermann
Scenedesmus quadricauda var. *maximum* W. et G.S.West
Scenedesmus quadricauda var. *quadrispina* (Chodat) G.M.Smith
Scenedesmus quadricauda var. *longispina* (Chodat) G.M.Smith
Scenedesmus quadricauda var. *westii* G.M.Smith
Scenedesmus quadricauda var. *eualternans* Proschk.
Scenedesmus opoliensis P. Richter
Scenedesmu bernardii G. M. smith
Scenedesmus dimorphus (Turpin) Kuetzing
Scenedesmu armatus (Chodat) G. S. Smith
Scenedesmus armatus var. *bicaudatus* (Guglielmetti) Chodat

Order: Conjugales (Filamentous)

Family : Zygnemaceae

Spirogyra ellipsospora Transeau
Spirogyra paludosa Czurda
Spirogyra porticalis (Muller) Cleve
Spirogyra rectangularis Welwitsch
Spirogyra occidentalis (Transeau) Czurda
Spirogyra angolensis Welwitsch.
Mougeotia punctata Wittrock
Zygnema mucigenum Randhawa

Order: Conjugales (Desmids)

Family : Desmidiaceae

Closterium acerosum (Schroeder) Ehr.
Closterium acerosum var. *elongatum* Breb.
Closterium dinae Ehr.
Closterium aerosum (Schrank) Ehr.
Closterium parvulum (Starr)
Closterium acutum Brebisson
Closterium strigosum Brebisson
Closterium ehrenbergii Meneghini ex Ralfs
Closterium lanceolatum Kuntz.
Closterium leibleinii Kuetzing.
Closterium abruptum W. West
Closterium venus Kutz.
Closterium gracile Brebisson
Closterium acutum var. *linea* West. and West.
Cosmarium botrytis var. *depressum* W. & G.S. West

Cosmarium botrytis var. *mediolaeve* West
Cosmarium vexatum West
Cosmarium impressulum Elfving
Cosmarium impressulum var. *crenalutum* (Naegeli) Krieger and Gerloff
Cosmarium depressum var. *apertum* (Turn) Hirano
Cosmarium subcostatum Nordsttdt
Cosmarium granatum Breb.
Cosmarium laeve Rabenhorst
Cosmarium lundellii Delp.
Cosmarium lundellii var. *ellipticum* West & West
Cosmarium reniforme (Ralfs) Arch.
Cosmarium contractum Kirchner
Euastrum insulare (Wittr.) Roy
Euastrum bidentatum Nag.
Euastrum oblongum (Greville) Ralfs
Staurastrum elongatum Barker
Staurastrum anatinum Cooke & will
Staurastrum indentatum f. *minus* Scott & Prescott
Staurastrum natator var. *crassum* W. & G.S.West
Staurastrum gracile Ralfs and Ralfs
Staurastrum bieneanum Rabenh.
Staurastrum tetracerum Ralfs
Staurastrum teliferum Ralfs
Pleurotaenium coronatum (Breb.) Rabenh.
Tetmemorus sp.
Order: Chaetophorales
Family : Chaetophoraceae
Stigeoclonium stagnatile (Hazen) Collins
Chaetophora elegans (Roth) C.A.Agarth
Order: Oedogoniales
Family : Oedogoniaceae
Oedogonium sp.
Order : Cladophorales
Family : Cladophoraceae
Cladophora sp.
Pithophora sp.
Order: Charales
Family : Characeae
Chara braunii Gmelin
Nitella sp.
Order: Ulotrichales
Family: Ulotrichaceae
Ulothrix aequalis Kuetzing
XANTHOPHYCEAE
Order: Botrydiales
Family: Botrydiaceae
Botrydium sp.
BACILLARIOPHYCEAE
Order : Achnanthales
Family : Achnanthaceae
Achnanthes inflata Kutzing
Achnanthes microcephala (Kutz) Grun.
Family : Cocconiedaceae
Cocconies pediculus Ehrenberg
Order : Thalassiophysales
Family : Catenulaceae
Amphora ovalis Kutz.
Amphora turgida Gregory

Order : Cymbellales Family : Cymbellaceae

Cymbella tumida (Breb.) Van Heurck.
Cymbella tumida f. *ventricosa* Gandhi
Cymbella ventricosa Kutz.
Cymbella cymbiformis (Kutzing) Brebisson
Cymbella affinis Kuetzing
Cymbella cistula (Ehr) Kirchn.
Cymbella kappi Cholnoky

Family : Gomphonemataceae

Gomphonema lanceolatum Ehr.
Gomphonema parvulum (Kutz.) Grunn.
Gomphonema parvulum var. *micropus* (Kutz.) Cleve
Gomphonema subventricosum F. Hustedt
Gomphonema gracile Ehrenberg
Gomphonema gracile var. *lanceolatum* (Kutz.) Cleve
Gomphonema subclavatum Grunn
Gomphonema montanum var. *genninum* Mayer
Gomphonema longiceps Ehr.
Gomphonema clavatoides sp. nov.
Gomphonema olivaceum (Lyngbye) Kuetzing
Gomphonema telographicum Kuetzing

Order : Naviculales

Family : Naviculaceae

Navicula elegans Wm. Smith
Navicula amphirhynchus Ehrenberg
Navicula rhynchocephala Kutzing
Navicula cuspidata Kutz.
Navicula cuspidata Kutz. var. *ambigua* (Ehr.) Cleve
Navicula cuspidata Kutz. var. *major* Meister
Navicula exigua (Greg.) Grun.
Navicula radiosa Kütz.
Navicula protracta (Grunow) Cleve
Navicula semilunum Grun.
Navicula halophyla f. *subcapitata* Ostrup
Navicula salinarum var. *intermedia* (Grun.) Cl.
Gyrosigma acuminatum (Kutz.) Rabh.
Gyrosigma scalproides (Rabh.) Cleve
Gyrosigma spencerii (Quek.) Griff and Hener
Stauronies anceps Ehrenb.

Family : Diadesmidaceae

Diadesmus confervacea Kutzing

Family : Amphipleuraceae

Amphipleura sp.
Frustulia rhomboides (Ehrenberg) Detoni

Family : Pinnulariaceae

Pinnularia viridis (Kutz.) Ehrenb.

Order : Fragilariales

Family : Fragilariaceae

Fragilaria capucina Desmaz.
Fragilaria crotonensis Kitton.
Fragilaria virescens (Ralfs) D.M. Williams & Round
Fragilaria construens (Ehr.) Grunow
Fragilaria construens var. *venter* (Ehr.) Grun.
Fragilaria intermedia Grun.
Synendra acus Kutz.
Synendra ulna var. *constricta* Venkataraman
Synendra ulna var. *amphirhynchus* (Ehrenberg) Grunow
Synendra dorsiventralis O. Muell.

Order: Licmophorales

Family: Ulnariaceae

Ctenophora pulchella (Ralfs ex Kutzing) D.M. Williams & Round

Order : Thalassiosirales

Family : Stephanodiscaceae

Cyclotella bodanica Eulenstein ex Grunow

Cyclotella kutziana Thwaites

Cyclotella meneghiniana Kütz.

Order : Bacillariales

Family : Bacillariaceae

Nitzschia acicularis W. Smith

Nitzschia palea (Kutz.) W. Smith.

Nitzschia obtusa Wm. Smith

Nitzschia obtusa var. *scalpelliformis* Grunow

Nitzschia recta Hantzsch ex. Rabenhorst

Nitzschia hantzsciana Rabenh.

Hantzschia amphioxys (Ehr.) Grun.

Hantzschia amphioxys var. *pusila* Dippel

Order: Eunotiales

Family : Eunotiaceae

Eunotia amphioxys Ehrenberg

Order: Rhopalodiales

Family: Rhopalodiaceae

Rhopalodia gibba (Ehr.) O. Muller

EUGLENOPHYCEAE

Order : Euglenales

Family : Euglenaceae

Euglena oxyuris Schmarda.

Euglena oxyuris var. *charkowiensis* (Swirensko) Chu

Euglena gracilis Klebs

Euglena polymorpha Dangeared.

Euglena ehrenbergii Klebs.

Euglena platydesma Skuja.

Euglena deses var. *intermedia* Klebs.

Euglena caudata Hübner

Euglena spirogyra Ehr.

Euglena acus Ehr .

Trachelomonas bacillifera var. *minima* Playf.

Family : Phacaceae

Lepocinclis ovum (Ehr.) Lemm.

Lepocinclis caudata (A. M. da Cunha) Pascher

Lepocinclis steinii Lemm.

Lepocinclis fusiformis (Carter) Lemmermann

Lepocinclis fusiformis var. *fusiformis* Arch. Protistenk

Lepocinclis fusiformis var. *amphirhynchus* Nyg. Dankvid. Selsk.

Lepocinclis salina Fritsch

Phacus acuminatus Stokes

Phacus tortus (Lemm.) Skv.

Phacus meson Pochmann

Phacus ephippion Pochmann

Phacus orbicularis Hubner

Phacus pyrum (Ehrenberg) F. Stein

Phacus longicauda (Ehr.) Duj.var. *longicauda*

CYANOPHYCEAE

Order: Chroococcales

Family : Chroococcaceae

Aphanocapsa bififormis A. Br.

Aphanocapsa grevillei (Hass.) Rabenh.

Aphanocapsa castagnei (Breb) Rabenhorst
Aphanocapsa littoralis Hansgirg
Aphanocapsa muscicola (Menegh) Wille
Aphanothece sp.
Chroococcus minor (Kutz.) Nag.
Chroococcus tenax (Kirchn.) Hieron.
Chroococcus turgidus (Kutz.) Nag.
Chroococcus turgidus var. *maximus* Nygaard
Chroococcus minutus (Kutz.) Nag.
Chroococcus montanus Hansgirg
Chroococcus montanus var. *hyalinus* Rao, C. B.
Chroococcus coherens (Breb.) Nag.
Chroococcus macrococcus (Kutz.) Rabenh.
Chroococcus giganteus West, W.
Gloeocapsa punctata Nag.
Gloeothece fusco-lutea Nag.
Merismopedia elegans A. Br.
Merismopedia glauca (Ehrenb.) Nag.
Merismopedia punctata Meyen
Microcystis aeruginosa Kutz.
Microcystis flos-aquae (Wittr.) Kirchner
Microcystis robusta (Clark) Nygaard
Microcystis panniformis Komarek *et al.*
Microcystis smithii Komarek *et Anagnostidis*
Microcystis wesenbergii (Komarek) Komarek *in Kondrateva*
Gomphosphaeria aponina Kutz.
Family: Entophysalidaceae
Johannesbaptistia pellucida (Dickie) Taylor *et Drouet*
Order: Pleurocapsales
Family: Pleurocapsaceae
Myxosarcina spectabilis Geitler
Order : Nostocales
Family : Oscillatoriaceae
Arthrospira jenneri Stizenb. *ex Gomont*
Arthrospira platensis (Nordst.) Gomont
Arthrospira platensis f. *granulata* forma nov.
Arthrospira massartii Kuffareth
Lyngbya martensiana Menegh. *ex Gomont*
Lyngbya martensiana var. *calcareo* Tilden
Lyngbya polysiphoniae Frey
Lyngbya majuscula Harvey *ex Gomont*
Lyngbya contorta Lemm.
Lyngbya birgei Smith, G. M.
Oscillatoria limosa Ag. *ex Gomont*
Oscillatoria chalybea (Mertens) Gomont
Oscillatoria chlorina Kutz. *ex Gomont*
Oscillatoria formosa Bory *ex Gomont*
Oscillatoria ornata Kutz. *ex Gomont*
Oscillatoria schultzei Lemm.
Oscillatoria curviceps Ag. *ex Gomont*
Oscillatoria princeps Vaucher *ex Gomont*
Oscillatoria perornata Skuja
Oscillatoria subbrevis Schmidle
Oscillatoria tenuis Ag. *ex Gomont*
Oscillatoria curviceps Ag. *Ex Gomont*
Oscillatoria proboscidea Gomont
Oscillatoria rupicola Hansg.
Oscillatoria margaritifera (Kutz.) Gomont

Oscillatoria rubescens DC ex Gomont
Oscillatoria acuta Bruhl et Biswas, orth. Mut. Geitler
Phormidium fragile (Meneghini) Gomont
Phormidium ambiguum Gomont
Phormidium jadinianum Gomont
Spirulina major Kutz. ex Gomont
Spirulina subsalsa Oerst. ex Gomont
Spirulina princeps W. et G.S. West
Spirulina meneghiniana Zanard. Ex Gomont
Spirulina labyrinthiformis (Menegh.) Gomont

Family : Nostocaceae

Anabaena doliolum Bharadwaja
Anabaena naviculoidea Fritsch
Anabaena constricta (Szafer) Geitler
Anabaena fertilissima Rao
Anabaena orientalis Dixit
Pseudanabaena schmidlei Jaag. O
Anabaenopsis circularis (West) Wolosz. et Miller
Anabaenopsis rociborskii Wolosz.
Cylindrospermum doryphorum Bruhl et Biswas
Cylindrospermum michailovskoense Elenkin
Raphidiopsis indica Singh, R. N.
Raphidiopsis mediterranea Skuja
Nodularia spumigena Mertens ex Born. et Flah.
Nostoc calcicola Brebisson ex Born. et Flah.
Nostoc ellipso sporum (Desm.) Rabenh. Born. et Flah.
Nostoc muscorum Ag. ex Born. et Flah.
Nostoc punctiforme (Kutz.) Hariot

Family : Rivulariaceae

Homoeothrix hansgirgi (Schmidle) Lemmermann
Calothrix braunii (A. Br.) Bornet et Flahault
Calothrix wembaerensis Hieron. Et Schmidle.
Calothrix marchia Lemmermann
Gloeotrichia intermedia (Lemm.) Geitler
Gloeotrichia rociborskii Woloszyńska
Rivularia dura Roth ex Born. et Flah.

Family : Scytonemaceae

Scytonema hofmanni Ag. ex Born. et Flah.
Scytonema simplex Bhardwaja
Tolypothrix tenuis (Kutz.) Johs. Schmidt em.

DINOPHYCEAE

Order: Peridinales

Family: Peridiniaceae

Peridinium cinctum Muller

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