

Planktonic Cyanophyceae from northeastern Argentina

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ABSTRACT

This paper presents the results of a floristic survey of the planktonic freshwater Cyanophyceae from northeastern Argentina (warm region). Sixty-one taxa were recorded including species and varieties. The following are new records for Argentina: Aphanothece longior, Chroococcus turicensis, Myxosarcina chroococcoides, Phormidium articulatum, Ph. chalybeum var. insularis, Ph. willei, Jaaginema kuetzingiana, Calothrix dolichomeres, C. scytonemicola, Hapalosiphon intricatus and Rhabdogloea clathrata. Of the species and varieties found 78 % are widespread, 10 % seem to be recorded only in tropical waters, while the rest were mentioned for various Indian and European locations. Some of the abiotic characteristics of the lakes are given.

KEYWORDS : Cyanophyceae — Plankton — Warm region — Algal flora — South America.

RESUMEN

CYANOPHYCEAE PLANCTÓNICAS DEL NORESTE DE LA ARGENTINA

En este trabajo se presentan los resultados obtenidos del inventario florístico de las Cyanophyceae planctónicas de agua dulce del noreste de Argentina (región cálida). Entre especies y variedades se reconocieron 61 taxones. Entre éstos, los siguientes constituyen nuevas citas para la Argentina: Aphanothece longior, Chroococcus turicensis, Myxosarcina chroococcoides, Phormidium articulatum, Ph. chalybeum var. insularis, Ph. willei, Jaaginema kuetzingiana, Calothrix dolichomeres, C. scytonemicola, Hapalosiphon intricatus and Rhabdogloea clathrata. El 78 % de los taxones hallados presentan amplia distribución geográfica, el 10 % parecen tener distribución pantropical y el resto fueron citados para distintas localidades de India y Europa. Se dan algunas características ambientales de los cuerpos de agua estudiados.

PALABRAS CLAVES : Cyanophyceae — Plankton — Región cálida — Flora algal — America del Sur.

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RÉSUMÉ

CYANOPHYCÉES PLANCTONIQUES DU NORD-EST DE L'ARGENTINE

Dans ce travail sont présentés les résultats sur l'inventaire floristique des Cyanophycées planctoniques d'eau douce du nord-est de l'Argentine (région chaude). Entre espèces et variétés, 61 taxons ont été reconnus. Parmi ceux-ci, les suivants sont nouveaux pour l'Argentine : *Aphanothece longior*, *Chroococcus turicensis*, *Myxosarcina chroococcoides*, *Phormidium articulatum*, *Ph. chalybeum* var. *insularis*, *Ph. willei*, *Jaaginema kuetzingiana*, *Calothrix dolichomeres*, *C. scytonemica*, *Hapalosiphon intricatus* and *Rhabdogloea clathrata*. Parmi les taxons trouvés, 78 % montrent une large distribution géographique, 10 % semblent présenter une distribution pantropicale et le restant a été signalé pour différentes stations de l'Inde et d'Europe. Quelques caractéristiques des milieux aquatiques étudiés sont données.

MOTS CLÉS : Cyanophycées — Plancton — Région chaude — Flore algologique — Amérique du Sud.

INTRODUCTION

This is a contribution to a series of papers (TELL, 1979a, 1979b, 1980a, 1980b, 1981; TELL and COUTÉ, 1979, 1993; COUTÉ and TELL, 1979, ZALOCAR DE DOMITROVIC, 1981, 1982; TELL and ZALOCAR DE DOMITROVIC, 1979, 1992) dealing with the algal flora from Northeastern Argentina (Province of Corrientes, Chaco and Formosa).

This paper presents a detailed study of the Cyanophyceae from different lentic aquatic systems (swamps, ponds, shallow lakes, etc.). All the recorded taxa were found in phytoplankton samples. Sixty-one different taxa have been identified, most of them strictly planktonic and some accidentally free-floating originated from the periphyton. Only a few taxa seem to be tropical, most of them have a worldwide distribution.

Even though several new taxa have been registered in the different groups of algae considered in the floristic studies mentioned above, no new entities were found for the Cyanophyceae. We complete the information of the geographical distribution for the taxa here registered, and in particular we enlarge the meridional limits in South America for the tropical taxa. The following taxa are new records for the region : *Aphanothece longior*, *Chroococcus turicensis*, *Myxosarcina chroococcoides*, *Phormidium articulatum*, *Ph. chalybeum* var. *insularis*, *Ph. willei*, *Jaaginema kuetzingiana*, *Calothrix dolichomeres*, *C. scytonemica*, *Hapalosiphon intricatus* and *Rhabdogloea clathrata*. Two new combinations are proposed.

Cyanophyceae from tropical and subtropical South America are scarcely known. Some papers dealing with this group have been published from Brazil, while almost nothing is known for other countries. Recently, LEITE SANT'ANNA and PAIVA AZEVEDO (1995) published a floristic study on the Oscillatoriaceae from São Paulo. In this paper the

authors also give the literature referring to members of this group in Brazil.

THE STUDY AREA

The study area is located in the subtropical region of Argentina (27° and 30° S; 56° and 59° W). TELL and COUTÉ (1993) present a detailed map of the region. The mean annual temperature is 21 °C. Rainfall varies between 1100 and 1500 mm per year. Most of the samples were collected in the province of Corrientes. This region is characterized by an extensive and complex system of swamps ("esteros"), rich in vegetated shallow lakes and ponds. Most of the lakes reach between 1 to 5 or 6 m of depth. During the sampling period, pH varied between 5 and 8, and was distributed as follows: lake Galarza 5, lake Luna 5.5-6.7, lake Iberá 5-6.4, lake Fernández 6.8, lake Medina 6.6, lake Trin 6.2-6.6, lakes Totoras and La Brava 7-8 (no data are available for lakes Tell, El Chiflón, Cuatro Diablos and El Carafeño).

From the limnological point of view, the best studied lakes of the province of Corrientes are La Brava, Totoras and González (BONETTO *et al.*, 1978a and 1978b). The conductivity of these three lakes shows low values, fluctuating between 10 to 170 $\mu\text{S cm}^{-1}$. Water temperature varied between 10 °C (winter) and 33 °C (summer).

MATERIAL AND METHODS

Surface phytoplankton samples were collected with a standard plankton net of 24 μm mesh during a period of three years, from 1977 to 1980. These were directly fixed in 4 % formaldehyde. In the descriptions we give the dimensions of our material and, in brackets, those given by other authors.

Taxonomical identifications were obtained mainly from GEITLER (1932) and DESIKACHARY (1959). The classification proposed by KOMÁREK and ANAGNOSTIDIS (1986), and ANAGNOSTIDIS and KOMÁREK (1988, 1990) was followed.

RESULTS

ORDER CHROOCOCCALES

FAM. MICROCYSTACEAE

***Aphanocapsa delicatissima* W. and G. S. West.** (pl. I, fig. 1)

Colony with colorless or yellowish homogeneous mucilaginous envelope. Cells 0.8-1.3 μm (0.5-0.8 μm) diam.

Corrientes: La Brava lake, 21/VI/77; Tell, 30/XI/77 and Iberá ponds, 12/II/78. Planktonic, widespread.

***A. elachista* W. and G. S. West var. *elachista*.** (pl. 1, fig. 2)

Cells very loosely packed in an homogeneous mucilaginous envelope, 1.5-2 μm (1.5-2 μm) in diam.

Corrientes: La Brava lake, 21/VI/77; Tell, 30/VII/77 and Galarza ponds, 19/II/78. Planktonic, widespread.

***A. elachista* var. *planctonica* G.M. Smith.** (pl. 1, fig. 3)

Cells rather bigger than the type, 2.5-3 μm (2-3 μm) in diam.

Corrientes: Tell lake, 30/VII/77; Fernández, 14/II/77 and La Brava ponds, 2/VII/77. Planktonic, widespread.

***A. pulchra* (Kütz.) Rabenh.** (pl. 1, fig. 4)

Cells single or in pairs, loosely packed in an homogeneous mucilage, 3-4 μm (3.4-4.5 μm) in diam.

Corrientes: La Brava, 22/II/77 and Iberá ponds, 12/II/78. Planktonic, widespread.

***A. rooseana* de Bary** (pl. 1, fig. 5)

Colony irregularly spherical, sometimes up to 30 μm . Cells 4-6 μm (5-8 μm) in diam.

Corrientes: Iberá, 12/II/78 and Fernández ponds, 14/II/77. Planktonic, widespread.

***Aphanothece longior* Naumann.** (pl. 1, fig. 7)

Cells loosely packed in an homogeneous envelope, 1 μm broad, 5 μm (up to 10.5 μm) long.

Corrientes: Iberá ponds 12/II/78. Planktonic, Europe, NE Argentina.

***A. microscopica* Näg.** (pl. 1, fig. 8)

Cells closely arranged in a common mucilaginous envelope, 4.5 μm (3.3-4.5 μm) broad, 6.5-7 μm (5.5-7.5 μm) long.

Corrientes: Fernández lake, 15/II/77. Planktonic, widespread.

***A. nidulans* Richt.** (pl. I, fig. 9)

In our material the cells are single or arranged in pairs, loosely packed in an homogeneous mucilage, 1 μm (1-1.5 μm) broad, 2-3 μm (up to 3.5 μm) long.

Corrientes: Luna lake, 11/II/77. Planktonic, widespread.

***A. saxicola* Näg.** (pl. 1, fig. 10)

Cells single or arranged in pairs, 1.5 μm (1-2 μm) broad, 3-4 μm (2.8-6 μm) long.

Corrientes: Galarza lake, 19/II/78; La Brava, 2/VII/77 and Iberá ponds, 12/II/78. Planktonic, widespread.

***A. stagnina* (Spreng.) A. Br.** (= *Coccochloris stagnina* Spreng.) (pl. 1, fig. 11)

Colony up to many centimeters in diam. Cells densely or loosely packed in an homogeneous mucilage, 2.5-3 μm (3-7 μm) broad, 5-6 μm (5-11 μm) long.

Corrientes: Galarza lake, 19/II/78; Luna, 11/II/77 and Iberá ponds, 12/II/78. Planktonic, widespread.

***Coelosphaerium kuetzingianum* Näg.** (pl. I, fig. 12)

Cells contiguously or loosely arranged, 2.5-4 μm (2.2-5 μm) in diam.

Corrientes: Totoras lake, 4/III/77. Planktonic, widespread.

***Chroococcus cumulatus* Bachm.** (pl. II, fig. 1)

Cells arranged in pairs, loosely packed in a common mucilaginous envelope, 6 μm (6-7 μm) in diam.

Corrientes: Luna lake, 11/II/77. Planktonic, Europe, Argentina.

***Ch. dispersus* (Keissl.) Lemm.** (= *Chroococcus minor* var. *dispersus* Keissl.) (pl. II, fig. 2)

Cells usually 2-4 arranged in a common mucilaginous colony, individual sheaths frequently gelatinised, not lamellated, colorless. Cells 3.5-4.5 μm (3-4 μm) in diam.

Corrientes: Galarza lake, 19/II/78. Planktonic, widespread.

***Ch. limneticus* Lemm.** (pl. 11, fig. 3)

Cells organized in groups of 4-32, mainly in a tabular gelatinous stratum, 6 μm (6-12 μm) in diam. Sheath distinct or diffluent, unlamellated, colorless.

Corrientes: La Brava, 31/VII/77 and Galarza ponds, 19/II/78. Planktonic, widespread.

***Ch. turgidus* (Kütz.) Näg.** (= *Protococcus turgidus* Kütz.) (pl. II, fig. 4)

Cells spherical to ellipsoidal, solitary or packed in groups of mainly 2-4, 10-12 μm (8-32 μm) in diam.

Corrientes: La Brava lake, 31/VII/77; Galarza, 19/II/78 and El Carrafeño ponds, 14/VII/78. Planktonic, widespread.

***Ch. turicensis* (Näg.) Hansg.** (= *Chroococcus rufescens* var. *turicensis* Näg.) (pl. II, fig. 5)

Cells assemblages of small groups, 13-15 μm (13-15 μm) in diam.

Corrientes: Luna lake, 11/II/77. Planktonic, widespread.

***Ch. varius* A. Br.** (pl. II, fig. 6)

Small colonies, with 2-8 globular cells, single or 2-4 together. Cells 4.5 μm (2-4 μm) in diam. Sheath indistinctly lamellated.

Corrientes: La Brava lake, 2/VII/77. Planktonic, widespread.

***Gomphosphaeria aponina* Kütz.** (pl. I, fig. 13)

Spherical or ellipsoidal colonies, up to 30-40 μm in diam. Cells spherical to ovoid, 4-13 μm (4-14 μm) in diam.

Corrientes: Totoras lake, 4/III/77. Planktonic, widespread.

***Merismopedia glauca* (Ehr.) Näg.** (= *Gonium glaucum* Ehr.) (pl. 11, fig. 7)

Small colonies, composed by 16-64 cells, rarely more. Cells densely arranged, 4-5 μm (3-6 μm) in diam.

Corrientes: Totoras lake, 12/II/78. Planktonic, widespread.

***M. tenuissima* Lemm.** (pl. II, fig. 8)

Cells closely packed in colonies of 16-100 cells, 1-1.2 μm (1.3-2 μm) in diam.

Corrientes: La Brava lake, 2/VII/77. Planktonic, widespread.

***Microcystis aeruginosa* Kütz.** (pl. II, fig. 9)

Compact or clathrate colonies. Cells often with gas vacuoles, 3-7 μm (3-7 μm) in diam.

Corrientes: La Brava lake, 9/III/77. Planktonic, cosmopolite.

***M. flos-aquae* (Wittr.) Kirchner in Engler and Prantl** (= *Polycistis flos-aquae* Wittr. in Wittrock and Nordstedt) (pl. II, fig. 10)

Colonies not clathrate. Cells spherical, frequently with gas-vacuoles, 5-6 μm (3-7 μm) in diam.

Corrientes: Galarza, 19/II/78 and Iberá ponds, 12/II/78. Planktonic, cosmopolite.

***M. pulvurea* (Wood) Forti in De Toni** (= *Pleurococcus pulvereus* Wood) (pl. II, fig. 11)

Colonies usually small, often grouped together. Cells 2 μm (2-3 μm) in diam.

Corrientes: Luna lake, 12/II/77. Widespread.

***Myxobaktron acicularis* (Lemm.) nov. comb.** (Bas.: *Ankistrodesmus falcatus* (Corda) Ralfs sec. Drouet and Daily, p. 149, 1956). Sin.: *Dactylococcopsis acicularis* Lemm., sec. Geitler, p. 283, 1932) (pl. I, fig. 14)

Cells spindle-shaped, 1.5-2 μm (2-2.5 μm) broad, 18-30 μm (27-80 μm) long. We include this species in the genus *Myxobaktron* because of the solitary and spindle-like cells (KOMÁREK and ANAGNOSTIDIS, 1986).

Corrientes: La Brava lake, 2/VII/77. Planktonic, widespread.

***Rhabdogloea clathrata* (W. and G. S. West.) Kom.** (pl. I, fig. 6)

Colony often irregular and clathrate. Cells 0.8-1 μm (0.6-1.2 μm) broad, 2-2.5 μm (2.5-6 μm) long.

Corrientes: La Brava lake, 21/VI/77. Planktonic, widespread.

FAM. XENOCOCCACEAE

***Myxosarcina chroococcoides* Geitler** (pl. III, fig. 1)

Spherical or irregular colonies, 12-22 μm in diam. Cells 5-9 μm (9-10 μm) in diam.

Corrientes: La Brava lake, 21/VI/77. The species is usually attached to submerged aquatic plants. Very rare in our material, micoplankton. Central Europe, Argentina.

ORDER OSCILLATORIALES

FAM. OSCILLATORIACEAE

***Lyngbya gracilis* Rabenh. ex Gomont** (pl. III, fig. 3)

Trichome constricted at the cross-walls. Cells 5.5 μm (5-8 μm) diam., 1-1/3 times longer than broad.

Corrientes: Iberá lake, 12/II/78. Planktonic, widespread.

***Oscillatoria annae* van Goor** (pl. III, fig. 10)

Trichomes rather constricted at the septa. Cells 7 μm (7.5-8 μm) diam., 2.5-3 μm (2.5-4 μm) long.

Corrientes: El Macá lake, 2/VIII/77. Planktonic widespread.

***O. limosa* Ag. ex Gomont** (pl. III, fig. 19)

Trichomes not constricted at the septa or gently constricted, 18-20 μm (11-22 μm) in diam. Cells very short, 2-5 μm long. End cell flatly rounded.

Corrientes: La Brava lake, 21/VI/77. Planktonic, widespread.

***O. sancta* (Kütz.) Gomont** (= *Oscillaria sancta* Kütz.) (pl. III, figs. 21-22)

Trichomes evidently constricted at the cross-wall, 10-13 μm (10-20 μm) in diam. Cells 1/2-1/6 times shorter than long.

Corrientes: La Brava lake, 21/VI/77. Planktonic, widespread.

***Porphyrosipon lutens* (Gomont) Anag. and Komar.** (= *Lyngbya lutea* (Ag.) Gomont) (pl. III, fig. 6)

Trichomes not constricted at the cross-wall. Cells square to 1/3 times as long as broad, 2.5 μm (1.5-4 μm) diam., 5 μm (1.5-5 μm) long.

Corrientes: Galarza lake, 19/II/78. Planktonic, widespread.

FAM. PSEUDANABAENACEAE

***Jaaginema kuetzingianum* (Gomont) Anag. and Kom.** (= *Oscillatoria kuetzingiana* (Nag.) ex Gomont) (pl. III, fig. 16)

Trichomes very pale, 1.5 μm (1.8-2 μm) diam. Cells about as long as broad.

Corrientes: Tell, 30/II/77 and Totoras ponds, 4/II/77. Planktonic, widespread.

***Leptolyngbya lagerheimii* (Gomont) Anag. and Kom.** (= *Lyngbya lagerheimii* Gomont) (pl. III, fig. 4)

Filaments irregularly coiled or straight. Cells 2 μm (2 μm) diam., 2 μm (1-3 μm) long.

Corrientes: Medina lake, 15/II/78. Planktonic, widespread.

***L. ochracea* (Thur. ex Gomont) Anag. and Kom.** (= *Lyngbya ochracea* Thur. ex Gomont) (pl. III, fig. 7)

Trichomes distinctly constricted at the cross-wall, septa granulated. Cells almost quadrangular, 0.9 μm (0.9 μm) diam., 0.6-1 μm (0.6-0.8 μm) long.

Corrientes: Iberá lake. 12/II/78. Planktonic, widespread.

***L. perelegans* (Lemm.) (= *Lyngbya perelegans* (Lemm.) Anag. and Kom.)** (pl. III, fig. 8)

Trichomes not constricted, cross-wall with a single granule on either side. Cells 1.5-2.3 μm (1.5-2 μm) diam., 2-6 μm (2-8 μm) long.

Corrientes: Iberá lake, 12/II/78. Planktonic, widespread.

***Planktolyngbya contorta* (Lemm.) Anag. and Kom.** (= *Lyngbya contorta* Lemm.) (pl. III, fig. 2)

Filaments in a regular and loose spiral. Cells 1-1.5 μm (1-2 μm) diam., 3-4 μm (3-5 μm) long.

Corrientes: Iberá lake, 12/II/78. Planktonic, widespread.

***P. subtilis* (W. West) Anag. and Kom.** (= *Lyngbya subtilis* W. West; *L. limnetica* Lemm.) (pl. III, fig. 5)

Filaments straight or rather coiled. Cells 1 μm (1-1.5 μm) diam., 1.5-4 μm (1-3 μm) long.

Corrientes: La Brava, 22/II/77 and Iberá lake, 12/II/77. Planktonic, widespread.

***Pseudanabaena catenata* Lauterb.** (pl. IV, fig. 4)

Cells cylindrical, 1.5 μm (2 μm) diam. Cells 2.5-5.5 μm (3 μm) long.

Corrientes: Iberá Sur lake, 12/II/78. Planktonic, widespread.

***P. limnetica* (Lemm.) Kom.** (= *O. limnetica* Lemm.) (pl. III, fig. 18)

Trichomes constricted at the septa, 1.5 μm (1.5 μm). Cells 2 1/2-6 times as longer as broad.

Corrientes: La Brava lake, 21/VI/77. Planktonic, widespread.

***P. mucicola* Hüb.-Pest. and Naum.** (pl. IV, fig. 5)

Filaments very short, 1.5-2 μm (1.5-2 μm). Cells almost as long as broad. Always epiphytic on planktonic algae.

Corrientes: in many small ponds, epiphytic on *Microcystis aeruginosa*. Widespread.

FAM. PHORMIDIACEAE

***Phormidium amphibium* (Ag. ex Gomont) Anag. and Kom.** (= *Oscillatoria amphibia* Ag. ex Gomont) (pl. III, fig. 9)

Trichomes straight or coiled, not constricted. Cells with two granules at the cross-wall, 2 μm (2-3.5 μm) diam., 2-3 times longer than broad.

Corrientes: El Macá lake, 2/VIII/77. Planktonic, widespread.

***Ph. articulatum* (Gard.) Anag. and Kom.** (= *Oscillatoria articulata* Gard.) (pl. III, fig. 11)

Trichomes not constricted at the cross-wall. Cells 1/2-1/3 shorter than broad, 3 μm (2.8-3.2 μm) diam.

Corrientes: Cuatro Diablos lake, 8/VIII/79. Planktonic, Puerto Rico, Argentina.

Ph. chalybeum* (Mert. ex Gomont) Anag. and Kom. var. *chalybeum (= *Oscillatoria chalybea* Mertens ex Gomont var. *chalybea*) (pl. III, fig. 13)

Trichomes slightly constricted at the cross-wall, 9-10 μm (8-13 μm) in diam. Cells 5-6 μm (5-7 μm) long. End cell obtuse.

Corrientes: Cuatro Diablos lake, 8/VIII/79. Planktonic, widespread.

***Ph. chalybeum* var. *insulare* (Gard.) nov. comb.** (*Bas.*: *Oscillatoria chalybea* var. *insularis* Gard., Mem N.Y. bot. Gdn. 7: 36, pl. 7, f. 6,8. 1927) (pl. III, fig. 14)

Trichomes not constricted at the cross-wall, 6-7 μm (6.4-7.2 μm) diam. Cells quadrangular or rather shorter than broad. Ends of the trichomes bent and sickle shaped.

Corrientes: Cuatro Diablos lake, 8/VIII/79. Planktonic, probably pantropical.

***Ph. hamelii* (Frémy) Anag. and Kom.** (= *Oscillatoria hamelii* Frémy) (pl. III, fig. 15)

Trichomes fairly constricted at the septa, 5.5-6 μm (4.8-5 μm) in diam. Cells 7-7.5 (7.2-8 μm) long.

Corrientes: El Chiflón lake, 14/III/78. Planktonic in warm regions. Africa, NE Argentina.

***Ph. numidicum* (Gomont) Anag. and Kom.** (= *Oscillatoria numidica* Gomont) (pl. III, fig. 20)

Trichomes constricted at the cross-wall, 2 μm (2.5-4 μm) in diam. Cells 2.5-3 μm (2-8 μm) long.

Formosa: small ponds near the route, 12/VIII/80. Planktonic, probably pantropical.

***Ph. simplicissimum* (Gomont) Anag. and Kom.** (= *Oscillatoria simplicissima* Gomont) (pl. III, fig. 23)

Trichomes not constricted at the cross-wall, 8 μm (8-9 μm) in diam. Cells almost 1/4-1/2 times as long as broad, 4 μm (2-4 μm) long. Apical cell rounded, with a thickened outer wall.

Corrientes: Iberá Sur lake, 12/II/78. Planktonic, widespread.

***Ph. splendidum* (Grev. ex Gomont) Anag. and Kom.** (= *Oscillatoria splendida* Grev.) (pl. IV, fig. 1)

Trichomes not constricted at the cross-wall, 2-2.5 μm (2-3 μm) in diam. Cells 2-4 times longer than broad, 6-8 μm (3-9 μm) long.

Corrientes: La Brava, 21/VI/77 and El Chiflón ponds, 14/III/78. Planktonic, widespread.

***Ph. willi* (Gard.) Anag. and Kom.** (= *Oscillatoria willi* Gard.) (pl. IV, fig. 3)

Trichomes not constricted at the septa, 3 μm (2.4-2.6 μm) in diam. Cells up to twice as long as broad. 3.2-3.5 μm long.

Corrientes: Tell lake, 30/VII/77. Planktonic, Africa, India, Puerto Rico, NE Argentina.

***Spirulina princeps* W. and G. S. West** (pl. III, fig. 12)

Trichomes 4.5 μm (4.5-5 μm) diam. Spirals 11-12 μm broad and 9.5-11 μm distant.

Corrientes: El Chiflón lake, 30/IV/78.

Sri Lanka, Africa, Brasil, Argentina. Probably pantropical.

***Trichodesmium iwanoffianum* Nyg.** (pl. III, fig. 17)

Trichomes very constricted at the cross-wall. Cells short-barrel shaped, 5 μm (5-9 μm) in diam., 3-4.5 μm (2-5 μm) long. End cells rounded.

Corrientes: El Chiflón lake, 14/III/78. Planktonic, widespread.

***Trichodesmium lacustre* Klebh.** (pl. IV, fig. 2)

Trichomes constricted at the septa, 6-6.8 μm (5-7 μm) in diam. Cells 4.5-6 μm (3-7 μm) long.

Corrientes: Iberá Sur lake, 12/II/78. Planktonic, widespread.

ORDER NOSTOCALES

FAM. NOSTOCACEAE

***Anabaena planctonica* Brunth.** (pl. IV, fig. 6)

Cells 9-15 μm (9-15 μm) diam., almost rather shorter than broad, up to 10 μm . Heterocysts 10 μm (10-14 μm) in diam. Spores ellipsoidal, 15 μm (10-20 μm) in diam., 28 μm (15-30 μm) long.

Corrientes: La Brava lake, 21/VI/77. Planktonic, Europe, U.S.A., NE Argentina.

***A. spiroides* Kleb.** (pl. IV, fig. 7)

Trichomes regularly spirally coiled. Cells spherical, 7-8 μm (6.5-8 μm) in diam. Heterocysts spherical, 7 μm (7 μm) in diam. Spores elongate, 14 μm (14 μm) in diam., 15-20 μm long.

Corrientes: La Brava lake. 21/V/77. Planktonic, widespread.

***Raphidiopsis mediterranea* Skuja** (pl. V, fig. 4)

Trichomes attenuated at both ends, 2-3 μm (1.9-3 μm) broad, 60-120 μm (40-180 μm) long. Cells 2-5 times longer than broad. Spores ellipsoid, single or in pairs.

Corrientes: Totoras lake, 4/III/77. Planktonic, widespread.

FAM. RIVULARIACEAE

***Calothrix clavata* G. S. West** (pl. IV, fig. 8)

Filaments up to 120 μm (100 μm) long; at the base 7-7.5 μm (7 μm) wide. Trichomes rather constricted at the base, 7 μm (5-5.5 μm) broad, 3.5-4 μm long, tapering to a fine hair of 70-80 μm long.

Corrientes: Fernández, 14/II/77 and Iberá Sur ponds, 12/II/78. Epiphytic, on free-floating vegetal detritus. Probably pantropical.

***C. dolichomeres* Skuja** (pl. IV, figs. 9, 10)

Filaments up to 1 mm, aggregated in caespitose colonies. Cells at the base 7-8 μm (7-8 μm), 1-1/2 times longer than broad, clearly constricted at the septae; cells at the hair several times longer than broad. Heterocyst 1-3, basal, rounded cylindrical, barrel-shape or hemispherical, 6.5-12 μm (8-9.5 μm) broad, 15-17 μm (7-19 μm) long.

Corrientes: Trim lake, 16/II/78. Epiphytic, accidentally free-floating. Widespread.

***C. scytonemicola* Tilden** (pl. V, fig. 1)

Filaments single or in small groups. Trichomes at the base 6-6.5 μm (6.3-7 μm) broad.

Corrientes: Totoras lake, 4/III/77. Epiphytic on submerged aquatic plants, casually free-floating. U.S.A., Europe, India, Argentina.

***C. stagnalis* Gomont** (pl. V, figs. 2, 3)

Filaments up to 1 mm long, gradually attenuated from the base to the apex. Cells at the base 7-8 μm (6-9 μm) broad, approximately as long as broad. Spherical heterocyst, 8 μm in diam. Spores 8 μm (10-11 μm) broad, 18-20 μm (26-40 μm) long.

Corrientes: Fernández lake, 14/II/77. Epiphytic, casually free-floating. France, U.S.A., Argentina.

ORDER STIGNOMETALES

FAM. MASTIGOCLADACEAE

***Hapalosiphon intricatus* W. and G. S. West** (pl. V, figs. 5, 6)

Thallus sparsely branched. Cells 6.5-7 μm (4-7 μm) broad, 1-3 times longer than broad.

Corrientes: Totoras lake, 4/III/77. Epiphytic, accidentally free-floating. Widespread.

***H. welwitschii* W. and G. S. West** (pl. V, figs. 7, 8)

Cells 4.5 μm (5.5-7.5 μm) broad, 1/2-3 times longer than broad. Lateral branches short, as broad as the main filament or even narrower. Our specimens show very few ramifications.

Corrientes: Totoras lake, 4/III/77. Epiphytic, casually free-floating. India, Africa, Argentina.

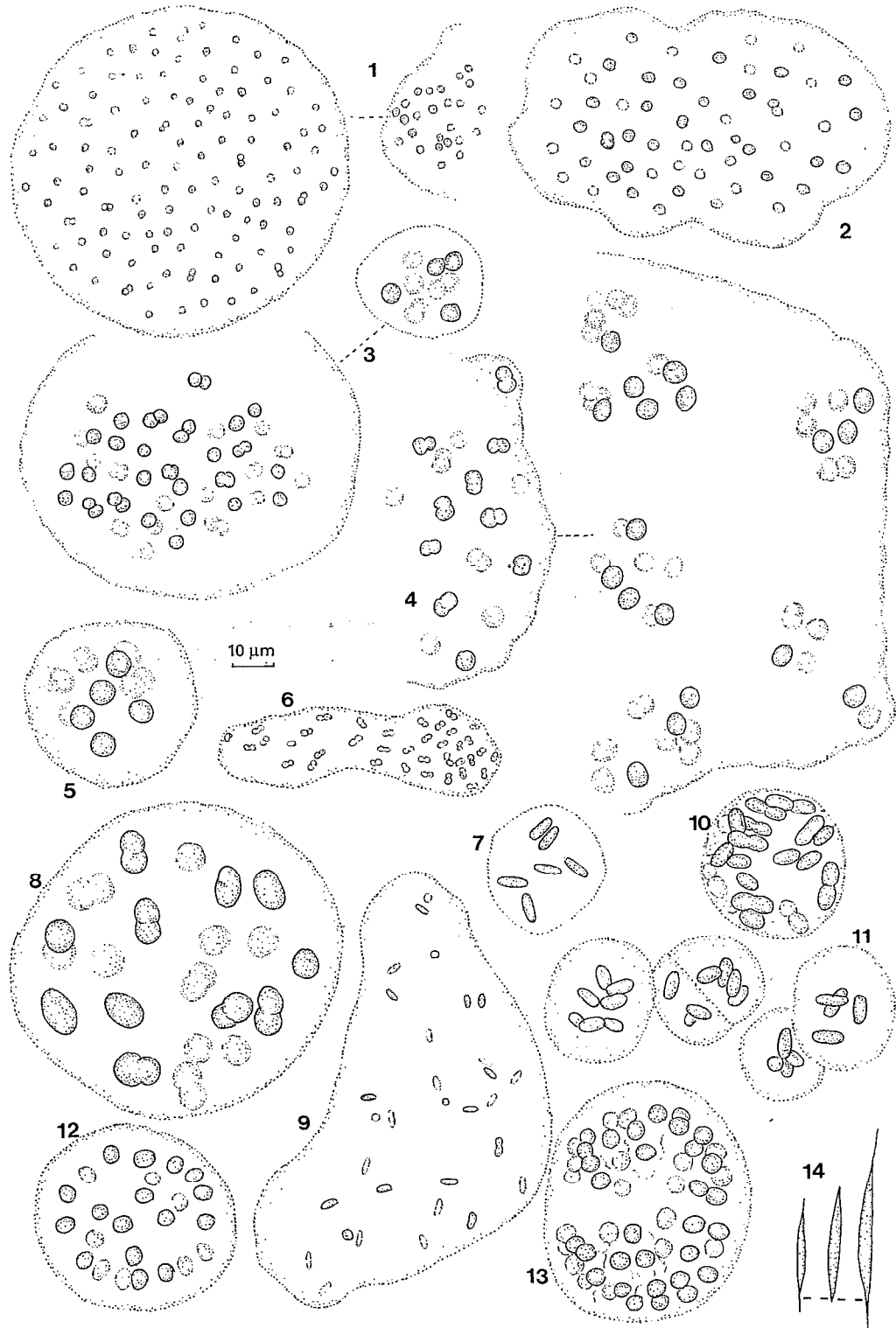


PLATE I

1. *Aphanocapsa delicatissima*; 2. *A. elachista* var. *elachista*; 3. *A. elachista* var. *planctonica*; 4. *A. pulchra*; 5. *A. roseana*; 6. *Rhabdogloea clathrata*; 7. *A. longior*; 8. *A. microscopica*; 9. *A. nidulans*; 10. *A. saxicola*; 11. *A. stagnina*; 12. *Coelosphaerium kuetzingianum*; 13. *Gomphosphaeria aponina*; 14. *Rhabdogloea acicularis*.

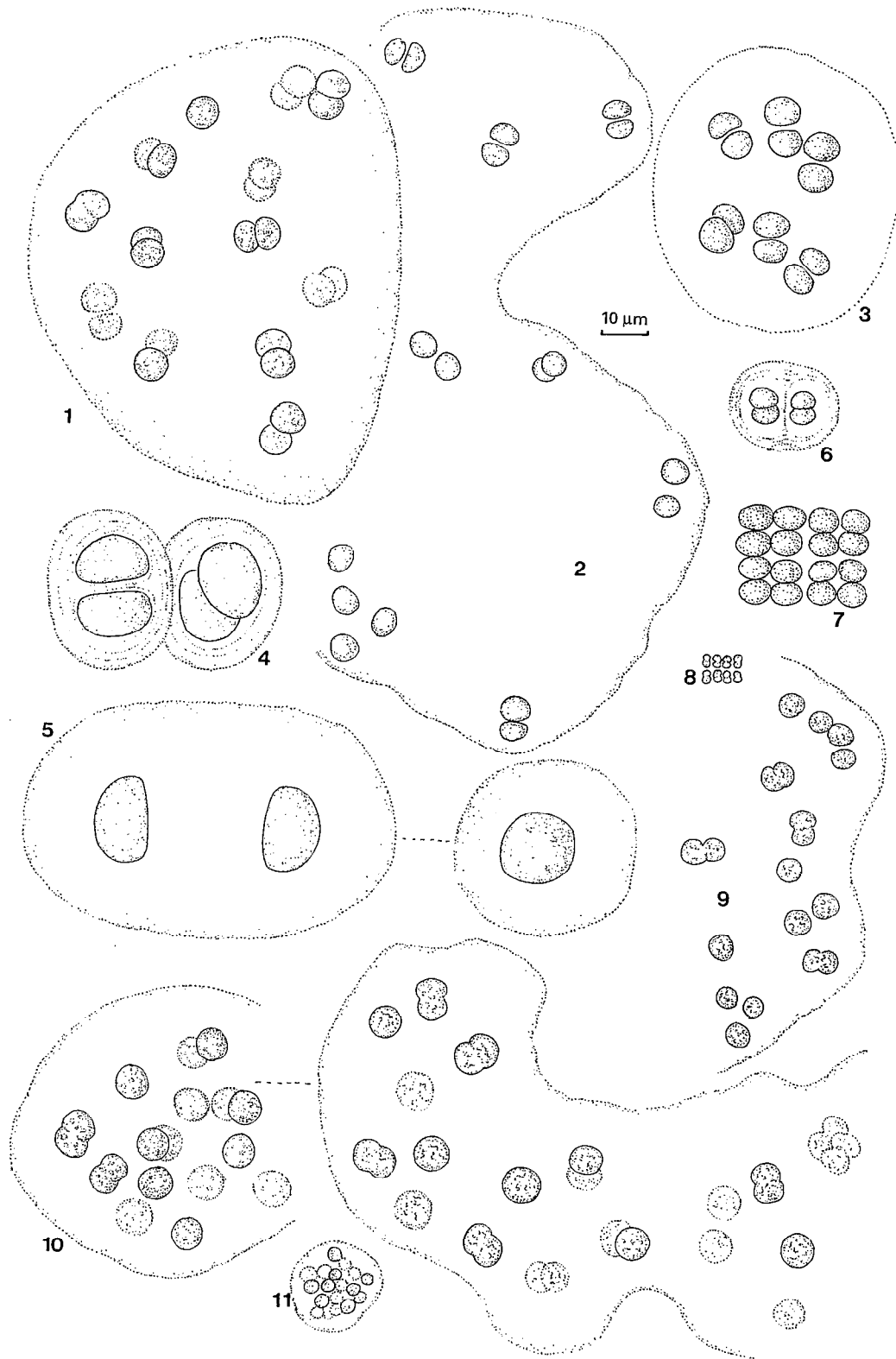


PLATE II

1. *Chroococcus cumulatus*; 2. *Ch. dispersus*; 3. *Ch. limneticus*; 4. *Ch. turgidus*; 5. *Ch. turicensis*; 6. *Ch. varius*; 7. *Merismopedia glauca*; 8. *M. tenuissima*; 9. *Microcystis aeruginosa*; 10. *M. flos-aquae*; 11. *M. pulvurea*.

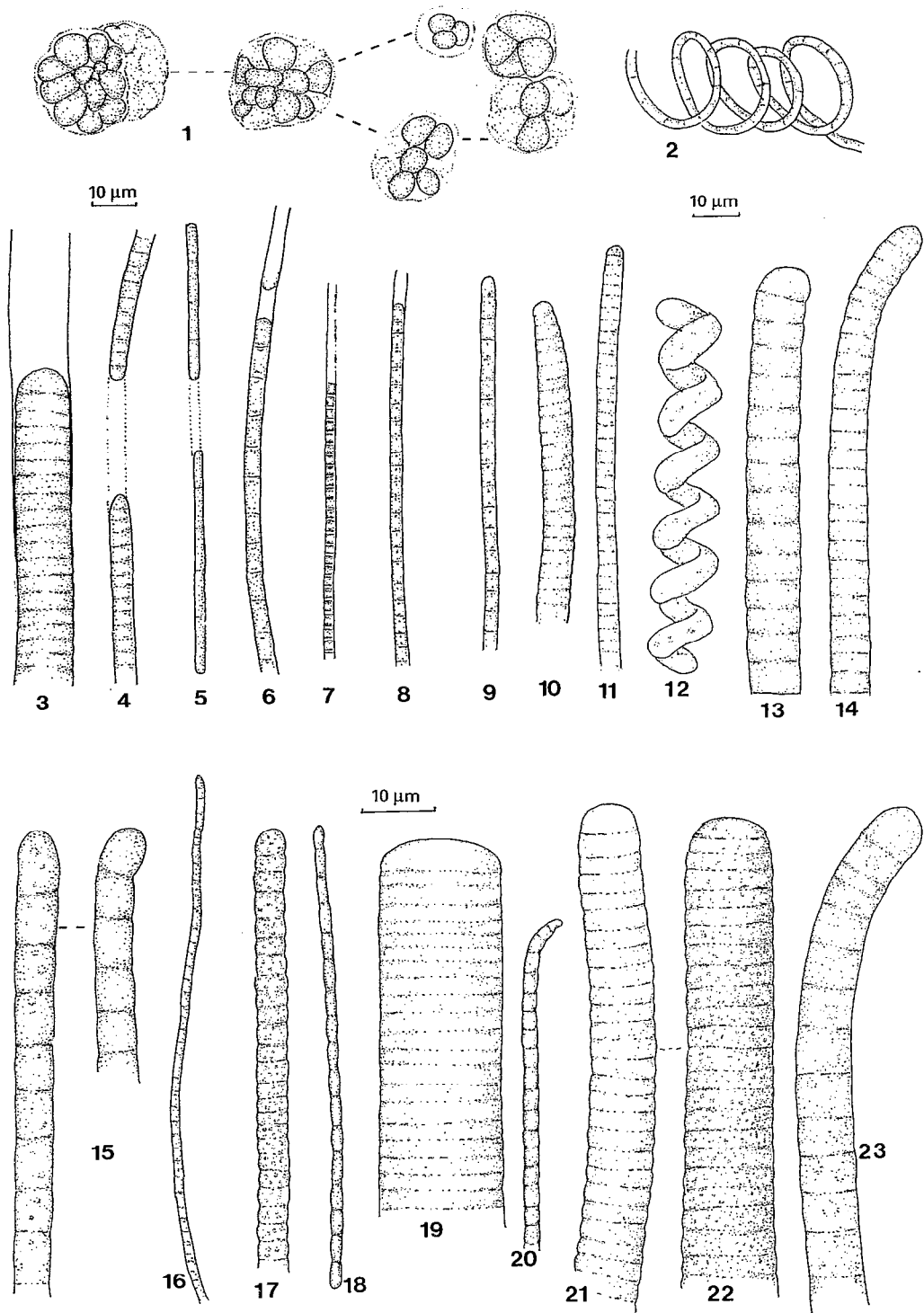


PLATE III

1. *Myzosarcina chroococcoides*; 2. *Planktolyngbya contorta*; 3. *Lyngbya gracilis*; 4. *Leptolyngbya lagerheimii*; 5. *Planktolyngbya subtilis*; 6. *Porphyrosiphon lutens*; 7. *Leptolyngbya ochraceae*; 8. *L. perelegans*; 9. *Phormidium amphibium*; 10. *Oscillatoria annae*; 11. *Phormidium articulatum*; 12. *Spirulina princeps*; 13. *Phormidium chalybeum*; 14. *Ph. chalybeum* var. *insulare*; 15. *Ph. hamelii*; 16. *Jaaginema kuetzingianum*; 17. *Trichodesmium iwanoffianum*; 18. *Pseudonabaena limnetica*; 19. *Oscillatoria limosa*; 20. *Phormidium numidicum*; 21-22. *Oscillatoria sancta*; 23. *Phormidium simplicissimum*.

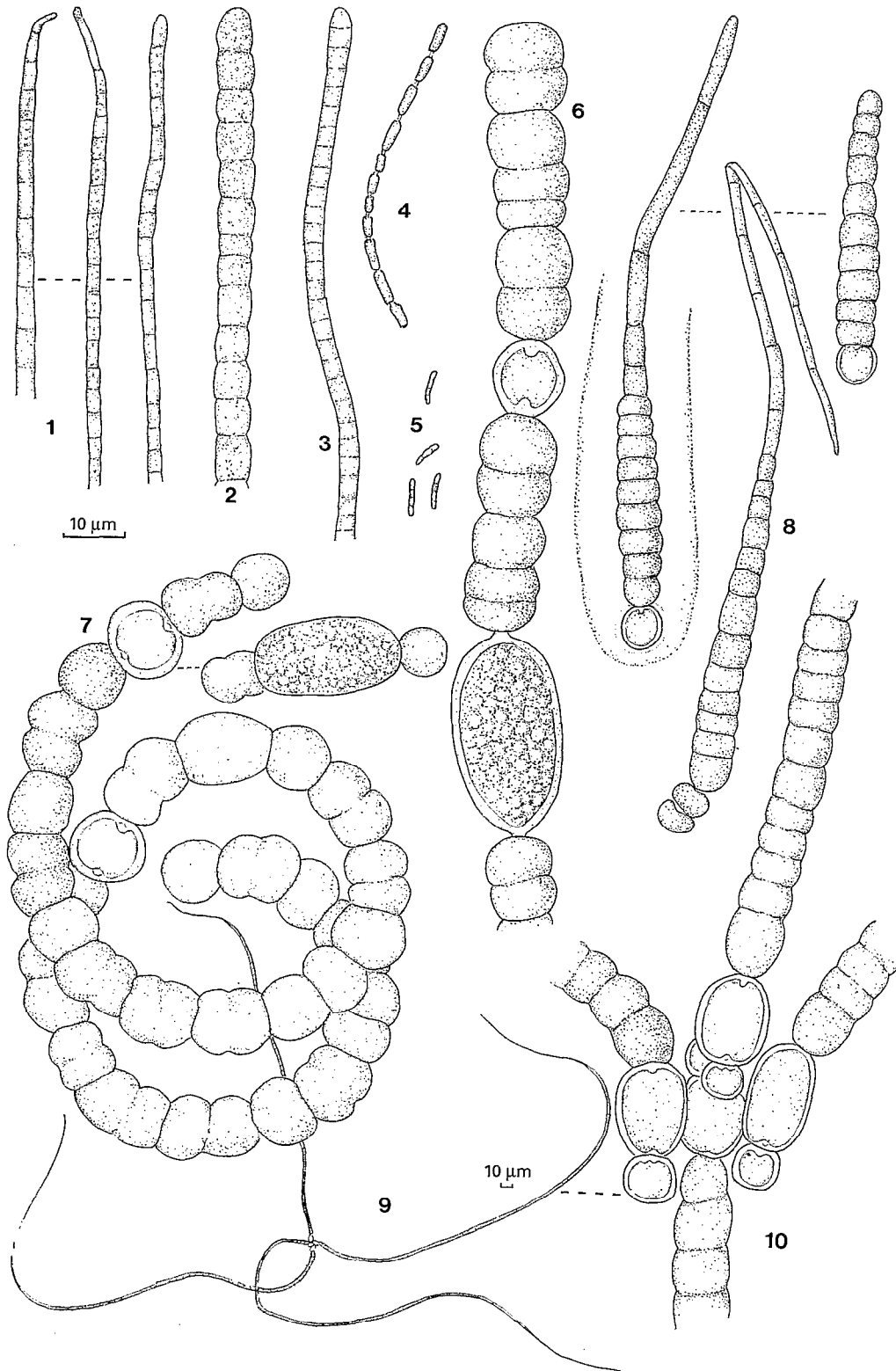


PLATE IV

1. *Phormidium splendidum*; 2. *Trichodesmium lacustre*; 3. *Phormidium williei*; 4. *Pseudanabaena calenata*; 5. *P. mucicola*; 6. *Anabaena planctonica*; 7. *A. spiroides*; 8. *Calothrix clavata*; 9, 10. *C. dolichomeres*.

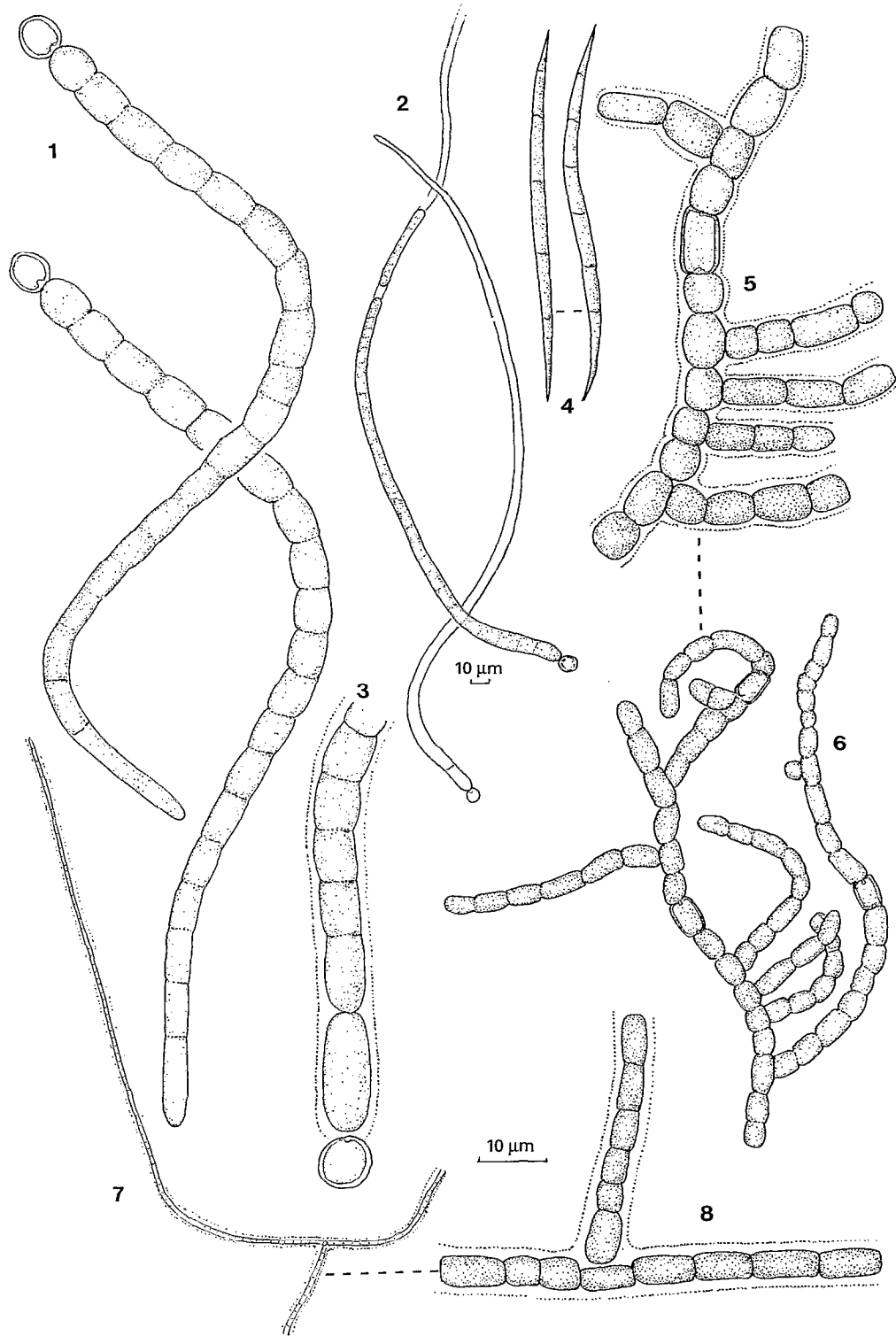


PLATE V

1. *Calothrix scytonemicola*; 2, 3. *C. stagnalis*; 4. *Raphidiopsis mediterranea*; 5, 6. *Hapalosiphon intricatus*; 7, 8. *H. welwitschii*.

CONCLUSIONS

The planktonic Cyanophyceae from Northeastern Argentina comprise 61 taxa. These are mainly distributed between the Microcystaceae (25 taxa) and Phormidiaceae (12 taxa) families. The families Pseudanabaenaceae (9 taxa), Oscillatoriaceae (5 taxa), Rivularaceae (4 taxa), Nostocaceae (3 taxa), Mastigocladaceae (2 taxa) and Xenococcaceae (1 taxa) complete, with a minor contribution, this flora.

Most of the species and varieties found (78%) are widespread, 10% seem to be recorded only in tropi-

cal waters, while the rest were mentioned for various Indian and European locations.

Most of the recorded entities are strictly planktonic and some accidentally free-floating originated from the periphyton. Eleven records are new for Argentina.

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REFERENCES

- ANAGNOSTIDIS (K.) and KOMAREK (J.), 1988. — Modern approach to the classification system of cyanophytes. 3-Oscillatoriales. *Algol. St.* 50-53 : 327-472.
- ANAGNOSTIDIS (K.) and KOMAREK (J.), 1990. — Modern approach to the classification system of cyanophytes. 5-Stigonematales. *Algol. St.* 59 : 1-73.
- BONETTO (A.), CORRALES (M.), VARELA (M.), RIVERO (M.), BONETTO (C.), VALLEJOS (R.) and ZALOCAR (Y.), 1978a. — Estudios limnológicos en la cuenca del Riachuelo II. Lagunas Totoras y González. *Ecosur* 5 (9) : 17-55.
- BONETTO (A.), NEIFF (J.), POI DE NEIFF (A.), VARELA (M.), CORRALES (M.) and ZALOCAR (Y.), 1978b. — Estudios limnológicos en la cuenca del Riachuelo III. Laguna La Brava. *Ecosur* 5.
- COUTÉ (A.) and TELL (G.), 1979. — Ultrastructure de la paroi de quatre espèces de *Pediastrum* Meyen (Chlorococcales, Hydrodictyaceae). *Bull. Mus. natn. Hist. nat.*, Paris, 4^e ser., 1, sec. B, n 2 : 97-105.
- DESIKACHARY (T. V.), 1959. — *Cyanophyta. I.C.A.R. Monographs on Algae*, New Delhi, 686 p.
- DRUET (F.) and DAILY (W. A.), 1956. — Revision of the coccoid Myxophyceae. *Butler Univ. Bot. St.* 12 : 1-128.
- GARDNER (N. L.), 1927. — New Myxophyceae from Porto Rico. *Mem. N. Y. Bot. Gard.*, 7 : 1-144.
- GEITLER (L.), 1932. — «Cyanophyceae». In : RABENHORST, éd. : *Kryptogamen-Flora*, Leipzig 14 : 1-1196.
- KOMÁREK (J.) and ANAGNOSTIDIS (K.), 1986. — Modern approach to the classification system of cyanophytes. 2-Chroococcales. *Algol. St.* 43 : 157-226.
- LEITE SANT'ANNA (C.), and PAIVA AZEVEDO (M. T.), 1995. — Oscillatoriaceae (Cyanophyceae) from São Paulo State, Brazil. *Nova Hedwigia* 60 (1/2) : 19-58.
- LEMMERMANN (E.), 1899. — «Planktonalgen». In : SCHAUSLAND, éd. : *Ergebnisse einer Reise nach dem Pacific*. Abh. naturw. Ver. Bremen, 16 (2) : 313-398.
- TELL (G.), 1979a. — Chlorophyceae d'eau douce rares et nouvelles de la République Argentine. *Rev. Algol. NS.*, 14 (1) : 39-48.
- TELL (G.), 1979b. — *Scenedesmus* nouveaux ou intéressants de la République Argentine. *Rev. Algol. NS.*, 14 (4) : 315-325.
- TELL (G.), 1980a. — Les Euglénophytes chlorophylliennes du nord-est de l'Argentine. *Bull. Mus. natn. d'Hist. nat.*, Paris, 4^e sér., 2, sec. B, n 1 : 21-47.
- TELL (G.), 1980b. — Le genre *Staurastrum* (Algues Chlorophycées, Desmidiées) dans le nord-est de l'Argentine. *Bull. Mus. natn. d'Hist. nat.*, 2, sec. B, n 2 : 145-207.
- TELL (G.), 1981. — Desmidiées (Chlorophyta) de la Provincia de Corrientes (Argentine). I. Los géneros *Netrium*, *Gonatozygon*, *Closterium*, *Docidium*, *Ichthyocercus*, *Actinotaenium*, *Pleurotaenium* y *Triploceras*. *Physis B* (Buenos Aires) 40 (98) : 45-54.
- TELL (G.), and COUTÉ (A.), 1979. — Étude ultrastructurale des variations morphologiques de la paroi chez deux nouvelles variétés de *Cosmarium lagoense* Nordst. *Protistolog.* 15 (4) : 629-634.

- TELL (G.), and COUTÉ (A.), 1993. — Nouvelles observations sur les desmidiacées (Chlorophyta, Zygnematales) d'Argentine au microscope électronique à balayage. *Cryptogamie: algol.* 14 (1) : 43-46.
- TELL (G.) and ZALOCAR (Y.), 1979. — Algas de agua dulce del nordeste argentino y sur del Paraguay. *Bol. Soc. Arg. Bot.* 18 (3-4) : 29-46.
- TELL (G.) and ZALOCAR (Y.), 1992. — Filamentous Desmidiaceae (Chlorophyta) from Northeastern Argentine. *Nova Hedwigia* 55 (3-4) : 457-472.
- ZALOCAR DE DOMITROVIC (Y.), 1981. — Desmidiaceae (Chlorophyta) de la Provincia de Corrientes. II. El género *Micrasterias*. *Physis B* (Buenos Aires) 40 (98) : 55-62.
- ZALOCAR DE DOMITROVIC (Y.), 1982. — Desmidiaceae (Chlorophyta) de la Provincia de Corrientes (Argentina). III. Los géneros *Cosmarium* y *Cosmocladium*. *Physis B* (Buenos Aires) 41 (100) : 25-40.