CHANGES IN THE PHYTOPLANKTON OF LAKE PLANETARIO AFTER A RESTORATION PROCESS

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Abstract. Ehrenhaus C. & M. S. Vigna. 2006. Changes in the phytoplankton of Lake Planetario after a restoration process. *Darwiniana* 44(2): 319-328.

Lake Planetario is an urban recreational lake that suffered a *Microcystis aeruginosa* bloom in March 1999. At the same time the birds and fishes that inhabited the lake died, probably affected by microcystin, hepatotoxin that some strains of *Miycrocyistis* produce. The City of Buenos Aires requested Aguas Argentinas to restore the lake. Restoration tasks included treatment of sediments and pumping of water from a brackish aquifer. For one year, monthly samples were taken with a phytoplankton net, the qualitative and quantitative composition of the phytoplankton were studied, and physicochemical data were collected. The structure and composition of the phytoplankton were studied and revealed that due to the turbulence caused by the pumping of water, the Cyanophyta were controlled and phytoplankton diversity increased significantly. Chlorophyta dominated during spring, Cyanophyta during fall and Bacillariophyta during summer and winter. The change in conductivity provided a favourable environment for new taxa to colonize the lake, with representatives of taxa typical for brackish water.

Keywords. Argentina, Buenos Aires, bloom, *Microcystis aeruginosa*, restoration, urban recreational lake.

Resumen. Ehrenhaus C. & M. S. Vigna. 2006. Cambios en el fitoplancton del Lago del Planetario luego de un proceso de restauración. *Darwiniana* 44(2): 319-328.

El lago del Planetario es un lago recreativo urbano localizado en la ciudad de Buenos Aires, Argentina. En marzo de 1999 se produjo una floración de *Microcystis aeruginosa*. Al mismo tiempo los peces y aves que habitaban el lago murieron, probablemente afectados por microcystina, una hepatotoxina que producen algunas cepas de *Microcystis*. El Gobierno de la Ciudad de Buenos Aires encomendó la restauración del lago a Aguas Argentinas. Las tareas de restauración incluyeron el tratamiento de los sedimentos y el bombeo de agua de una napa salobre. Durante un año se tomaron muestras mensuales con una red de fitoplancton, se estudió su composición cuantitativa y cualitativa, y se tomaron medidas de factores físicoquímicos. Debido a la turbulencia causada por el bombeo de agua, el crecimiento de las Cyanophyta fue controlado y la diversidad fitoplanctónica aumentó significativamente. Las Chlorophyta dominaron durante la primavera, las Cyanophyta durante el otoño y las Bacillariophyta en verano e invierno. El cambio en la conductividad proveyó condiciones favorables para que nuevos taxones, típicos de ambientes salobres, colonizaran el lago.

Palabras clave. Argentina, Buenos Aires, floración, *Microcystis aeruginosa*, restauración, lago recreativo urbano.

INTRODUCTION

Eutrophication and pollution of urban recreational lakes and ponds is a common problem throughout the world. Human activities are usually the main culprit responsible in the transformation of these aquatic systems from their original state. Several studies have documented

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eutrophication of urban recreational lakes, from various localities throughout the world, that reached the point of producing toxic algal blooms (Edmondson, 1979; Lund, 1979; Cronberg, 1982). Shallow lakes and ponds are more sensitive to eutrophication and are much more easily disturbed than deep lakes, usually requiring human intervention to be restored (Kagalou et al., 2001; Scasso et al, 2001).

Microcystis aeruginosa (Kützing) Kützing (Cyanophyta, Chroococcales) is frequently found in eutrophic water bodies in large quantities (de Leon & Chalar, 2003; Ilhe et al., 2005). Some strains have the capacity to produce microcystin, a hepatotoxin which, when present in large concentrations, can cause mortality of the animals inhabiting or using the body of water (Krienitz et al, 2003; Ballot et al., 2004).

Microcytis aeruginosa overwinters as vegetative colonies in the sediments, being able to reinoculate the body of water by resuspension (Verspagen et al., 2004; Ilhe et al., 2005). Because of higher contact with the water column and susceptibility of being disturbed by wind, the sediments in shallow waters are of greater importance when contributing to the reinoculation of the water column (Brunberg & Blomquist, 2003). *Microcystins* are also stored in sediments, even though they are produced only in the pelagic stage (Ilhe et al., 2005).

Lake Planetario lies in Tres de Febrero Park, Buenos Aires, Argentina. It is part of a group of recreational water bodies in the largest park of the city, receiving a strong negative influence from people that visit the park daily. Previously, this lake had never been the subject of monitoring tasks.

During March 1999 the ducks and fishes that inhabited the lake died, at the same time a *M. aeruginosa* bloom was recorded. Subsequently, the city authorities requested Aguas Argentinas Corporation to perform the restoration of this water body. The restoration strategies included the emptying of the lake and treatment of the sediments in order to avoid reinoculation by *M. aeruginosa* or resuspension of the toxin. Later, the lake was filled with water pumped from a brackish aquifer. Throughout the study period, water was periodically pumped to partially replace the water of the lake.

The aim of this work was to describe the phytoplankton succession after the restoration measure. To achieve this, studies were conducted throughout a one year period. Data obtained was compared with available data of samples collected before the restoration process to make a preliminary diagnosis of the current status.

MATERIALS AND METHODS

Lake Planetario is located in the Tres de Febrero Park, City of Buenos Aires (34º 35” S, 58º 25” W), one kilometre away from the Río de la Plata. Its surface is about 10,000 m^2 and its average depth 1.20 m. It is a shallow water body that does not show thermal stratification due to the mixing action of the winds, thus phytoplankton is equally distributed throughout the water column. Similar to other lakes in the park it is subject to strong anthropic stress.

Monthly samples were collected from the shore throughout a one-year period (from October 1999 to October 2000), using a 20 µm mesh phytoplankton net for qualitative studies. The sampling site was located near the water pump. Samples prior to the restoration process were also collected by our laboratory. For quantitative studies, the samples were collected with 500 ml bottles. Half of the net samples and all of the samples collected with bottles were preserved with formaldehyde 4% “in situ”. The remaining net samples were brought to the laboratory in live condition to perform preliminary observations of structures that could be easily altered by the preservation process.

Material was analysed in the laboratory with a Zeiss Standard 14 light microscope, equipped with a “camera lucida” drawing tube and photographic camera M-35. To facilitate diatom identification, a sub sample of 10 ml was taken from each sample and mineralized (Round et al., 1990), using Stirax as mounting medium for setting up permanent samples. Quantitative analysis was carried out using sedimentation chambers of 5 and 10 ml and an inverted microscope (Olympus CK2 M021). Sedimentation time was 24 hr and counting was done according to Utermöhl (1958). To assess number of cells for *M. aeruginosa*, the number of cells corresponding to a standard individual was established.

At the time of collection, water pH was measured with pH paper (Riedel de Häen range 1-11). In the laboratory, pH was measured again with an Altronix pHmeter, and conductivity with a Dist WP Hanna conductimeter. Temperature was measured “in situ” with a conventional thermometer and transparency concurrently evaluated using a Secchi disc.

From the sample corresponding to 15/03/2000, which showed the highest conductivity, a subsample was taken to perform an ionic analysis. This was done using an anionic column DIONEX AS4A, and a Na_2CO_3 1.8 mM - $HnaCO_3$ 1.7 mM solution as eluent in a DIONEX DX-100 equipment. The cationic analysis was performed using a DIONEX CS-10 column and HCl 60 mM 2,3, diaminopropionic 6 mM acid as eluent. These studies were performed by the Laboratory of Ionic Chromatography (INQUIMAE, FCEN, UBA). Since Aguas Argentinas did not perform submerged macrophyte management during the study period, the lack of macrophyte data should not greatly impact this study.

Nutrient data was obtained from Aguas Argentinas. The relationship of total phytoplankton, number of species, and number of individuals of each class was studied with respect to dissolved oxygen (DO), ammonia (NH_4), nitrate (NO_3), total phosphorous (TP) and phosphate (P-PO_4).

Mann-Whitney tests were performed on the data to establish differences between the number of taxa for the total phytoplankton in the lake before and after the restoration process, the same was done for each class. To test the response of phytoplankton to the physicochemical parameters, correlations between the number of taxa and individuals versus each parameter were performed. For the statistical tests Analyse-it Version 1.71 (Analyse-it for Microsoft Excel, Leeds, UK) was used.

Examined material

Samples were deposited in the Herbarium of the Facultad de Ciencias Exactas y Naturales, UBA (BAFC).

ARGENTINA. **Ciudad Autónoma de Buenos Aires**. Parque 3 de Febrero, Lago del Planetario, V to X-1998, *C. Munari s.n.* (BAFC 1684-1689); X-1999 to IX-2000, *C. Ehrenhaus s.n.*, (BAFC 169-1696, BAFC 1698-1700, and BAFC 1702- 1707).

RESULTS

The pH fluctuated between 7.17 and 9.24, the values of both periods (before and after the restoration) being similar (Table 1).

The water temperature varied from 9.2ºC in August 1998 to 31 ºC in January 2000. This variation reflected the temperature fluctuations of the air.

Secchi disk transparency varied between 16 and 77 cm (lake bottom at the sampling site). Transparency was lower before and higher after the restoration.

Conductivity in the period before the restoration was from 410 to 690 µS/cm. At the beginning of the restoration process conductivity was high, reaching values of 2856 µS/cm due to the addition of water from a brackish aquifer. But later, during winter, from May to September, it diminished to values between 295 and 472 µS/cm, when the pumping of water ceased (Table 1).

Table 1 shows the nutrient data. Dissolved oxygen ranged from 10.8 to 17.3 mg/l, NH_4 was recorded as less than 0.05 to less than 0.3 mg/l, the concentration of P-PO_4 was <0.03 to 0.2 mg/l, and TP 0.12 to 2.44. No correlation was observed between any of the nutrients studied and species number, or total phytoplankton (ind/ml). Each class was analyzed separately by plotting a linear regression with each of the parameters studied. Only Cyanophyta showed a significant negative correlation (r= 0.77) with P-PO_4. The remaining classes showed no correlation with any parameter.

During September, the algal abundance increased and transparency diminished.

The ionic analysis performed in the sample extracted in March 2000 revealed the presence of ClNa and SO_4Na_2 as the predominant ions. The values of these were Cl^- 360 mg/l, SO_4^{-2} 380 mg/l, and Na^+ 460 mg/l.

Phytoplankton was composed of 39 taxa before restoration and 75 taxa after restoration (Table 2). The Mann-Whitney test indicated that the difference in number of taxa observed was significant (p= 0.0001). Most algal taxa belonged to Cyanophyta, Chlorophyta and Bacillariophyta, representing above 97% of the phytoplankton, except for the sample from November 2000, in which they were 89% of the phytoplankton. Therefore, these were the most intensively studied divisions.

Table 1. Physicochemical data of Lake Planetario. Dates from June 1998 to November 1998 are prior to the restoration process; those from October 1999 to September 2000 are after the restoration process. Abbreviations: Temp, temperature; DO, dissolved oxygen; NH_4, ammonia; NO_3, nitrate; P-PO_4, phosphate; TP, total phosphorus.

Date	pH	Temp (ºC)	Transparency (cm)	Conductivity (µS/cm)	DO[a] (mg/l)	NH_4[a] (mg/l)	NH_4[a] (mg/l)	P-PO_4[a] (mg/l)	TP[a] (mg/l)
Jun-1998	7.7	13.4	-	420	-	-	-	-	-
Jul-1998	7.17	10.6	-	410	-	-	-	-	-
Aug-1998	9.17	9.2	26	470	-	-	-	-	-
Sept-1998	9.2	10.8	20	690	-	-	-	-	-
Oct-1998	9.24	13.1	16	570	-	-	-	-	-
Nov-1998	8	14.8	26	690	-	-	-	-	-
Oct-1999	8.4	20.1	-	2500	13.1	<0.05	<1.0	<0.03	0.27
Nov-1999	8.75	28	-	2764	11.0	<0.3	-	0.2	0.43
Dec-1999	8.1	28.5	77	2856	10.8	<0.3	<0.2	0.1	0.27
Jan-2000	8.75	31	32	2474	-	-	-	-	-
Feb-2000	9.1	29.9	54	2766	12.8	<0.3	0.3	<0.03	0.22
Mar-2000	8.1	29	55.5	2820	12.1	<0.3	<0.2	<0.03	2.44
Apr-2000	8.75	19	32	1686	17.3	<0.3	<2.0	<0.03	0.15
May-2000	8.6	17.5	28.5	388	12.7	<0.3	0.47	<0.03	0.12
Jun-2000	7.7	16	52	386	13.5	<0.3	<0.45	0.14	0.38
Jul-2000	8.9	14.5	42	295	-	-	-	-	-
Aug-2000	8.5	15.5	77	472	-	-	-	-	-
Sept-2000	9.1	18	25	414	-	-	-	-	

[a] Data provided by Aguas Argentinas.

The two last groups increased significantly (p=0.001 and 0.0001 respectively) in number of taxa present in the lake after the restoration.

The abundance of *Mycrocystis aeruginosa* during the bloom was 364.75 x 10^6 cells/ml, whereas after the restoration the values ranged between 857.01 x 10^4 to zero cells/ml, diminishing towards the end of the study period.

Post-restoration, there are two peaks of maximum algal abundance, one during spring and one during fall. The spring maximum coincides with the Chlorophyta maximum, when this group represents 93% of the phytoplankton studied. The late-summer/early-fall maximum was comprised predominantly by Cyanophyta (76.6% of total sample). During summer and winter, Bacillariophyta was the dominant group (82% and 85% respectively). The minimum of total phytoplankton recorded was for June (106317 ind/ml); also two other secondary minima were found in November and January. In all these cases, the predominant division was the Bacillariophyta (Fig. 1 and 2).

No correlation was found between the physicochemical parameters studied and the abundance in taxa and individuals of these classes.

Xanthophyceae, Euglenophyta and Dinophyta were present always in low concentrations, below 5% of total phytoplankton. Again, no significant correlation was found with any of the factors studied. Synurophyceae were only recorded in the samples before the restoration process.

DISCUSSION

Restoration of Lake Planetario was performed through two main actions: treatment of sediments to eliminate possible reinoculating colonies and toxins (Brunberg & Blomquist, 2003; Verspagen et al., 2004; Ilhe et al., 2005), and pumping of brackish water, which also generated turbulence. The sudden increase in conductivity might have caused the population of established algae to diminish drastically. In addition, the turbulence generated by pumping water may have controlled the numbers of *M. aeruginosa*. The restoration measures

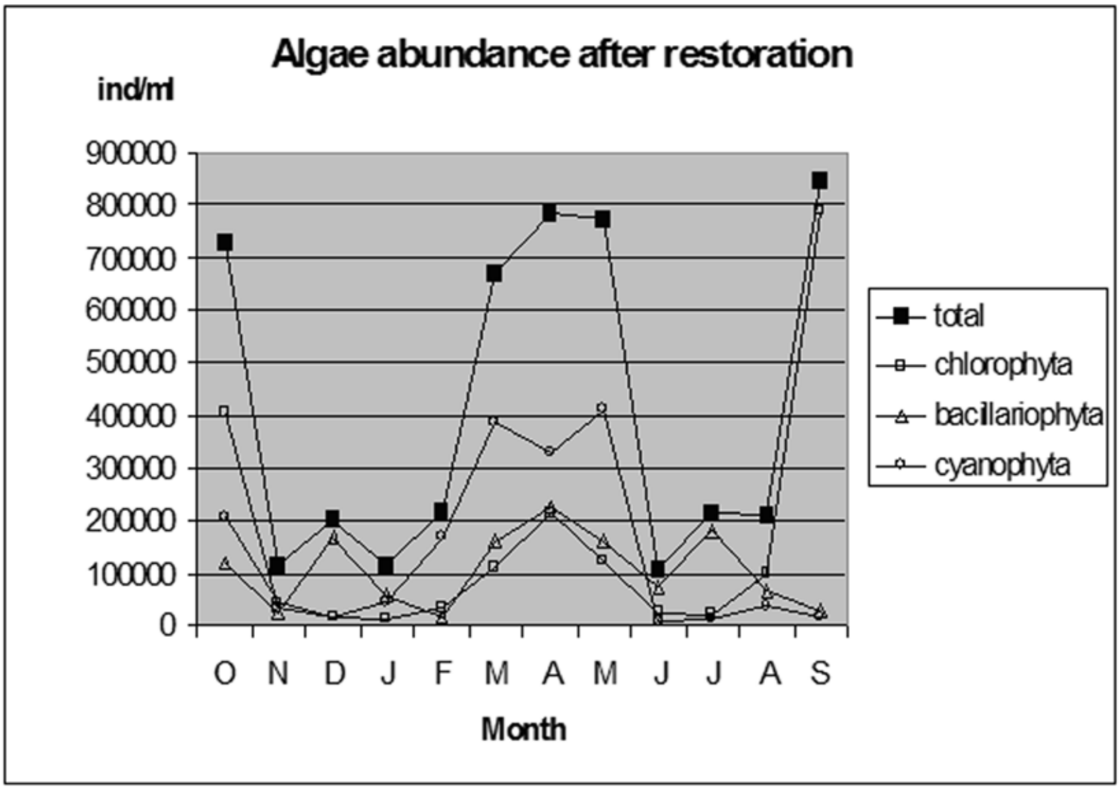

Fig. 1. Monthly fluctuations of the three most important divisions and total algae.

performed in the lake seem to have contributed to diminish the amounts of *M. aeruginosa* from 106 to zero cells/ml towards the end of the study period.

Cyanophyta are known to bloom during periods of calm water (Reynolds et al., 1987), so the turbulence generated by the inflow of water could have avoided this.

The restoration process performed in Lake Planetario caused changes in the phytoplankton composition and structure. The succession observed was as follows: Chlorophyta dominated during early spring (93% of total phytoplankton) yielding to Bacillariophyta at the beginning of summer (Fig. 2). By late summer Cyanophyta were the most abundant division, with Chlorophyta and Bacillariophyta not showing any predominant pattern over each other, maintaining this structure throughout winter (Fig. 2). By late spring Bacillariophyta began to increase and became dominant over Chlorophyta at the beginning of summer (Fig. 2). Euglenoids were only present when Chlorophyta were not dominant (Fig. 2). Seasonality and sun irradiance could be partly responsible for the successional stages, since no correlation with any of the measured physicochemical factors was positive for each class or the total phytoplankton. However, Lake Planetario is a small lake highly influenced by many factors that were not recorded. Such factors include anthropogenic impact, heavy precipitations, or draught periods, which can modify the lake volume and dilution of the waters.

The low transparency registered in the lake prior to the restoration (Table 1) was probably due to the forming *Microcystis* bloom (Ballot *et al*, 2004; Verspagen *et al*, 2004). After the restoration, the transparency increased, most likely because of the lower number of algae during the period studied (Table 1). Possibly due to the increase in transparency, the bottom of the lake was populated with *Potamogeton* sp. (Potamogetonaceae). This

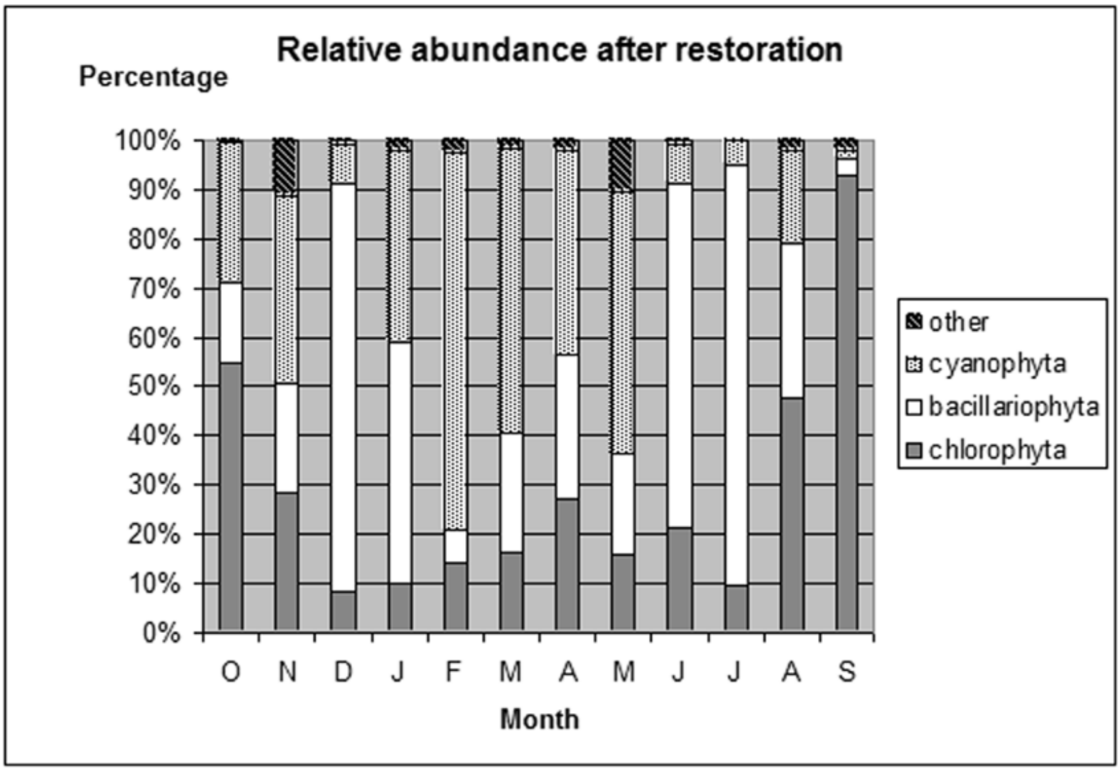

Fig. 2. Seasonal fluctuation of the phytoplankton.

also might have contributed to the avoidance of later blooming episodes through allelopathic substances, competition for nutrients, and shading (Scheffer et al., 1993).

The water pumped into the lake was originally from a brackish aquifer. This caused the conductivity of the lake to increase notably (Table 1). When the risk of a *M. aeruginosa* bloom was low, probably due to the weather conditions during 2000 (from May to September), the pumping ceased. This, plus the heavy rainfalls during that period likely reduced the conductivity of the lake again to original values. It is at this time of low conductivity that Volvocales species started to dominate the lake.

The taxa number significantly increased 87% after the restoration. The changes in conductivity provided different ecological conditions for new species to colonize the lake. Species typical from brackish waters were recorded during high conductivity periods. *Aphanizomenon* aff. *gracile* Lemmermann (Bacillariophyta; Geitler, 1932), *Coelosphaerium kuetzingianum* Nägeli (Cyanophyta), *Lemmermanniella flexa* Hindak (Cyanophyta; Komarek & Anagnostidis, 1999), *Chaetoceros* aff. *muelleri* Lemmermann (Bacillariophyta), and *Epithemia adnata* (Kützing) Brebisson (Bacillariophyta; Kramer & Lange-Bertalot, 1991) were present during the months of high conductivity.

On the other hand, species which are said to be associated to low conductivity were also recorded during periods of high conductivity. According to Ettl (1978) *Goniochloris contorta* (Bourrelly) Ettl (Xantophyta), and *G. spinosa* Pascher (Xanthophyta) are typical for non-brackish environments. In this study, they are reported for conductivities from 414 to 2856 µS/cm, thus widening their ecological range.

The absence of *Mallomonas elongata* Iwanoff (Chrysophyta) and *M. caudata* Reverdin (Chrysophyta) after the restoration was most likely due to the high conductivity, since these organisms require lower conductivities (Siver & Vigna, 1997).

Table 2. Taxocenosis of Lake Planetario during the period studied.

Species/ Sample	J98	J98	A98	S98	O98	N98	O99	N99	D99	E00	F00	M00	A00	M00	J00	J00	A00	S00
CYANOPHYTA																		
Anabaena laxa (Rabenhorst) Braun	X	X			X	X	X		X	X	X	X	X	X				
Anabaenopsis arnoldii Aptekarj	X						X		X	X	X	X	X	X	X	X	X	
Aphanizomenon gracile Lemmermann	X	X		X	X	X					X	X						
Coelosphaerium kuetzingianum Nägeli							X	X		X	X							
C. minutissimum Lemmermann		X			X	X	X		X	X	X	X	X	X				X
Lemmermanniella flexa Hindák							X	X		X	X							
Merismopedia punctata Meyen	X		X		X			X	X									
Microcystis aeruginosa Kützing	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
Nodularia spumigena Mertens		X								X	X	X						
Spirulina laxissima West	X	X	X	X	X	X					X	X	X	X	X	X	X	X
CHLOROPHYTA																		
Acanthosphaera zachariasii [(a)] Lemmermann														X				
Actinastrum hantzschii Lagerheim						X	X	X	X	X	X	X	X	X	X	X		
Ankistrodesmus bibraianus (Reinsch) Korsikov								X	X									
Cladophora sp. Kützing				X					X									
Closteriopsis acicularis (G. M. Smith) Belcher & Swale		X			X		X	X	X			X	X	X	X	X	X	X
Coelastrum microporum Nägeli var. *octaedricum* Sodomkova	X			X	X	X	X	X	X		X	X		X	X	X	X	X
Chaetosphaeridium globulosum (Nordstet) Klebahn																		X
Dictyosphaerium pulchellum Wood		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
D. tetrachotomum Printz			X				X	X				X		X	X	X	X	
Echinosphaeridium nordstedtii Lemmermann			X				X				X			X		X	X	X
E. quadrisetum [(a)] Behre																X		
Eudorina unicocca Smith															X	X	X	X
Gonium pectorale Müller															X	X	X	X
Interfilum paradoxum [(a)] Chodat & Topali											X			X				
Keratococcus raphidioides [(a)] (Hansg.) Pascher							X											

Table 2. (Continuation)

Lagerheimia ciliata (Lagerheim) Chodat											X			X				
Micractinium pusillum Fresenius				X		X		X				X		X	X	X	X	X
Monoraphidium circinale (Nygaard) Nygaard							X											
Nephrochlamys subsolitaria Komárek & Foot		X	X	X		X	X											
Oocystis lacustris Chodat	X	X	X	X			X	X	X	X	X	X	X	X		X	X	X
Pandorina morum Müller															X	X	X	X
Pediastrum boryanum var. *boryanum* Meyen	X					X	X	X	X	X	X	X	X			X	X	X
P. duplex var. *dup*lex Meyen								X										
P. duplex Meyen var. *rugulosum* Raciborski				X			X	X			X							X
Polyedriopsis bitridens [(a)] (Beck-Mannagetta) Kovacic						X												
Quadricoccus laevis [(a)] Fott								X										
Scenedesmus acuminatus (Lagerheim) Chodat				X		X	X	X		X	X	X	X	X	X	X	X	X
S. linearis Komárek								X										
S. longispina Chodat				X		X			X	X	X	X	X	X	X	X	X	X
S. magnus [(a)] Meyen	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S. obtusus Meyen								X	X									X
S. opoliensis Richter			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
S. semipulcher [(a)] Hortobagyi								X	X	X	X							
Spirogyra sp. Link	X								X	X	X	X						
Tetraedron caudatum (Corda) Hansirg						X			X		X							
T. minimum Hansirg		X		X		X	X	X	X	X	X	X	X	X	X			X
Treubaria schmidlei (Schröder) Fott & Kovacic							X	X	X	X								X
EUGLENOPHYTA																		
Colacium vesiculosum Ehrenberg								X									X	X
Euglena ehrenbergii Klebs							X	X	X	X		X		X				
Lepocinclis salina Fritsch				X	X	X	X			X			X	X				
L. texta (Dujardin) Lemmermann					X			X	X								X	
Phacus brevicaudatus (Klebs) Lemmermann														X				
P. tortus Skvortzow							X	X	X		X			X				
Strombomonas acuminata (Schmarda) Deflandes												X		X				

Table 2. (Continuation)

Trachelomonas verrucosa Strokes							X	X			X							
XANTHOPHYTA																		
Goniochloris contorta (Bourrelly) Ettl											X	X						X
G. spinosa [(a)] Pascher									X	X	X	X	X				X	X
Pseudostaurastrum enorme (Ralfs) Chodat				X				X	X									X
Tribonema regulare Pascher									X			X						
CHRYSOPHYTA																		
Mallomonas elongata Reverdin		X	X															
M. caudata (Ivanov) Willi & Krieger		X	X															
BACILLARIOPHYTA																		
Achnanthes inflata Kützing															X			
Amphiprora alata Kützing									X	X	X	X		X	X	X	X	X
Cyclotella meneghiniana Kützing	X	X	X	X	X		X	X	X	X	X			X	X	X		X
Cymbella affinis Kützing								X			X					X	X	X
Chaetoceros muelleri aff. Lemmermann								X	X									
Epithemia adnata (Kützing) Brébisson							X		X									
Frustulia rhomboides (Ehrenberg) de Toni		X		X			X	X	X		X	X	X	X	X	X		X
Gomphonema gracile Ehrenberg							X	X	X	X	X	X		X	X	X		X
Gyrosigma acuminatus (Kützing)		X		X		X	X	X	X	X	X	X	X			X		
Aulacoseira granulata (Ehrenberg) Simonsen	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X
Navicula viridula (Kützing) Ehrenberg	X	X					X		X	X	X	X						
Nitzschia hungarica Grunow							X	X	X	X	X	X	X	X		X		X
N. sigma (Kützing) W. Smith							X	X	X	X	X	X	X		X	X	X	
Pinnularia acrosphaeria Brébisson							X		X	X	X	X	X	X	X	X	X	X
Surirella capronii Brébisson		X					X	X			X	X						
S. ovalis Brébisson																		X
Synedra acus Kützing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DINOPHYTA																		
Peridiniun sp. Ehrenberg	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X
Total taxa in sample	15	21	15	23	16	19	38	40	40	32	43	37	24	33	25	31	27	36

[(a)] New records for Argentina.

New records for Argentina include the genera *Keratococcus* Pascher (Chlorophyta) and *Interfilum* Chodat & Topali (Chlorophyta), specifically *K. raphidioides* (Hansg) Pascher and *I. paradoxum* Chodat & Topali, and the Chlorophycean species *Polyedropsis bitridens*, *Acanthosphaera zachariasii* Lemmermann, *Echinosphaeridium quadrisetum* Behre, *Quadricoccus laevis* Fott, *Scenedesmus magnus* Meyen, *S. semipulcher* Hortobagyi and the Xanthophyta *Goniochloris spinosa* Pascher.

Fazio and O'Farrell (2005) found that biodiversity diminished with increasing conductivity in Los Coipos Lake, their results are contradictory with ours. However the conductivities they recorded reached up to 23000 µS/cm, tenfold the value recorded for the present study. It is our opinion that it is advisable to continue with this implemented plan to maintain Lake Planetario free of further Cyanophyta blooms, by pumping water to generate turbulence when the risk of Cyanophyta blooms is higher. Also, monitoring tasks should be continued in this and other neighbouring recreational urban lakes.

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