

PRIMARY RESEARCH PAPER

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The structure of winter phytoplankton in Lake Nero, Russia, a hypertrophic lake dominated by *Planktothrix*-like Cyanobacteria

Taxonomic composition and eco-geographical characteristics of the under-ice phytoplankton in the lake Nero (1999-2010)

Taxon	Habitat	Distribution	Salinity	pH	Saprobity
Cyanophyta (Cyanoprokaryota)					
<u>Chroococcales</u>					
<i>Aphanocapsa delicatissima</i> W. et G.S. West.	P	c	–	–	–
<i>A. grevillei</i> (Berk.) Rabenh.	L	c	–	Al	o-β
<i>Gloeocapsa</i> sp.	–	–	–	–	–
<i>Microcystis aeruginosa</i> (Kütz.) Kütz.	P	c	–	Al	β
<i>M. flos-aquae</i> (Wittr.) Kirchner	P	c	IN	–	–
<i>Synechocystis</i> sp.	–	–	–	–	–
<u>Nostocales</u>					
<i>Anabaena cylindrica</i> Lemm.	P	–	–	–	o-β
<i>Anabaena</i> sp.	–	–	–	–	–
<i>Aphanizomenon gracile</i> Lemm.	P	c	H	–	–
<u>Oscillatoriales</u>					
<i>Geitlerinema amphibium</i> (Ag. ex Gom.) Anagn.	L	c	–	–	–
<i>Jaaginema geminatum</i> (Menegh. ex Gom.) Anagn. et Kom.	P	c	–	In	–
<i>Limnothrix planctonica</i> (Wolosz.) Meffert	P	c	–	–	o-β
<i>L. redekei</i> (Van Goor) Meffert	P	c	IN	–	β
<i>Oscillatoria</i> sp.	–	–	–	–	–
<i>Phormidium amoenum</i> Kütz. ex Anagn. et Kom.	O	–	IN	–	–
<i>P. granulatum</i> (Gardner) Anagn.	P	b	IN	–	–
<i>P. molle</i> Gom.	L	c	IN	–	β

<i>Phormidium</i> sp.	–	–	–	–	–
<i>Planktolyngbya circumcreta</i> (G.S. West) Anagn. et Kom.	P	–	IN	–	–
<i>P. contorta</i> (Lemm.) Anagn. et Kom.	P	–	IN	–	–
<i>P. limnetica</i> (Lemm.) Kom.-Legn. et Cronb.	P	c	–	In	β - α
<i>Planktolyngbya</i> sp.	–	–	–	–	–
<i>Planktothrix agardhii</i> (Gom.) Anagn. et Kom.	P	c	IN	–	β
<i>Pseudanabaena acicularis</i> (Nyg.) Anagn. et Kom.	P	–	IN	–	–
<i>P. limnetica</i> (Lemm.) Kom.	P-B	c	IN	–	α - β
<i>P. mucicola</i> (Naum. et Hub.-Pestal.) Schwabe	P	c	IN	–	α - β
<i>Romeria leopoliensis</i> (Racib.) Koczw.	P	–	–	–	α - β
Chrysophyta					
<u>Chromulinales</u>					
<i>Chromulina</i> Cienk. sp.	–	–	–	–	–
<i>Chrysococcus biporus</i> Skuja	P	c	IN	In	α - β
<i>C. punctiformis</i> Pascher	P	–	IN	In	α - β
<i>C. triporus</i> Matv.	P	–	IN	In	α - β
<i>Kephyrion moniliferum</i> (Schmid.) Bourelly	–	–	–	–	–
<i>K. rubri-claustri</i> Conrad	L	b	IN	–	α
<i>K. spirale</i> (Lackey) Conrad	L	–	IN	–	β
<i>Kephyrion</i> sp.	–	–	–	–	–
<u>Ochromonadales</u>					
<i>Dinobryon</i> sp.	–	–	–	–	–
<i>Mallomonas</i> sp.	–	–	–	–	–
<i>Microglena punctifera</i> (Müller) Ehr.	L	c	IN	–	–
<i>Ochromonas</i> sp.	–	–	–	–	–
<i>Pseudokephyrion conicum</i> (Schiller) Schmid	–	–	–	–	–
<i>Synura</i> sp.	–	–	–	–	–
Bacillariophyta					
<u>Thalassiosirales</u>					
<i>Cyclostephanos invisitatus</i> (Hohn et Hell.) Ther., Stoer. et Håk.	P	c	IN	Al	–
<i>Cyclotella</i> sp.	–	–	–	–	–
<i>Stephanodiscus binderanus</i> (Klitz.) Krieg.	–	–	–	–	–
<i>S. hantzschii</i> Grun.	P	c	IN	Al	α -p

<i>S. minutulus</i> (Kütz.) Cleve et Möller	P	b	IN	Al	α
<i>Stephanodiscus</i> sp.	–	–	–	–	–
<u>Melosirales</u>					
<i>Aulacoseira ambigua</i> (Grun.) Sim.	P	c	IN	Al	α – β
<i>A. granulata</i> (Ehr.) Sim.	P	c	IN	Al	β
<u>Araphales</u>					
<i>Fragilaria capucina</i> var. <i>radians</i> (Kütz.) Lange-Bert.	P	c	IN	Al	α – β
<i>Staurosira construens</i> var. <i>construens</i> Ehr.	L	c	IN	Al	α – β
<i>S. construens</i> var. <i>binodis</i> (Ehr.) Ham.	O	c	IN	Al	α
<i>S. construens</i> var. <i>exigua</i> (Smith) Kobayasi	L	c	IN	Al	–
<i>Staurosirella berlinensis</i> (Lemm.) Bukht.	P	c	IN	Al	β
<i>Synedra</i> sp.	–	–	–	–	–
<i>Ulnaria acus</i> (Kütz.) Aboal	P	c	IN	Al	α – β
<i>U. delicatissima</i> var. <i>angustissima</i> (Smith) Aboal et Silva	P	c	IN	Al	α – β
<u>Raphales</u>					
<i>Cymatopleura solea</i> (Breb.) Smith	L	c	IN	Al	β
<i>Gyrosigma acuminatum</i> (Kütz.) Rabenh.	O	b	IN	Al	β
<i>Navicula</i> sp.	–	–	–	–	–
<i>Nitzschia acicularis</i> (Kütz.) W. Sm.	P	b	IN	Al	α
<i>N. gracilis</i> Hantzsh.	P	c	IN	In	β
<i>N. holsatica</i> Hust.	P–B	c	IN	In	–
<i>N. longissima</i> (Bréb.) Ralfs	–	–	–	–	–
<i>N. palea</i> var. <i>debilis</i> (Kütz.) Grun.	P–B	c	H	In	α
<i>N. paleacea</i> Grun.	P–B	c	IN	Al	β – α
<i>N. recta</i> Hantzsch	L	c	–	Al	β – α
<i>N. sublinearis</i> Hust.	B	b	IN	–	α – β
<i>N. vermicularis</i> (Kütz.) Hantzsch	L	c	IN	Al	β
<i>Pinnularia major</i> (Kütz.) Rabenh.	B	c	IN	In	α
<i>P. microstauron</i> (Ehr.) Cleve	B	c	–	In	–
<i>Surirella biseriata</i> Bréb	P	c	IN	Al	β
<u>Xanthophyta</u>					
<u>Heterococcales</u>					
<i>Tetraedriella impressa</i> Pasch.	P	–	–	–	–

Cryptophyta					
<u>Cryptomonadales</u>					
<i>Chroomonas minima</i> Czosnow.	–	–	–	–	–
<i>C. caudate</i> Geitler	P	c	IN	–	β–α
<i>Cryptomonas caudata</i> Schiller	P	c	IN	–	–
<i>C. curvata</i> Ehr.	P	c	–	In	β
<i>C. erosa</i> Ehr.	L	c	H	In	α
<i>C. obovoidea</i> Pascher	P	–	–	–	–
<i>C. marssonii</i> Skuja	P	c	IN	–	o–β
<i>C. nasuta</i> Pasch.	L	–	H	–	–
<i>C. ovata</i> Ehr.	P	c	IN	In	α
<i>C. parapyrenoidifera</i> Skuja	–	–	–	–	–
<i>Cryptomonas</i> sp.	–	–	–	–	–
Dinophyta					
<u>Peridinales</u>					
<i>Gymnodinium</i> sp.	–	–	–	–	–
<i>Peridiniopsis sphaeroideum</i> (Christen) Bourrelly	P	–	–	–	–
<i>Peridinium aciculiferum</i> Lemm.	P	c	–	In	o–β
<i>P. umbonatum</i> var. <i>umbonatum</i> Stein	P	c	IN	In	o–β
<i>P. umbonatum</i> var. <i>deflandrei</i> (Lefevre) Pop. and Pfiester	P	–	–	–	–
<i>P. umbonatum</i> var. <i>goslaviense</i> (Wolosz.) Pop. and Pfiester	P	–	–	–	–
<i>P. umbonatum</i> var. <i>incospicuum</i> Stein.	–	–	–	–	–
<i>Peridinium</i> sp.	–	–	–	–	–
<i>Woloszynskia tenuissima</i> (Lauterb.) Thomp.	–	–	–	–	–
Euglenophyta					
<u>Euglenales</u>					
<i>Euglena acus</i> Ehr.	L	c	IN	In	β
<i>E. acus</i> var. <i>minor</i> Hansg.	–	–	–	–	–
<i>E. gracilis</i> Klebs	L	c	IN	Al	o–β
<i>E. granulata</i> (Klebs) Schmitz	L	c	IN	–	–
<i>E. hemihromata</i> Skuja	L	–	–	–	β
<i>E. limnophila</i> Lemm.	L	–	–	–	o–β
<i>E. limnophila</i> var. <i>swirenkoi</i> (Arnoldi) Pop.	L	–	IN	–	–

<i>E. megalitus</i> Skuja	P	–	–	–	–
<i>E. minima</i> France	L	c	–	–	o
<i>E. pisciformis</i> Klebs	L	c	IN	–	β-α
<i>E. proxima</i> Dang.	P	b	IN	In	o-β
<i>E. vagans</i> Delf.	P-B	c	–	–	–
<i>E. viridis</i> Ehr.	P-B	c	–	In	α-p
<i>Euglena</i> sp.	–	–	–	–	–
<i>Phacus arnoldii</i> var. <i>ovatus</i> Popova	–	–	–	–	–
<i>P. indicus</i> Skvortzov	P	c	IN	In	o-β
<i>P. oscillans</i> Klebs	L	c	H	–	–
<i>P. parvulus</i> Klebs	L	c	IN	In	β
<i>P. pyrum</i> (Ehr.) Sein	P	c	IN	In	o-β
<i>P. striatus</i> France	L	–	–	–	–
<i>Phacus</i> sp.	–	–	–	–	–
<i>Strombomonas acuminata</i> (Schmarda) Defl.	L	c	IN	In	o-β
<i>Trachelomonas hispida</i> (Perty) Stein emend. Defl.	P	c	IN	In	β
<i>T. hispida</i> var. <i>crenulatocollis</i> (Maskell) Lemm.	P	c	IN	In	–
<i>T. hispida</i> var. <i>granulata</i> Playf.	L	c	IN	In	–
<i>T. hispida</i> f. <i>punctata</i> Lemm.	–	–	–	–	–
<i>T. hispida</i> var. <i>volicensis</i> Drez.	P-B	–	–	–	–
<i>T. intermedia</i> Dang.	P	c	IN	In	o
<i>T. planctonica</i> var. <i>oblonga</i> Drez.	P	c	IN	–	–
<i>T. rotunda</i> Swir.	L	c	IN	In	o
<i>T. spinulosa</i> (Skv.) Defl.	P	c	IN	Al	–
<i>T. volvocina</i> Ehr.	P	c	IN	In	o-β
<i>T. volvocina</i> var. <i>punctata</i> Playf.	P	c	IN	–	–
<i>T. volvocina</i> var. <i>subglobosa</i> Lemm.	P	c	IN	In	o-β
<i>Trachelomonas</i> sp.	–	–	–	–	–
Chlorophyta					
<u>Chlorellales</u>					
<i>Closteriopsis acicularis</i> (G.M. Sm.) Belcher et Swale	P	c	IN	Al	–
<i>Koliella longiseta</i> (Visch.) Hind.	L	c	IN	In	β
<i>K. planctonica</i> Hind.	P	–	–	–	–

<u>Chlorococcales</u>					
<i>Chlorococcum sp.</i>	–	–	–	–	–
<i>Golenkinia radiata</i> Chod.	P	c	IN	–	β
<u>Chlorodendrales</u>					
<i>Tetraselmis cordiformis</i> (Carter) Stein	P	–	–	–	–
<u>Oocystales</u>					
<i>Lagerheimia genevensis</i> (Chod.) Chod.	P	c	IN	–	β
<u>Sphaeropleales</u>					
<i>Ankistrodesmus falcatus</i> (Corda) Ralfs	L	c	IN	–	β
<i>A. gracilis</i> (Reinsch) Korsch.	P	c	IN	Al	β
<i>Coelastrum astroideum</i> De Not.	P	c	IN	In	β
<i>C. microporum</i> Näg.	P	c	IN	–	β
<i>Hyaloraphidium contortum</i> Pasch. et Korsch.	L	c	IN	–	–
<i>Kirchneriella contorta</i> (Schmidle) Bohl.	P	c	IN	–	–
<i>K. obtusa</i> (Korsch.) Kom.	P	c	IN	–	–
<i>Monoraphidium arcuatum</i> (Korsch.) Hind.	P	c	IN	–	β
<i>M. contortum</i> (Thur.) Kom.–Legn.	P	c	IN	–	β
<i>M. irregulare</i> (Smith) Kom.–Legn.	P	c	IN	In	–
<i>M. komarkovae</i> Nyg.	P	c	IN	In	–
<i>M. minutum</i> (Näg.) Kom.–Legn.	P	c	IN	Al	β–α
<i>Pediastrum biradiatum</i> Meyen	P	c	IN	In	β
<i>P. boryanum</i> (Turp.) Menegh.	P	c	–	In	β
<i>P. boryanum</i> var. <i>longicorne</i> Reinsch	P	c	IN	In	–
<i>P. duplex</i> Meyen	P	c	IN	–	β
<i>P. simplex</i> Meyen var. <i>simplex</i>	P	c	IN	–	o–β
<i>P. simplex</i> var. <i>echinulatum</i> Wittr.	P	c	IN	–	–
<i>P. tetras</i> (Ehrenb.) Ralfs	P	c	IN	–	β
<i>Scenedesmus acuminatus</i> (Lagerh.) Chod.	P	c	IN	–	β
<i>S. communis</i> Hegew.	P	c	–	–	–
<i>S. eornis</i> (Ehr.) Chod.	P	c	–	–	β
<i>S. quadricauda</i> (Turp.) Breb.	L	c	–	In	β
<i>S. spinosus</i> Chod.	P	c	IN	–	–
<i>Scenedesmus sp.</i>	–	–	–	–	–

<i>Schroederia setigera</i> (Shroed.) Lemm.	P	c	IN	–	β
<i>Tetraedron caudatum</i> (Corda) Hansg.	P	c	IN	–	β
<i>T. minimum</i> (Braun) Hansg.	P	c	IN	–	β
<u>Volvocales</u>					
<i>Chlamydomonas actinochloris</i> Deason et Bold	–	–	–	–	–
<i>C. augustae</i> Skuja	–	–	–	–	–
<i>C. kvildensis</i> Ettl	P	–	H	In	–
<i>Chlamydomonas sp.</i>	–	–	–	–	–
<i>Chlorogonium gracile</i> Matw.	P	–	–	–	–
<i>C. maximum</i> Skuja	–	–	–	–	–
<i>Pteromonas variabilis</i> Hub. – Pest.	–	–	–	–	–
<i>Sphaerellopsis cylindrica</i> Skuja	P	–	IN	–	–
<u>Zygnematales</u>					
<i>Staurostrum tetracerum</i> Ralfs var. <i>tetracerum</i>	P	–	–	–	o–β

1. Habitat: P – planktonic, L – littoral, B – benthic. 2. Distribution: c – cosmopolitan, b – boreal. 3. Salinity: IN – indifferent, H – halophilous. 4. pH: Al – alkaliphilous, In – indifferent. 5. Saprobity: o – oligosaprobous, β – β-mesosaprobous, α – α-mesosaprobous, p – polysaprobous.