

## Euglenophyta from a stream of Pampean plain subjected to anthropic effects: A<sup>o</sup> Rodríguez, Buenos Aires, Argentina

VISITACIÓN CONFORTI<sup>1,\*</sup>, ERICA OHIRKO<sup>1</sup> and NORA GÓMEZ<sup>2</sup>

<sup>1</sup> Dpto. Biodiversidad y Biología Experimental, FCEyN, UBA, Ciudad Universitaria, CONICET, Buenos Aires, Argentina

<sup>2</sup> Instituto de Limnología Dr. R. Ringuelet, CONICET, La Plata, Argentina

With 101 figures and 2 tables

**Abstract:** Eighty nine taxa of Euglenophyta, sampled in Rodríguez Stream, Buenos Aires, Argentina, 2 belonging to the genus *Euglena* EHR., 7 to *Lepocinclis* PERTY, 14 to *Phacus* DUJ., 40 to *Strombomonas* DEFL. and 26 to *Trachelomonas* EHR. have been identified. Besides 12 loricate taxa were examined by scanning electron microscopy (SEM). Details of their envelope ultrastructure are illustrated.

**Key words:** Euglenophyta, phytoplankton, Rodríguez Stream, taxonomy, ultrastructure

### Introduction

Rivers and streams are complex ecosystems in which many environmental factors vary on different spatial and temporal scales. Climate, land use, and geomorphology in the watershed can influence physical, chemical and biological characteristics. Normally, the running waters of the Pampean plain are characterized by low discharge, resulting from the shallow gradient, which increases water residence times. Canalization of the watercourse increases its flow in order to decrease flooding which is a common hydraulic disturbance. Rodríguez stream represents one of the water bodies where this method was employed. Its course was canalized in spring 2001 which promoted a series of modifications of its physico-chemical and biological characteristics. Among the phytoplankton of this stream, Euglenophyta were the most important group by its diversity as well as by its number

\* corresponding author

(BAUER et al. 2002). This algal group has been little explored in lotic systems of the Pampean plain (DEL GIORGIO et al. 1981, CONFORTI 1991, CONFORTI et al. 1995, O'FARRELL et al. 2002).

In order to increase our knowledge about this group, the aim of this study was to analyse the euglenoids' taxonomical composition in a polluted stream of the Pampean plain subjected to dredging during the sampling period.

## Study area

This study covered a 12 km stretch of Rodríguez stream, with a total length of 22 km. It is located in the Pampean plain, close to La Plata City, Buenos Aires, Argentina. Three sampling sites were established. Site 1 was located in a zone with moderate horticulture, site 2 was located downstream of an artificial pond and receives the effluents from a meat-packaging depot and site 3 was located in an urban zone receiving domestic effluents. The streambed is composed principally by clay and silt and there is an important development of hydrophytes and filamentous algae downstream. A dam upstream of site 2 has created a small artificial pond; this favours water retention and modifies the stream discharge downstream.

This watercourse was dredged in station 1 on 13 November 2001. Two weeks later they continued in station 2, and in spite of proceeding downstream in the subsequent weeks they did not reach station 3 during the study period. The latter station received, however, an important quantity of suspended solids during the last three weeks of the study.

## Materials and methods

Qualitative and quantitative samples of phytoplankton were collected weekly in the three sampling sites, on eight occasions, three previous to the dredging (10/24/01 to 11/07/01) and five after the dredging (11/13/01 to 12/11/01). At each station samples were taken with a 10 µm mesh plankton net and fixed with buffered formaldehyde (4 % final concentration). Temperature, conductivity, pH (Hanna HI 8633) were measured with portable meters. Water samples to be analysed for the dissolved inorganic nutrients were filtered immediately through glass fiber filters (Whatman GF/C) and were stored at 4 °C until arrival at the laboratory. Soluble reactive phosphorus, nitrite and ammoniacal nitrogen were determined colourimetrically, nitrate was reduced to nitrite before colourimetric measurement. BOD was determined after 5 days incubation at 20 °C and COD by oxidation with potassium dichromate in acid medium. All these analyses were made according to APHA (1998).

For taxonomic identifications an Olympus BX50 binocular microscope was used. For observation under SEM, organisms were washed with distilled water, filtered through Millipore filters (0.20 µm pore) and air-dried.

Filter pieces were attached on stubs to be subsequently coated with gold/palladium. Specimens were examined and photographed by means of a Phillips 505 SEM at the Electron Microscopy Service of CITEFA, Argentina.

The following specialized literature was used for taxa identification: DEFlandre (1930), Huber-Pestalozzi (1955), POPOVA (1966), STARMACH (1983) and TELL & CONFORTI (1986). Eighty-nine taxa were studied, of which only those new for Argentina and those whose ultrastructure was previously unknown are described in detail in the text. Additional comments on morphology, distribution, and size are given for known taxa. *Euglena ehrenbergii*, *E. gracilis* and *Phacus orbicularis* were observed and determined but they were not illustrated.

The samples were deposited in the Laboratorio de Biología de Protistas, Departamento de Biodiversidad y Biología Experimental, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina.

## Results

During the post-dredging period suspended solids and conductivity increased in the three sampling sites and BOD<sub>5</sub> and COD diminished in sites 2 and 3 while the nutrients evidenced a pronounced increase, immediately after dredging (Table 1).

Table 1: Average values of the water physical and chemical parameters of the three sampling sites measured pre-dredging and post-dredging.

	Pre-dredging			Post-dredging		
	Site1	Site 2	Site 3	Site 1	Site 2	Site 3
Temperature (°C)	20.0 (±3.4)	23.0 (±1.0)	23.7 (±0.9)	21.8 (±2.1)	25.2 (±3.3)	24.4 (±2.8)
Conductivity (µS cm <sup>-1</sup> )	260.2 (±121.3)	679.7 (±288.9)	679.7 (±256.0)	506.6 (±246.8)	914.8 (±505.5)	817.2 (±223.1)
pH	7.7 (±0.1)	7.8 (±0.03)	7.8 (±0.1)	7.7 (±0.2)	7.8 (±0.1)	7.8 (±0.2)
TSS (mg L <sup>-1</sup> )	66.0 (±34)	34.5 (±8.5)	33.1 (±5.6)	172.5 (±185.2)	71.3 (±34.7)	72.9 (±53.7)
DBO <sub>5</sub> (mg L <sup>-1</sup> )	5.7 (±1.2)	65.3 (±25.7)	55.0 (±25.5)	12.0 (±13.0)	31.8 (±12.3)	27.6 (±9.5)
DCO (mg L <sup>-1</sup> )	48.3 (±5.7)	93.0 (±60.6)	85.0 (±46.1)	42.4 (±17.1)	51.2.4 (±9.0)	52.0 (±17.3)
SRP (mg L <sup>-1</sup> )	0.6 (±0.1)	0.8 (±0.1)	0.8 (±0.1)	0.7 (±0.3)	2.9 (±2.3)	2.4 (±1.8)
NH <sub>4</sub> <sup>+</sup> (mg L <sup>-1</sup> )	0.2 (±0.1)	0.1 (±0.1)	0.2 (±0.1)	0.2 (±0.1)	6.6 (±6.0)	5.1 (±4.3)
NO <sub>2</sub> <sup>-</sup> (mg L <sup>-1</sup> )	0.1 (±0.01)	0.4 (±0.3)	0.4 (±0.2)	0.2 (±0.1)	0.5 (±0.3)	0.8 (±0.4)
NO <sub>3</sub> <sup>-</sup> (mg L <sup>-1</sup> )	0.9 (±1.1)	0.7 (±0.9)	3.5 (±1.1)	2.1 (±1.3)	1.0 (±0.6)	2.6 (±0.3)









Table 2 shows the total taxa found in the studied materials. Among the 89 taxa, we recorded two belonging to *Euglena* EHR., seven to *Lepocinclis* PERTY, fourteen to *Phacus* DUJ., forty to *Strombomonas* DEFL. and twenty six to *Trachelomonas* EHR.

## Taxonomic descriptions

Family Euglenophyceae

### ***Phacus* DUJARDIN 1841**

*Phacus acuminatus* var. *acuticauda* (ROLL) HUBER-PESTALOZZI Fig. 12

The observed specimens were thinner than those described by HUBER-PESTALOZZI (1955), 31–32.5 µm long x 23.5–24.5 µm wide. Hungary, Russia. This is the first record for Argentina.

### ***Strombomonas* DEFL. 1930**

*Strombomonas acuminata* var. *acuminata* (SCHM.) DEFL. Figs 26 a–d, 101

Lorica trapezoid. Sides concave gradually tapering to the posterior end into a conical cauda (6–9 µm long), and converging to the front into a cylindrical collar oblique and irregular at the distal end (3–5 x 7–8 µm). Wall yellowish to light brown, coarse, thick, with numerous irregularly distributed, exogenous particles adhering on its surface. The lorica of some specimens was smaller than those described by HUBER-PESTALOZZI (1955), 27–46 µm long, 16.5–25.5 µm diam. Cosmopolitan. This is the first study by SEM of this taxon.

*Strombomonas acuminata* var. *amphora* PLAYF. Fig. 43

Lorica 44.5–46 µm long, 26–28 µm diam. This variety was originally described in materials from Australia. In South America it was only reported in Brazil, this is the first record of the species for Argentina.

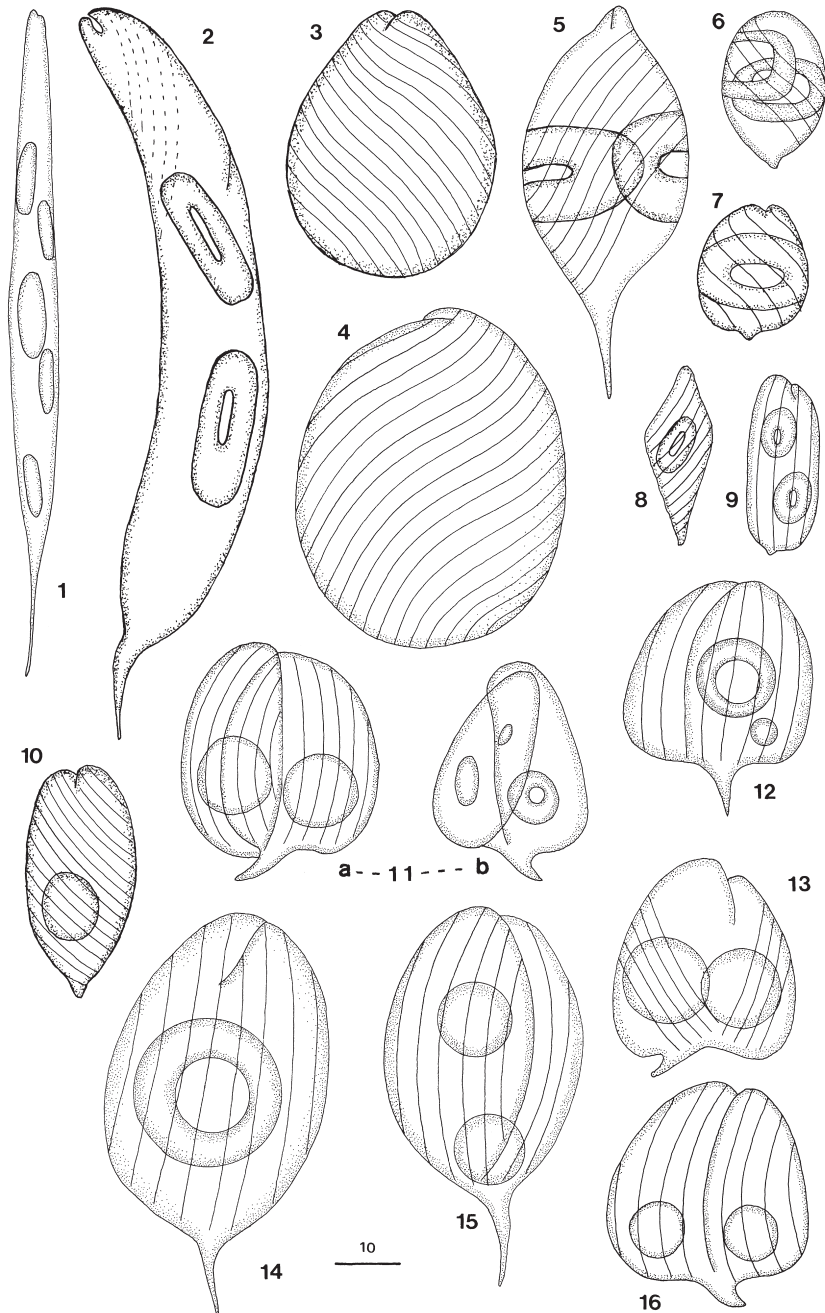
*Strombomonas acuminata* var. *massartii* VAN OYE Figs 25, 95

Some of the observed organisms were shorter than those described by HUBER-PESTALOZZI (1955), TELL & CONFORTI (1986) and CONFORTI & PEREZ (2000), lorica 19–29 µm long, 16.5–23 µm diam., but they were totally coincident with their morphological characteristics. This variety only differs from the type by the posterior rounded end without cauda. BROSNAN et al. (2005) reported that *S. acuminata* var. *acuminata* could be with or without cauda depending on the cell movements during the lorica development. According to this, both varieties could represent the same taxon. Widespread.

*Strombomonas asymmetrica* (ROLL) POPOVA Fig. 34

The studied organisms showed similar dimensions than those described by CONFORTI (1993), and smaller than those mentioned by POPOVA (1966),





Figs 1–16: 1 – *Lepocinclis acus*, 2 – *L. oxyuris*, 3 – *L. texta*, 4 – *L. salina*, 5 – *L. caudata*, 6 – *L. ovum* var. *dimidio-minor*, 7 – *L. ovum* var. *globula*, 8, 10 – *P. polytrophos*, 9 – *P. granum*, 11a,b – *P. anomalus*, 12 – *P. acuminatus* var. *acuticauda*, 13 – *P. textus*, 14 – *P. platalea*, 15 – *P. caudatus*, 16 – *P. curvicauda*.

26–27  $\mu\text{m}$  long, 14–15  $\mu\text{m}$  diam. Lorica ellipsoid, wall coarse, yellowish. Europe, USA, Brazil. This is the first record of the species for Argentina.

*Strombomonas balvayi* BOURR. et COUTÉ

Figs 53 a–c

Lorica trapezoid, triangular in apical view, with the posterior end narrowed and rounded, or presenting a very short conical cauda (3–5  $\mu\text{m}$  long). Apical end broader ending gradually in a wide short neck with the opening slight or clearly oblique, with very irregular distal contour by adhering particles. Wall yellowish to light brown, covered by numerous exogenous particles agglutinated on its surface. Some of the specimens were smaller than those described by CONFORTI (1993), CONFORTI & PEREZ (2000) and MEICHTRY DE ZABURLIN et al. (2004), 32.5–44.5  $\mu\text{m}$  long, 13–24.5  $\mu\text{m}$  diam. Europe, Brazil, Uruguay. In Argentina: Corrientes. This is the first record of this species for Buenos Aires.

*Strombomonas brevicaudata* CONF. et JOO

Fig. 36

Lorica 24–25  $\mu\text{m}$  long, 13–14  $\mu\text{m}$  diam. The observed specimens were morphologically coincident with those described by CONFORTI & JOO (1994). USA, Brazil. It is the first record for Argentina.

*Strombomonas confortii* ZALOCAR de DOMITROVIC

Fig. 48

The studied specimens resemble the type but their lorica was thinner than those described by ZALOCAR DE DOMITROVIC (1991) and CONFORTI & ZALOCAR DE DOMITROVIC (2003), 38–39  $\mu\text{m}$  long, 26–27  $\mu\text{m}$  diam. Brazil. In Argentina: originally described in materials from Chaco; this is the first record for Buenos Aires.

*Strombomonas eurystoma* fo. *incurva* POPOVA

Fig. 24

Some of the observed organisms were larger than those described by POPOVA (1966) and TELL & CONFORTI (1986), 25.5–37.5  $\mu\text{m}$  long, 18–21.5  $\mu\text{m}$  diam. Argentina, Brazil, Russia, USA.

*Strombomonas fluviatilis* var. *elegans* DREZ. aff.

Figs 28–29

Some studied specimens showed a similar shape than *S. fluviatilis* var. *elegans* DREZ., but differed from this by the short conical cauda and its smaller dimensions. Lorica 30–43  $\mu\text{m}$  long, 17–23  $\mu\text{m}$  diam.

*Strombomonas girardiana* var. *triundulata* TELL et ZALOC.

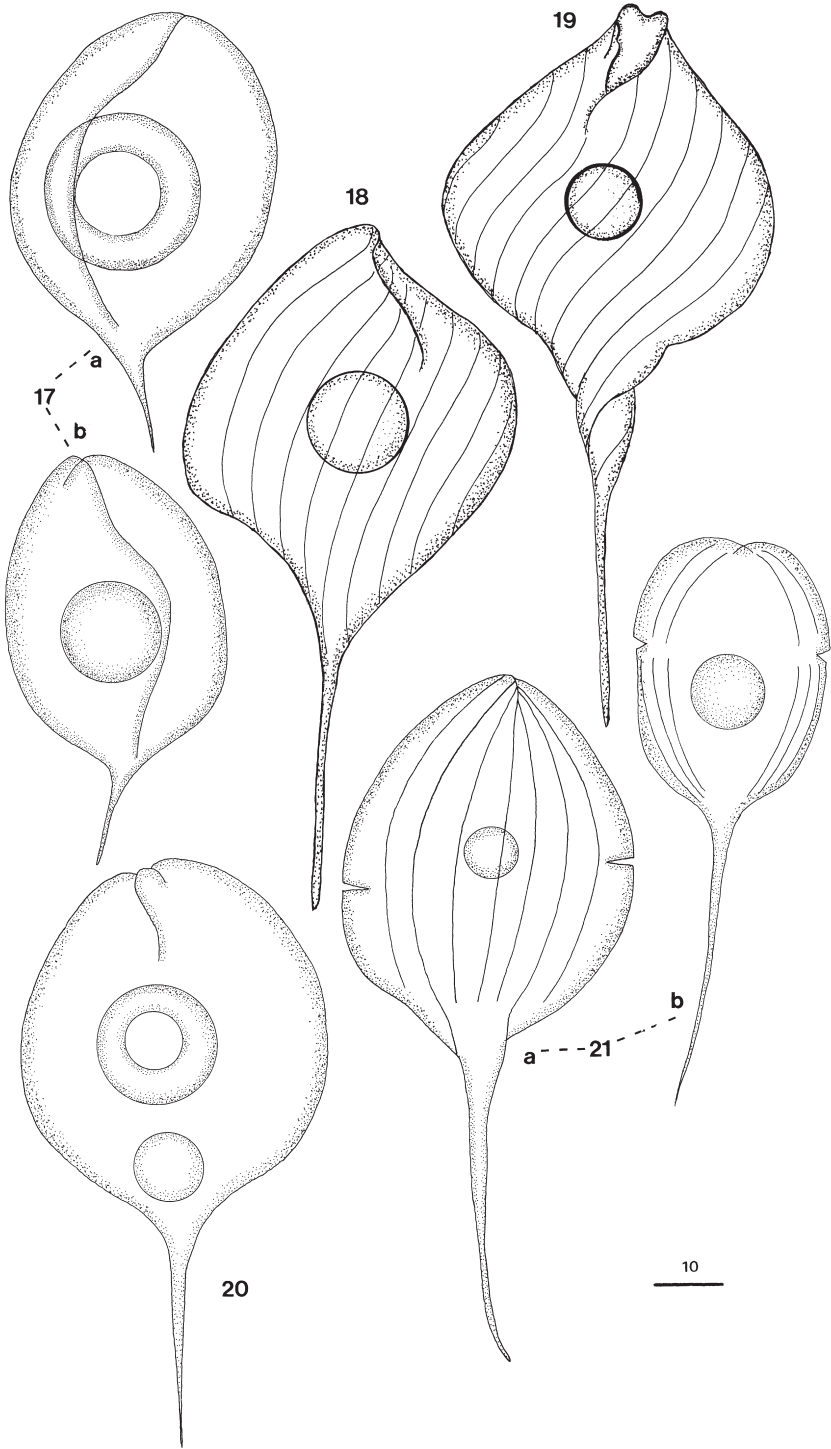
Fig. 47

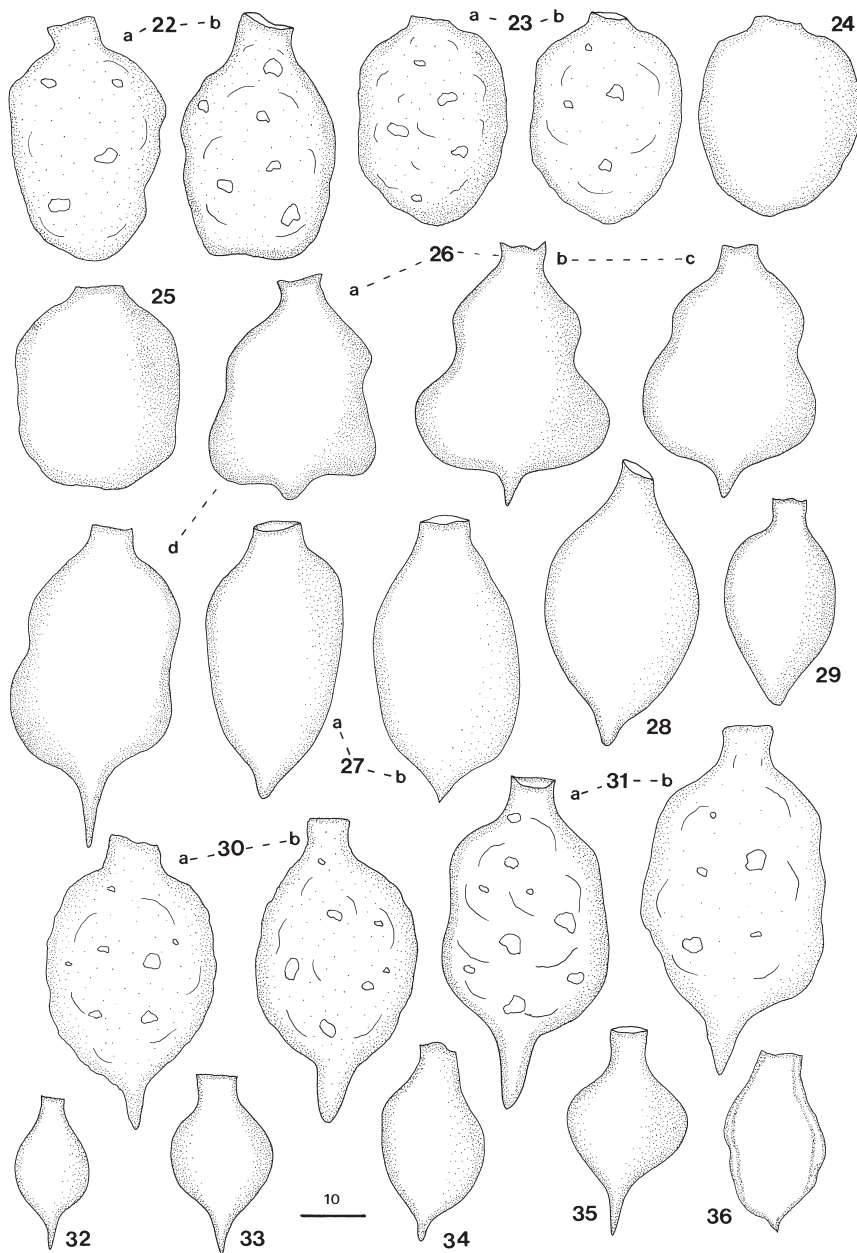
The observed organisms were smaller than those reported by TELL & CONFORTI (1986), 42–43 long, 20–21  $\mu\text{m}$  diam. This variety was only reported in materials from tropical and subtropical regions of South America, Bo-

---

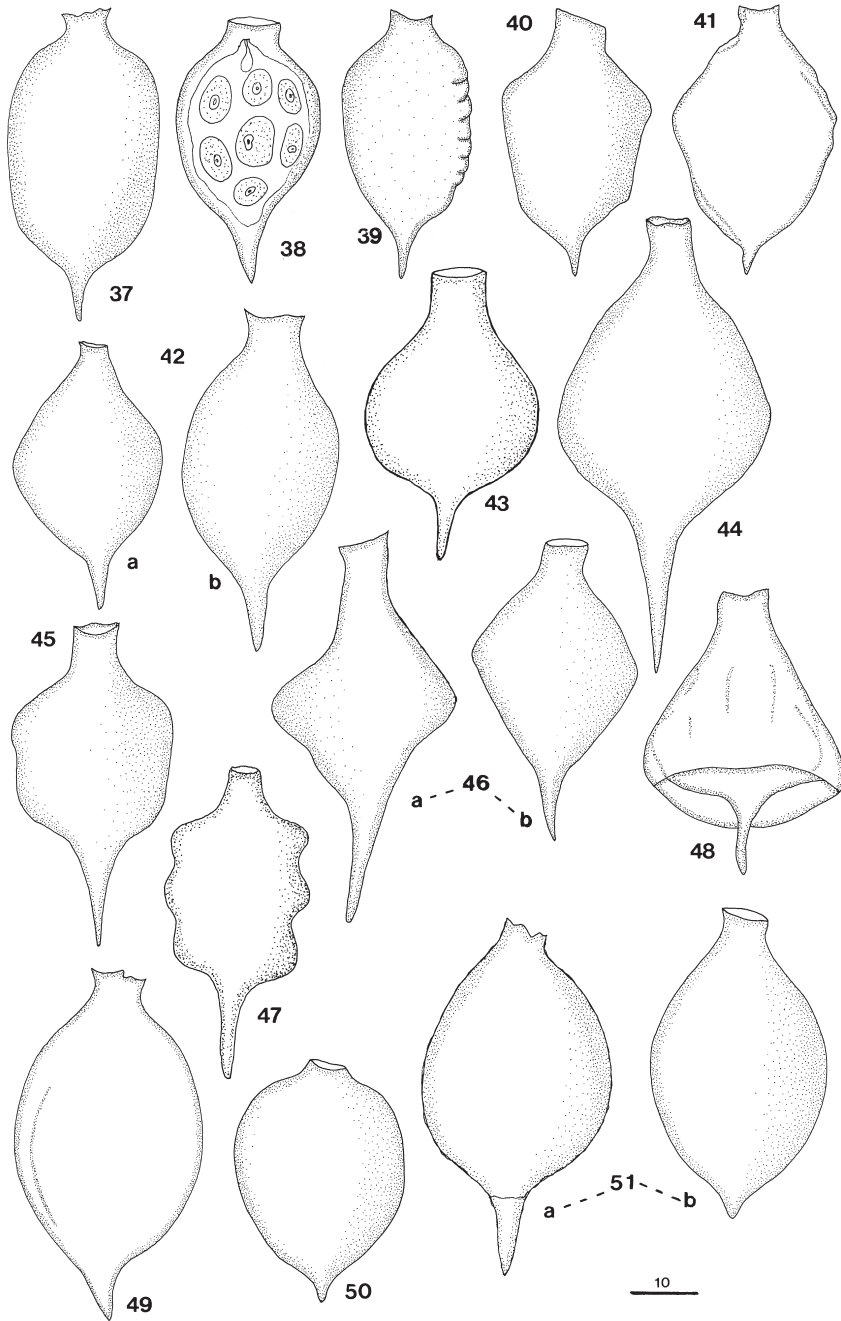
Figs 17–21: **17** a,b – *P. triqueter*, **18** – *P. tortus*, **19** – *P. sesquiertortus*, **20** – *P. longicauda* var. *longicauda*, **21** a,b – *P. longicauda* var. *insecta*.

→





Figs 22–36: 22a,b – *S. verrucosa* var. *conspersa*, 23a,b – *S. borysthensiensis*, 24 – *S. eurystoma* var. *incurva*, 25 – *S. acuminata* var. *massartii*, 26a–d – *S. acuminata* var. *acuminata*, 27a,b – *S. eurystoma* var. *eurystoma*, 28,29 – *S. fluvialis* var. *elegans* aff., 30a,b – *S. verrucosa* var. *verrucosa*, 31a,b – *S. verrucosa* var. *zmiewika*, 32 – *S. globulosa*, 33 – *S. rotunda*, 34 – *S. asymmetrica*, 35 – *S. schauinslandii*, 36 – *S. brevicaudata*.



Figs 37–51: 37 – *S. urceolata* var. *urceolata*, 38 – *S. urceolata* var. *elegans* fo. *americana*, 39 – *S. tambowika*, 40 – *S. triquetra*, 41 – *S. telli*, 42 – *S. praeliariis*, 43 – *S. acuminata* var. *amphora*, 44 – *S. ensifera* var. *javanica*, 45 – *S. girardiana* var. *girardiana*, 46a,b – *S. gibberosa*, 47 – *S. girardiana* var. *triondulata*, 48 – *S. confortii*, 49 – *S. costata*, 50 – *S. ovalis*, 51a,b – *S. planctonica*.

livia (THÉREZIEN 1989), Venezuela (SALAZAR 2004), Uruguay (CONFORTI & PEREZ 2000). In Argentina: Chaco (TELL & ZALOCAR DE DOMITROVIC 1985). This is the first record for Buenos Aires.

*Strombomonas globulosa* CONFORTI et JOO Fig. 32

Lorica 19–20 µm long, 9.5–11.5 µm diam. Brazil, USA. It is the first record for Argentina.

*Strombomonas planctonica* (WOL.) POPOVA Figs 51a–b

The studied specimens were smaller than those mentioned by CONFORTI (1993), 41–51 µm long, 24–27 µm diam. Widespread. In Argentina: Corrientes (MEICHTRY DE ZABURLIN et al. 2004). This is the first record for Buenos Aires.

*Strombomonas praeliariis* (PALMER) DEFL. Fig. 42

We could observe a wider range of dimensions than those mentioned in the bibliography, lorica 29.5–50 µm long, 16–26 µm diam. Widespread. In Argentina: Corrientes (MEICHTRY DE ZABURLIN et al. 2004). This is the first record for Buenos Aires.

*Strombomonas scabra* var. *coberensis* (DEFL.) TELL et CONFORTI Figs 54 a–b, 92, 93

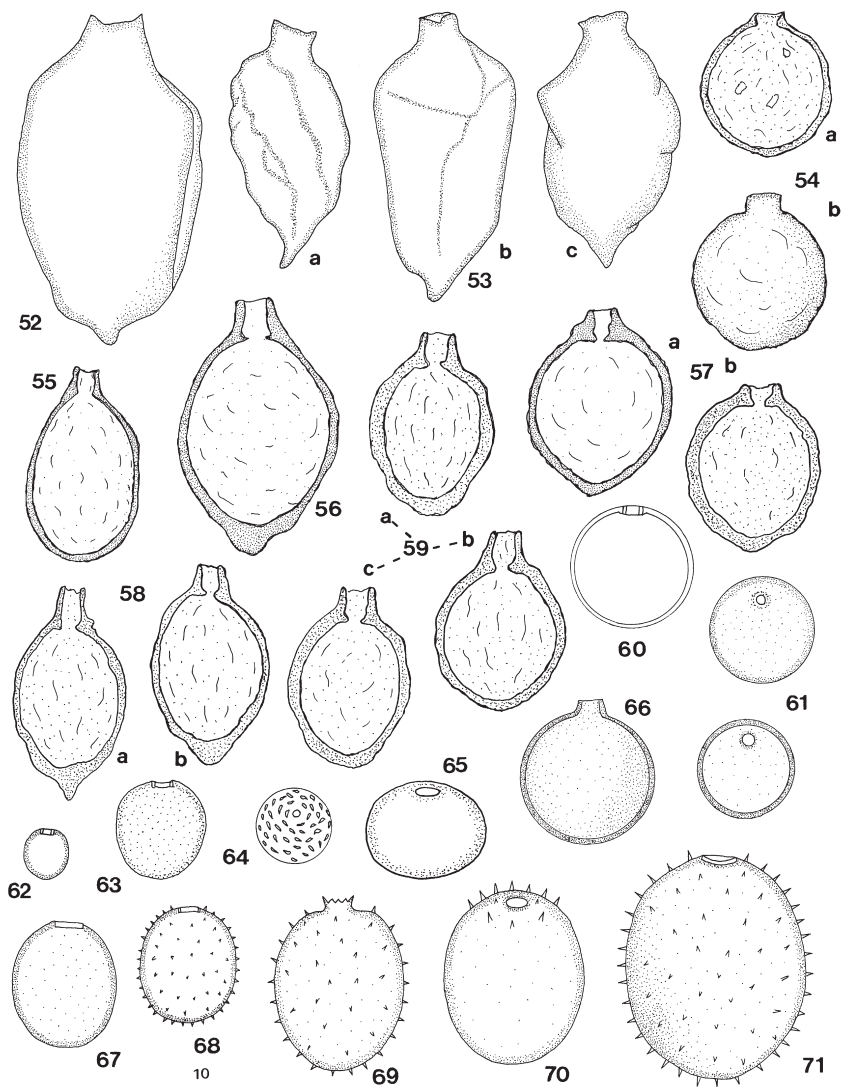
Lorica spherical to subspherical. Pore surrounded by a short neck (4.5–5.5 µm diam.) with irregular distal end. We recorded a wider variation of lorica dimensions than those cited by TELL & CONFORTI (1986), CONFORTI & PÉREZ (2000) and MEICHTRY DE ZABURLIN et al. (2004), 13–24.5 µm long, 14–20 µm diam. Belgium, USA. In South America: Argentina, Brazil, Venezuela, Uruguay.

*Strombomonas scabra* var. *cordata* (PLAYF.) TELL et CONFORTI Figs 57a–b, 94

Lorica 19–29.5 µm long, 16–26.5 µm diam. The distinguishing feature of this variety is its heart-shape. Pore 5–6.5 µm diam., without collar or very short, surrounded by irregular projections. Membrane thick, rough, with numerous adhering particles on its surface, yellowish to reddish-brown. France, USA. In Argentina: Chaco (TELL & CONFORTI 1988). This is the first record for Buenos Aires.

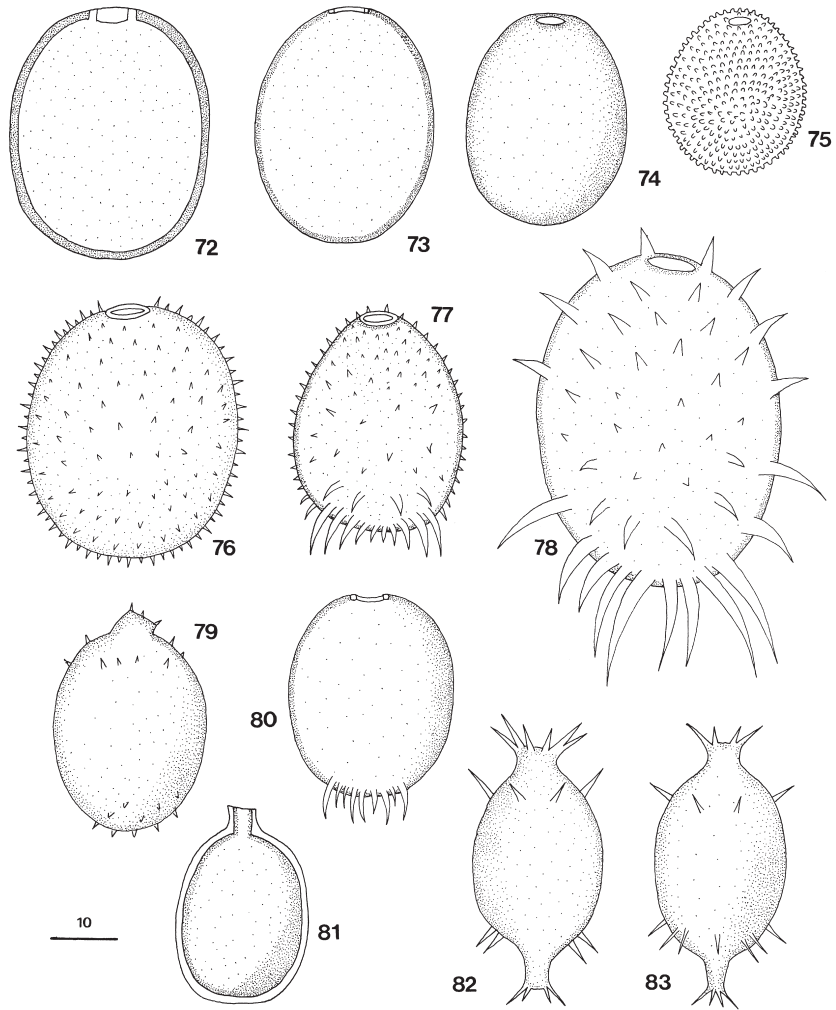
*Strombomonas scabra* var. *intermedia* (YACUB.) TELL et CONFORTI Fig. 100

The observed organisms were shorter than those reported by CONFORTI (1993), 35–36.5 µm long, 18–19 µm diam. The lorica studied by SEM showed the same ultrastructure as those described by TELL & CONFORTI (1988). This variety was only recorded for tropical and subtropical regions of South America: Argentina, Brazil, Venezuela.



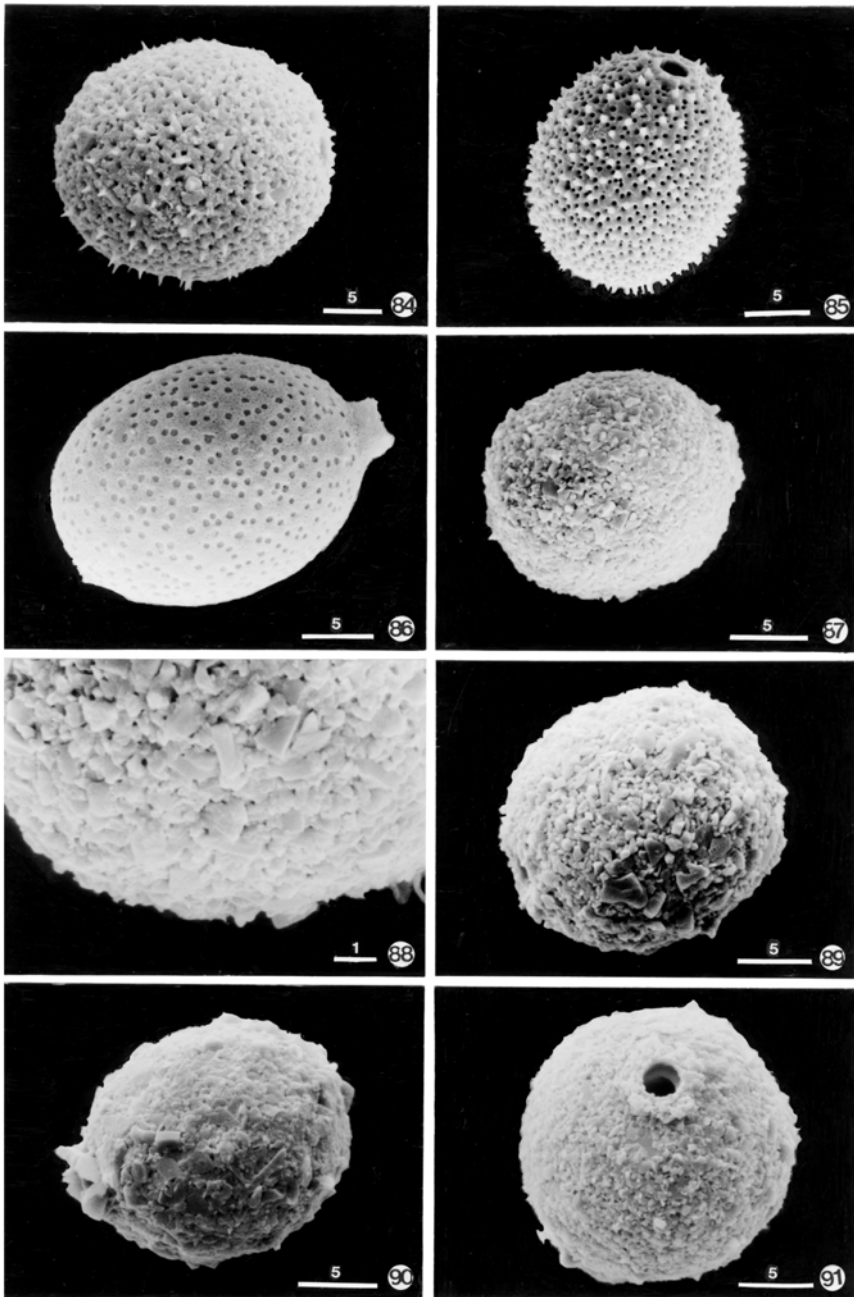
Figs 52–71: 52 – *S. prismatica* var. *triangulata*, 53a,c – *S. balvayi*, 54a,b – *S. scabra* var. *coberensis*, 55 – *S. scabra* var. *longicollis*, 56 – *S. scabra* var. *ovata* fo. *ovata*, 57a,b – *S. scabra* var. *cordata*, 58a,b – *S. scabra* var. *ovata* fo. *caudata*, 59a,c – *S. scabra* var. *ovata* fo. *minor*, 60 – *T. volvocina* var. *volicina*, 61a,b – *T. volvocina* var. *punctata*, 62 – *T. pusilla* var. *pusilla*, 63 – *T. pusilla* var. *punctata*, 64 – *T. nexilis*, 65 – *T. curta*, 66 – *T. volvocina* var. *derephora*, 67 – *T. intermedia*, 68 – *T. hispida* var. *hispida* fo. *minor*, 69 – *T. sydneyensis* var. *minima*, 70 – *T. raciborskii* var. *nova* fo. *minor*, 71 – *T. kelloggii* var. *effigurata*.





Figs 72–83: **72** – *T. abrupta* var. *obesa*, **73** – *T. abrupta* var. *arcuata*, **74** – *T. armata* var. *armata* fo. *inevoluta*, **75** – *T. bacillifera* var. *minima*, **76** – *T. superba*, **77** – *T. armata* var. *armata* fo. *armata*, **78** – *T. armata* var. *longispina*, **79** – *T. similis* var. *spinosa*, **80** – *T. armata* var. *steinii*, **81** – *T. planctonica* var. *planctonica*, **82** – *T. acanthophora* var. *speciosa*, **83** – *T. acanthophora* var. *minor*.





Figs 84–91: **84** – *T. hispida* var. *hispida* fo. *hispida*, **85** – *T. bacillifera* var. *minima*, **86** – *T. planctonica* var. *oblonga*, **87–91** – *S. scabra* var. *scabra*, **87, 89, 90** – general views, **88** – detail of the envelope surface covered by agglutinate material, **91** – apical view showing detail of the lorica pore.

*Strombomonas scabra* var. *longicollis* (PLAYF.) TELL et CONFORTI Fig. 55

Some of the observed organisms were smaller than those mentioned by HUBER-PESTALOZZI (1955), POPOVA (1966), and TELL & CONFORTI (1986), 21.5–29 µm long, 13–19 µm diam.

*Strombomonas scabra* var. *ovata* fo. *caudata* (TELL et ZALOC.) TELL et CONFORTI Fig. 58 a–b

The studied specimens were smaller than those mentioned by TELL & CONFORTI (1986), 22–28 µm long, 14–19 µm diam. This forma was only registered in subtropical and tropical regions of South America, Brazil. In Argentina: Chaco (TELL & ZALOCAR DE DOMITROVIC 1985). This is the first record for Buenos Aires.

*Strombomonas scabra* var. *ovata* fo. *ovata* (PLAYF.) TELL et CONFORTI Figs 56, 97

Lorica ovoid, sides rounded gradually converging to the front in a cylindrical collar, very irregular to the distal end, whose base presents a well-developed annular external thickening. Posterior end tapered to a short conical rounded cauda. Wall brown, thick, coarse, covered by exogenous adhered materials. Some specimens were smaller than those shown by HUBER-PESTALOZZI (1955) and TELL & CONFORTI (1986), 26.5 – 33.5 µm long, 18 – 20 µm diam. Australia, in South America: Argentina, Brazil, Venezuela.

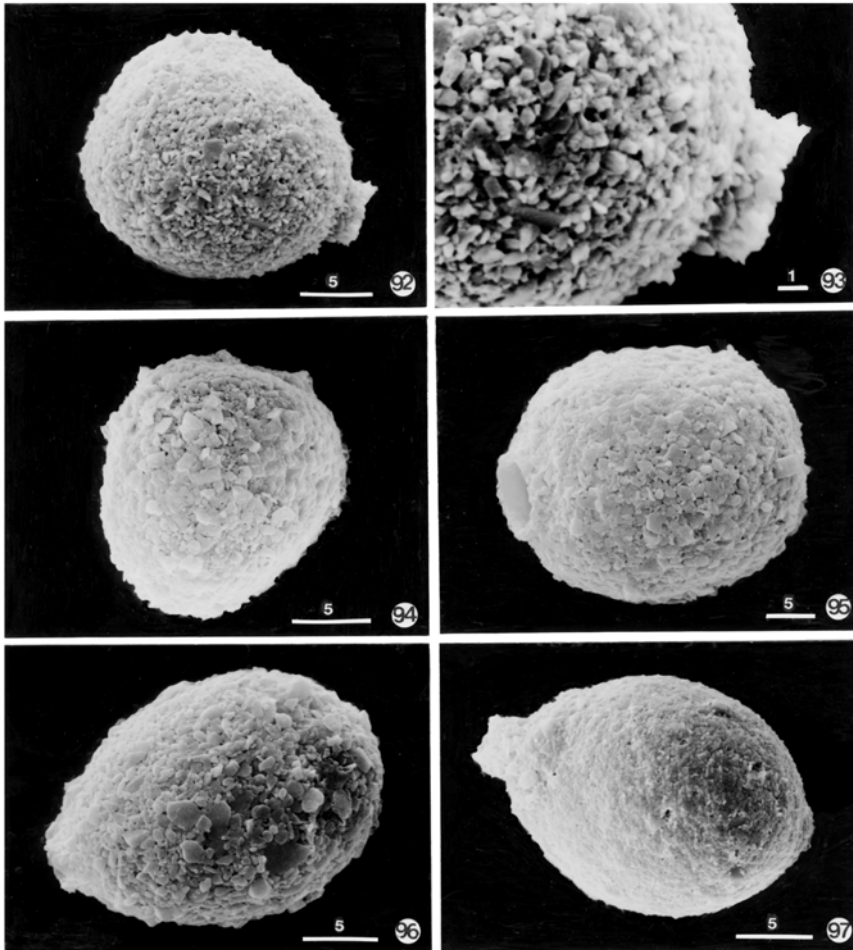
*Strombomonas scabra* var. *scabra* (PLAYF.) TELL et CONFORTI Figs 87–91

Lorica cylindrical to ellipsoid; both ends broadly rounded. Pore surrounded by a depressed collar or by adhering particles. Wall yellowish to dark brown, thick, coarse, covered by numerous exogenous adhering materials on its surface. Some organisms were smaller than those studied by HUBER-PESTALOZZI (1955), POPOVA (1966), TELL & CONFORTI (1986), and CONFORTI (1993), 13.5–24.5 µm long, 10–18 µm diam. Widespread.

BROSNAN et al. (2005) noted that *S. scabra* and its varieties must be considered as belonging to *Trachelomonas* because they produce plate-like scales on their mature loricas that can easily be mistaken for agglutinated particles. This affirmation is not consistent with our SEM observations (Figs 87–91), which showed that the adhered materials on the surface of the loricas had very irregular dimensions and shapes to be considered cell products; additionally some of these were diatom frustules pieces. It is clear that additional cell culture studies on this subject are necessary.

*Strombomonas urceolata* var. *elegans* fo. *americana* CONF. et PEREZ Fig. 38

Lorica 35–34 µm long, 19–20 µm diam. This forma was originally described from Uruguay, it represents the first record for Argentina.



Figs 92–97: **92–93** – *S. scabra* var. *coberensis*, **92** – general view, **93**– detail of the anterior end and lorica surface, **94** – *S. scabra* var. *cordata*, **95** – *S. acuminata* var. *massartii*, **96** – *S. scabra* var. *ovata* fo. *minor*, **97** – *S. scabra* var. *ovata* fo. *ovata*.

*Strombomonas telli* ZALOCAR DE DOMITROVIC

Fig. 41

Lorica 35–36  $\mu\text{m}$  long, 21–22  $\mu\text{m}$  diam. This species was only recorded for tropical and subtropical regions from South America: Brazil. In Argentina: Chaco (ZALOCAR DE DOMITROVIC 1991); it is the first record for Buenos Aires.

*Strombomonas verrucosa* var. *conspersa* (PASCHER) TELL et CONFORTI

Figs 22 a, b; 99

Lorica 27–34  $\mu\text{m}$  long, 20.5–21  $\mu\text{m}$  diam. The specimens studied by SEM showed the same characteristics as those described by TELL & CONFORTI (1984). Widespread.

**Trachelomonas EHR. emend. DEFL. 1926***Trachelomonas armata* var. *armata* fo. *inevoluta* DEFL.

Fig. 74

The observed organisms were smaller than those mentioned by HUBER-PESTALOZZI (1955) and TELL & CONFORTI (1986), 28–29 µm long, 21–22 µm diam. Widespread.

*Trachelomonas bacillifera* var. *minima* PLAYF.

Figs 75, 85

Lorica ovoid to broadly ellipsoid, punctuated (176–185/100 µm<sup>2</sup>), covered by rod-like obtuse spines (0.5–0.6 µm long), irregularly distributed (60–75/100 µm<sup>2</sup>). Pore 2–2.5 µm diam., with an annular thickening. The lorica studied by SEM showed the same characters as those described by CONFORTI & TELL (1986) and was shorter than those described by POPOVA (1966), 20.5–23.5 µm long, 18–20.5 µm diam. Widespread.

*Trachelomonas curta* DA CUNHA emend. DEFL.

Fig. 65

The specimens were smaller than those mentioned by HUBER-PESTALOZZI (1955) and TELL & CONFORTI (1986), 12.5–13 µm long, 14–17 µm diam. Cosmopolitan.

*Trachelomonas hispida* var. *hispida* fo. *hispida* (PERTY) STEIN emend. DEFL.

Fig. 84

Lorica 22.5–27 µm long, 20–23 µm diam. This very common taxon has been studied previously by SEM by COUTÉ & ILTIS (1981), CONFORTI & TELL (1986), RINO & PEREYRA (1989/90), CONFORTI (1993), CONFORTI (1999) and CONFORTI & RUIZ (2001). Cosmopolitan.

*Trachelomonas hispida* var. *hispida* fo. *minor* BOURR.

Fig. 68

This forma presents the same characteristics than the type; it only differs by its smaller dimensions. Our specimens were smaller than those described by HUBER-PESTALOZZI (1955) and CONFORTI & RUIZ (2001), lorica 15–16 µm long, 13–14 µm diam. Guadeloupe, Colombia. This is the first record in Argentina.

*Trachelomonas kellogii* var. *effigurata* SKVORTZOW

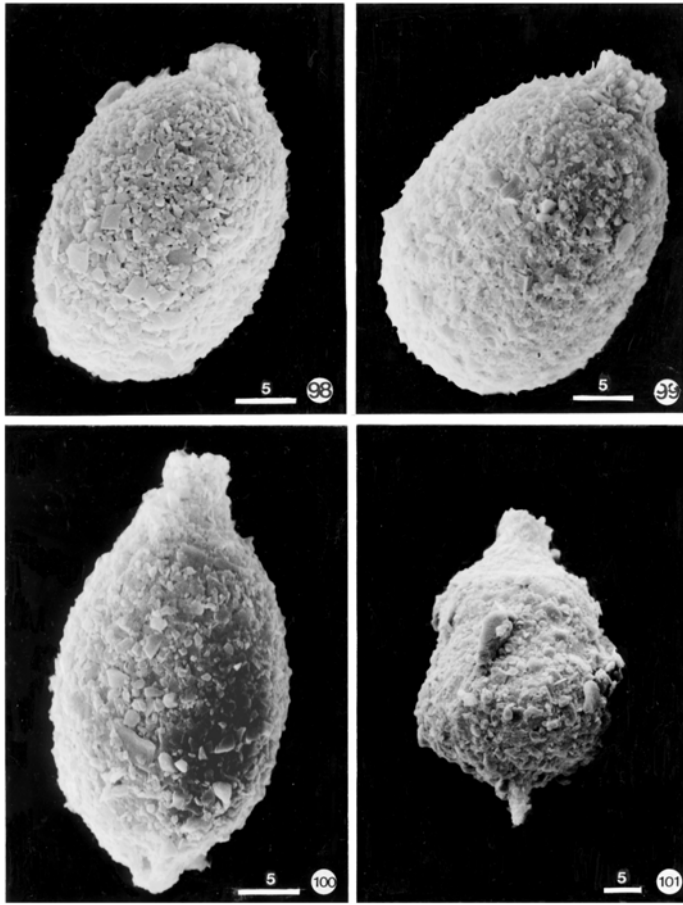
Fig. 71

The organisms were smaller than those mentioned by HUBER-PESTALOZZI (1955) and TELL & CONFORTI (1986), lorica 30–31 µm long, 24–25 µm diam. Widespread.

*Trachelomonas nexilis* PALMER

Fig. 64

The observed organisms were smaller than those recorded by HUBER-PESTALOZZI (1955) and TELL & CONFORTI (1986), lorica 9.5–11 µm diam. Argentina, Brazil, Uruguay, USA.



Figs 98–101: **98** – *S. scabra* var. *scabra*, **99** – *S. verrucosa* var. *conspersa*, **100** – *S. scabra* var. *intermedia*, **101** – *S. acuminata* var. *acuminata*.

*Trachelomonas planctonica* var. *oblonga* DREZ.

Figs 81, 86

This taxon differs from the type by its ellipsoid to ovoid contour. Lorica 23–25.5  $\mu\text{m}$  long, 17–18  $\mu\text{m}$  diam. Pore surrounded by a cylindrical neck slightly asymmetrical, smooth at the tip. The specimens of our photo probably represented a lorica with an initial stage of mineralization because it presented very large punctuations, sparsely distributed (72–75/100  $\mu\text{m}^2$ ). This variety has been studied previously by SEM by CONFORTI & RUIZ (2001) in materials from Korea. Cosmopolitan.

*Trachelomonas volvocina* var. *derephora* CONRAD

Fig. 66

Lorica 19–20.5  $\mu\text{m}$  long, 17.5–18.5  $\mu\text{m}$  diam. This variety differs from the type by the pore surrounded by a short collar. Europe, Java. Brazil. In Ar-

gentina, it was recorded by TELL & ZALOCAR DE DOMITROVIC (1985) and studied by means of SEM (CONFORTI 1999) from materials from Chaco; this is the first record for Buenos Aires.

## Conclusion

Most of the taxa sampled in the Rodríguez Stream were reported previously for Buenos Aires. *Strombomonas balvayi*, *S. confortii*, *S. girardiana* var. *triondulata*, *S. planctonica*, *S. praeliariis*, *S. scabra* var. *cordata*, *S. scabra* var. *ovata* fo. *caudata*, *S. telli*, *Trachelomonas volvocina* var. *derephora* are new cites for Buenos Aires. *Phacus acuminatus* var. *acuticauda*, *Strombomonas acuminata* var. *amphora*, *S. balvayi*, *S. brevicaudata*, *S. globulosa*, *S. urceolata* var. *elegans* fo. *americana*, *Trachelomonas hispida* var. *hispida* fo. *minor* are new cites for Argentina. Twelve were examined and photographed by SEM, one of them was studied by this method for the first time: *Strombomonas acuminata* var. *acuminata*.

The modifications in the habitat during the post dredged period lead to a loss in the diversity. In general, the naked species were more sensitive to the new conditions, specially the metabolic ones. *L. acus*, *L. oxyuris* and *P. tortus* have been favoured after the dredging. Among the loricate, *Trachelomonas* diminished strongly its taxa number, only the species with small, strong, dark brown coloured and less ornamented lorica were found in the altered habitats. On the contrary, *Strombomonas* increased its diversity, specially the taxa belonging to the *Scabra* group which presented high amounts of particles adhering on its surface. Our study shows a clear response in the diversity and physiognomy of the euglenoid assemblage to physico-chemical changes in the post dredging period.

## Resumen

En este trabajo fueron determinados 89 taxones de euglenofitos provenientes del Arroyo Rodríguez, Buenos Aires, Argentina, 2 pertenecientes al género *Euglena* EHR., 7 a *Lepocinclis* PERTY, 14 a *Phacus* DUJ., 40 a *Strombomonas* DEFL. y 26 a *Trachelomonas* EHR. Doce taxones lorizados fueron examinados utilizando microscopio electrónico de barrido (MEB) y se ilustran detalles de su ultraestructura.

## Acknowledgements

This work was supported by the grants PICT 14083/03, CONICET PIP N° 5702 and UBACYT X 047 to V. C.



## References

- APHA (1998): Standard Methods for the Examination of Water and Wastewater. – American Public Health Association, Washington DC.
- BAUER, D., CONDE, M. & GÓMEZ, N. (2002): Phytoplankton of a small lowland stream related to water quality and hydraulic discontinuities. – Arch. Hydrobiol. **153**: 421–442.
- BROSNAN, S., BROWN, P., FARMER, M. & TRIEMER, R. (2005): Morphological separation of the euglenoid genera *Trachelomonas* and *Strombomonas* (Euglenophyta) based on lorica development and posterior strip reduction. – J. Phycol. **41**: 590–605.
- CONFORTI, V. (1991): Taxonomic study of the Euglenophyta of a highly polluted river of Argentina. – Nova Hedwigia **53**: 73–98.
- CONFORTI, V. (1993): Study of the Euglenophyta from the Camaleão lake (Manaus, Brazil) II. *Strombomonas* DEFL. – Rev. Hydrobiol. Trop. **26**: 187–197.
- CONFORTI, V. (1994): Study on the Euglenophyta from Camaleão Lake (Manaus, Brazil) III. *Euglena* EHR., *Lepocinclis* PERTY, *Phacus* DUJ. – Rev. Hydrobiol. Trop. **27**: 3–21.
- CONFORTI, V. (1998): Estudio taxonómico y ultraestructural de Euglenophyta no loricadas del Nordeste Argentino. – Iheringia, Sér. Bot., **50**: 49–66.
- CONFORTI, V. (1999): Taxonomic and ultrastructural study of *Trachelomonas* EHR. (Euglenophyta) from subtropical Argentina. – Cryptog., Algol. **20**: 167–207.
- CONFORTI, V., ALBERGHINA, J. & GONZALEZ URDA, E. (1995): Structural changes and dynamics of phytoplankton community along a highly polluted river of Argentina (Matanza – Riachuelo). – J. Aquat. Ecosyst. Health **4**: 59–75.
- CONFORTI, V. & JOO, G. J. (1994): Taxonomic and ultrastructural study of *Trachelomonas* EHR. and *Strombomonas* DEFL. (Euglenophyta) from oxbow lakes in Alabama and Indiana (U.S.A.). – Cryptog., Algol. **15**: 267–286.
- CONFORTI, V. & PEREZ, M. C. (2000). Euglenophyceae of Negro River, Uruguay, South America. – Algological Studies **97**: 59–78.
- CONFORTI, V. & RUIZ, L. (2001). Euglenophytes from Chunam reservoir (South Korea) II. *Trachelomonas* EHR. – Algological Studies **102**: 117–145.
- CONFORTI, V. & TELL, G. (1989): Ultrastructure of the pellicle and the envelope of some euglenoid flagellates from Argentina by means of S.E.M. – Nova Hedwigia **48**: 187–206.
- CONFORTI, V. & ZALOCAR DE DOMITROVIC, Y. (2003): Ultrastructural study of *Strombomonas* (Euglenophyta) from Province of Chaco (Argentina). – Bol. Soc. Argent. Bot. **38**: 5–12.
- COUTÉ, A. & ILTIS, A. (1981): Ultrastructure stéréoscopique de la logette de *Trachelomonas* (Algae, Euglenophyta) récoltés en Côte d'Ivoire. – Rev. Hydrobiol. Trop. **14**: 115–133.
- DEFLANDRE, G. (1930): *Strombomonas* nouveau genre d'Euglénacées. (*Trachelomonas* EHR. p.p.). – Arch. Protistenk. **69**: 551–614.
- DEL GIORGIO, P., VINOCUR, A. L., LOMBARDO, R. J. & TELL, H. G. (1991): Progressive changes in the structure and dynamics of the phytoplankton community along a pollution gradient in a lowland river – a multivariate approach. – Hydrobiologia **224**: 129–154.
- HUBER-PESTALOZZI, G. (1955): Euglenophyceen. – Die Binnengewässer. Das Phytoplankton des Süßwassers **16**: 1–606.
- MEICHTRY DE ZABURLIN, N., GONI, O. & CONFORTI, V. (2004): Euglenofitos pigmentados del Arroyo Yacarey (Corrientes, Argentina). I. *Strombomonas* DEFL. – Iheringia, Sér. Bot., **59**: 117–130.
- O'FARRELL, I., LOMBARDO, R., DE TEZANOS PINTO, P. & LOEZ, C. (2002): The assessment of water quality in the Lower Luján River (Buenos Aires, Argentina): phytoplankton and algal bioassays. – Environm. Pollut. **120**: 207–218.
- POPOVA, T. G. (1966): Evgenovyje vodorosli vyp. 1. – Flora sporovykh rastenij SSSR. **8**. Izd. Nauka. Moskwa-Leningrad.

- RINO, J. A. & PEREIRA, M. J. (1989–90): Euglenophyta da regioao centro de Portugal. II. Género *Trachelomonas* EHR. 1833 emend. DEFL. 1926. II. Estrutura da lorica em microscopia electronica de varrimento. – Revista Biol. Univ. Aveiro **3**: 139–187.
- SALAZAR, C. (2004): Euglenophyta pigmentadas asociadas a *Hymenachne amplexicaulis* en una Sabana tropical inundable. – Acta Bot. Venez. **27**: 101–125.
- STARMACH, K. (1983): Euglenophyta-Eugleniny. – Flora Slodkowodna Polski **3**: 1–594. P. W. N. Warszawa.
- TELL, G. & CONFORTI, V. (1984): Ultraestructura de la lóriga de cuatro especies de *Strombomonas* DEFL. (Euglenophyta) en M.E.B. – Nova Hedwigia **40**: 123–131.
- TELL, G. & CONFORTI, V. (1986): Euglenophyta pigmentadas de la Argentina. – Biblioth. Phycol. **75**: 1–301.
- TELL, G. & CONFORTI, V. (1988): Quelques *Strombomonas* DEFL. (Euglenophyta) de l'Argentine au microscope photonique et électronique à balayage. – Nova Hedwigia **46**: 541–556.
- TELL, G. & ZALOCAR, Y. (1985): Euglenophyta pigmentadas de la provincia del Chaco (Argentina). – Nova Hedwigia **41**: 353–391.
- THÉRÉZIEN, Y. (1989): Algues d'eau douce de la partie amazonienne de la Bolivie. – Biblioth. Phycol. **88**: 1–75.
- ZALOCAR DE DOMITROVIC, Y. (1991): *Strombomonas* (Euglenophyta) nuevas o raras de la Argentina. – Cryptog., Algol. **12**: 271–281.

Manuscript received July 4, 2007, accepted July 29, 2008.

The authors' addresses:

DRA. VISITACIÓN CONFORTI  
Dpto. Biodiversidad y Biología Experimental  
Facultad de Ciencias Exactas y Naturales  
Ciudad Universitaria, Pab.II  
1428, Buenos Aires, Argentina  
E-mail: conforti@bg.fcen.uba.ar

ERICA OHIRCO  
Dpto. Biodiversidad y Biología Experimental  
Facultad de Ciencias Exactas y Naturales  
Ciudad Universitaria, Pab.II  
1428, Buenos Aires, Argentina  
E-mail: ericaohirko@yahoo.com.ar

DRA. NORA GÓMEZ  
Instituto de Limnología, Dr. R. Ringuelet  
CONICET; C.C. 712, La Plata, Argentina  
E-mail: nora@ilpla.edu.ar