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Study of Euglenophyta in the Jacuí Delta State Park, Rio Grande do Sul, Brazil. 1. *Euglena* Ehr., *Lepocinclis* Perty

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RESUMO – (Estudo de Euglenophyta no Parque Estadual Delta do Jacuí, Rio Grande do Sul, Brasil, 1. *Euglena* Ehr., *Lepocinclis* Perty). Este trabalho é o resultado do estudo de Euglenaceae pigmentadas realizado na área do Parque Estadual Delta do Jacuí, localizado entre paralelos 29°56' e 30°03'S e os meridianos 51°12'e 51°18'W, com amostragens qualitativas em 25 estações de coletas distribuídas em 8 ilhas, 8 sacos, 6 desembocaduras de rios e 3 canais, em dezembro/1993 e janeiro/1994 e de fevereiro/1998 a dezembro/1999. Foram identificados na área cerca de 150 táxons de Euglenophyceae. São apresentados, neste trabalho, 23 táxons específicos e infra-específicos do gênero *Euglena* e 12 táxons de *Lepocinclis*. *E. acus* Ehr. var. *acus* e *L. salina* Fritsch var. *salina* foram os táxons melhor representados na área por ocorrerem em mais de 40% dos biótopos estudados. *E. bonettoi* (Tell & Zaloc.) Couté & Thérez., *L. playfairiana* Defl. var. *striata* Conf. e *L. caudata* (Cunha) Conr. foram registrados exclusivamente para o América do Sul e 16 táxons identificados possuem distribuição cosmopolita. São fornecidas as amplitudes de algumas variáveis abióticas dos ambientes em que cada táxon ocorreu na área de estudo.

Palavras-chave: Euglenophyta, *Euglena, Lepocinclis*, Parque Estadual Delta do Jacuí, Sul do Brasil

ABSTRACT – (Study of Euglenophyta in The Jacuí Delta State Park, Rio Grande do Sul, Brazil. 1. *Euglena* Ehr., *Lepocinclis* Perty). This paper is the result of the study of pigmented Euglenaceae performed within the area of the Jacuí Delta State Park, located between parallels 29º56' and 30º03'S and meridians 51º12'and 51º18'W, with qualitative samplings at 25 stations, distributed over 8 islands, 8 "sacos" (i.e. small bays), 4 river mouths, 2 stream mouths and 3 channels in December/1993 and January/1994, and from February/1998 to December/1999. One hundred and fifty taxa of the Euglenophyceae were identified in the area. Currently 23 specific and infraspecific taxa of genus *Euglena* and 12 taxa of *Lepocinclis* are presented. *E. acus* Ehr. var. *acus*, and *L. salina* Fritsch var. *salina* were the taxa best represented in the region since they occured in over 40% of the samples studied. *E. bonettoi* (Tell & Zaloc.) Couté & Thérez., *L. playfairiana* Defl. var. *striata* Conf. and *L. caudata* (Cunha) Conr. were recorded exclusively for South America; sixteen taxa identified have a cosmopolitan distribution. Ranges of some abiotic variables of the environments in which each taxon occurred in the study area are mentioned.

Key words: Euglenophyta, *Euglena, Lepocinclis*, Jacuí State Delta Park, Southern Brazil

Introduction

In the geography of Rio Grande do Sul there are three large river basins in the central region of the state. The Guaiba basin covers the largest population (approximately 56% of the population of the state of almost 6 million inhabitants), the highest concentration of economic activities and, consequently, the largest number of environmental problems. This basin is divided into eight sub-basins interconnected by large rivers, that accumulated the wastes of the different activities of the population on their bed.

The Jacuí Delta State Park, at 29º56' and 30º03'S and 51º12' and 51º18'W (Fig. 1), located in the Guaíba basin, is one of the most significant nature areas in the Porto Alegre Metropolitan Region, covering a 1,724 hectare surface, running into the Delta region, the Jacuí, Caí, Gravataí and Sinos rivers, forming the so-called "four rivers delta". This park is formed by a large variety of floodable fields, wetlands, channels, islands and forests, presenting a broad diversity of species of fauna and flora. According to Köppen classification, the local climate is Cfa, the subtropical humid type.

This paper is part of the broader project within the Program for Rational Development Recovery and Environmental Management of the Guaiba River Basin ("Pró-Guaiba"), developed by researchers from the Natural Sciences Museum of the Zoobotanical Foundation of Rio Grande do Sul, aiming to acquire knowledge regarding to the fauna and the flora components in the Jacuí Delta State Park, in order to establish a Management Plan for this Conservation Unit.

In Brazil the class Euglenophyceae was studied firstly by foreign authors, being Ehrenberg (1843) the

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first author that published studies on the group. In the last decades the study of this group of algae in country have been developed thanks to the several Brazilian specialists' effort, like Alves-da-Silva (1998), Alves-da-Silva & Torres (1992; 1994), Cardoso (1979; 1982), Cecy (1990), Menezes (1984; 1990; 1994) and Xavier (1988; 1991; 1994), among others.

In Rio Grande do Sul State many papers registered the ocurrence of Euglenophyta. Alves-da Silva & Hahn (2001) analized 39 publications wich presented this algae group between 1972 and 2000, resulting in 244 taxa list in generic, specific and infra-specifica levels, already identified in the State.

The study of the Euglenophyta community in the area of the Jacuí Delta State Park began in 1993-1994, resulting in the publication of two papers, Alves-da-Silva & Ávila (1997) and Alves-da-Silva & Crossetti (1999), with the descriptions of only four species of *Euglena* and *Lepocinclis* (*E. bonetoi* (Tell & Zaloc.) Couté & Thérez., *E. oxyuris* Schmarda, *E. tripteris* (Duj.) Klebs and *L. salina* Fritsch).

Due to the high diversity of Euglenophyceae found in the Jacui Delta State Park (almost 150 taxa) we divided the results publication in four more papers. The present paper presents the genera *Euglena* and *Lepocinclis* found in the Park, and indicates the range of the abiotic variables in which each taxon occurred in the area of the study, contributing to broader the knowledge and distribution of these two genera.

Material and methods

Seventy-two samples collected by nets in December/1993 and January/1994, and from February/1998 to December/1999, were analyzed. They were distributed on eight island banks, eight small bays, four river mouths, three channels and stream mouths (Fig. 1). Quarterly samplings of phytoplankton were performed, only in the biotopes called stations 1 to 7 ("saco do Cabral" - station 1, "saco das Garças" - station 2, "canal Feliz" - station 3, "Ilha do Serafim" - station 4, "saco do Quilombo" - station 5, "saco do Jacaré" - station 6 and "saco da Pólvora" - station 7) and at the mouths of the four rivers. In these eleven environments, besides sampling biological material, water was collected to determine the following abiotic variables: ammonium, nitrate, nitrite, biochemical oxigen demande, orthophosphate, dissolved oxygen and organic matter according to APHA (1992). On the islands "Cabeçuda", "Marinheiros", "Formiga", "Siqueiras", "Cravo", "Pombas" and "Flores"; in the "canal do Lage" and "canal das Balseiras"; "saco dos Cachorros", "saco do Ferraz" and "saco Santa Cruz"; stream mouth of Guaiba and stream mouth of Sanga das Pedras samples were collected only during the summer. In all environments, except for the 1993-1994 samplings, the pH, electric conductivity, transparency and water temperature were measured in the field, pH directly with digital pHmeter, model DMPH-P; water electric conductivity directly with a field conductivimeter Digimed, model CD-28, transparency with Secchi disk, and water temperature with a chemical thermometer.

The samples were collected using a plankton net, with a 25µm mesh and subdivided into two parts: one part was fixed in the field, with a "Transeau" solution, at a 1:1 proportion, according to Bicudo & Bicudo, (1970) (in the 1993-1994 samples) or with formaldehyde 4% (in the 1998-1999 samples) and part was kept alive to observe certain morphological characteristics essential for the taxonomic identification of the Euglenophyceae. For the taxonomic analysis, we used a Leitz optical microscope, model Dialux.

For specific and infra-specific identification of the taxa, basic works were used such as: Conrad (1935), Conrad & Van Meel (1952), Gojdics (1953), Huber-Pestalozzi (1955), Németh (1980), Starmach (1983), Tell & Conforti (1986), Zakrýs (1986) and Wolowski (1998), besides recent papers about the group.

We present the illustration of the taxa that have not yet been publishes for the area, geographical distribution and some comments, besides supplying information regarding environmental factors in which each taxon occurred in the area of the study (Tab. 1).

All samples are kept in the collection of the Prof. Dr. Alarich R. H. Schultz Herbarium (HAS-Herbário Alarich R. H. Schultz) in the Natural Sciences Museum of the Zoobotanical Foundation of Rio Grande do Sul (Tab. 2).

Results and discussion

The study of 72 samples resulted in the identification of almost 150 taxa of Euglenophyta, wich only genera *Euglena* and *Lepocinclis* are presented, and they were represented by 35 specific and infra-specific taxa, listed below:

Family Euglenaceae

Genus *Euglena* Ehrenberg 1830

1. *Euglena acus* Ehr. var. ***acus***, Infusions. Organismen., 12, pl. 7, fig. l5. 1838.

Fig. 2

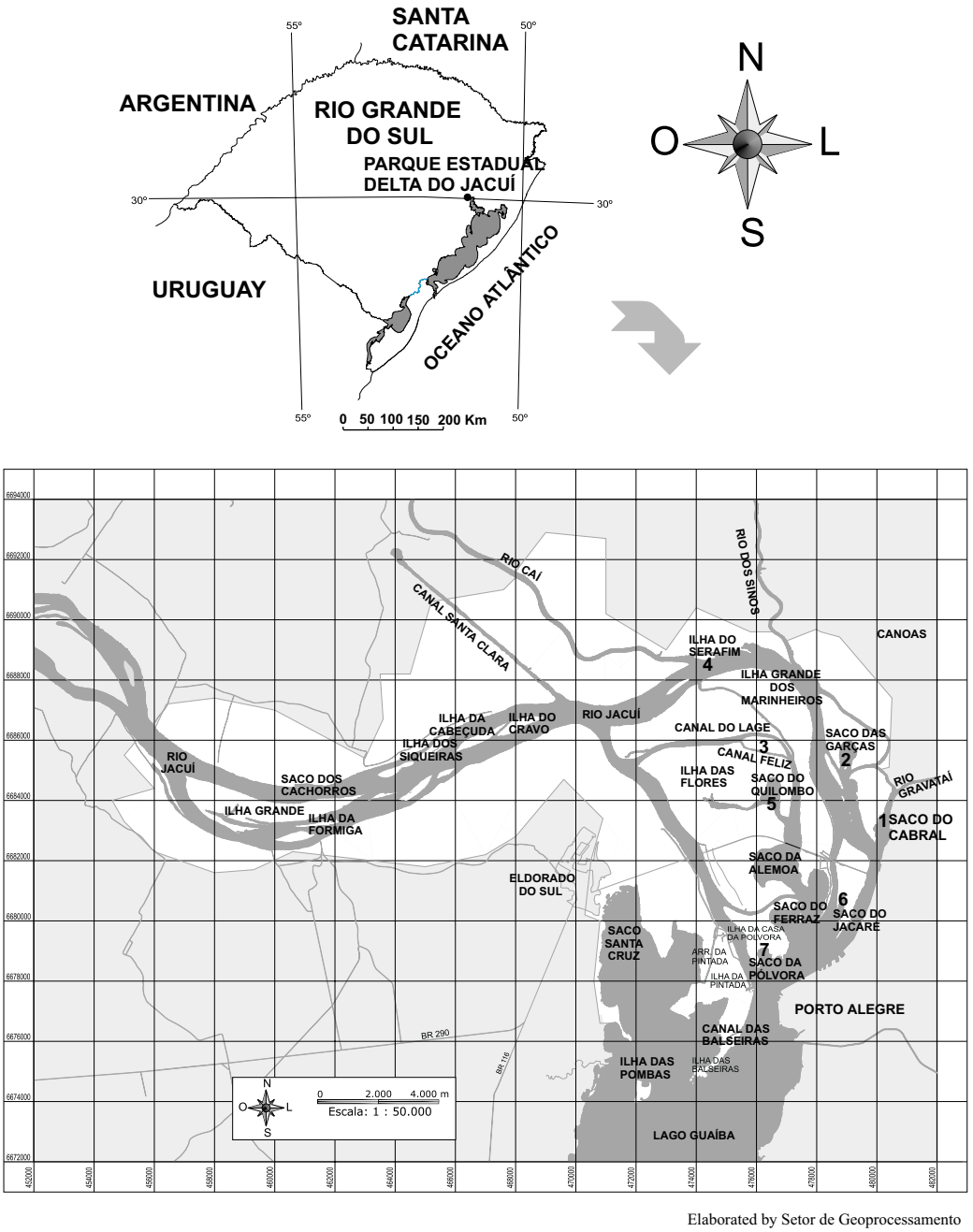
Cell fusiform, 92.5-102.6µm long, 7.4-8.3µm broad, Rl/b= 12.4; tail piece 12-17µm long, pellicle rigid to semi-rigid, striae longitudinal; paramylon grains 5 to numerous, rod-shaped.

Deposited sample: HAS 26331, HAS 26347, HAS 34633, HAS 34639, HAS 34647, HAS 34651, HAS 34657, HAS 34665, HAS 34709, HAS 34720, HAS 34791, HAS 34793, HAS 34805, HAS 34809, HAS 34813, HAS 34815, HAS 34817, HAS 34819, HAS 34822, HAS 34825, HAS 34831, HAS 34881, HAS 34885, HAS 34891, HAS 34908, HAS 34922, HAS 34992, HAS 34994, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: fast displacement, reduced metabolism, can assume S and J shapes. This taxon was well represented in the area, occurring in 40% of the environments studied.



Elaborated by Setor de Geoprocessamento

Figure 1. Area of the Jacui Delta State Park, RS, Brazil, with sampling stations.

Table 1. Variation range of abiotic data with occurrence of *Euglena* and *Lepocinclis* in the Jacuí Delta State Park, Rio Grande do Sul State, Brazil, in 1993-1994 and 1998-1999. NM = no measured.

Taxa/Environmental variables	pH	Temperature (ºC)	NH4 (µg.L^{-1})	NO2 (µg.L^{-1})	NO3 (µg.L^{-1})	P-orto (µg.L^{-1})	OD (mg.L^{-1})	BOD5 (mg.L^{-1})	Organic matter (mg.L^{-1})
Euglena acus var. *acus*	5.5-7.2	17.4-28.7	15-1,800	1.0-131	300-2,100	30-11,500	1.0-8.0	0.3-2.9	1.4-9.5
E. acus var. *longissima*	6.2-7.4	17.4-29.6	166-1,800	21916	300-1,100	30-11,500	1.0-8.0	0.3-2.9	3.0-9.5
E. agilis var. *agilis*	5.9-7.0	13.1-23.2	20-1,800	7.0-131	700-1,500	100-11,500	1.0-9.2	0.4-2.9	3.6-9.5
E. allorgei var. *allorgei*	5.6-6.8	16.7-27.4	14-1,200	1.0-131	400-1,300	160-1,440	1.1-8.3	0.3-2.4	3.6-7.3
E. bonettoi	NM	28.4	6.0	7.0	NM	NM	6.6	1.4	3.4
E. caudata	5.9-6.8	16.9-27.4	65-1,800	10-131	400-1,300	100-11,500	1.0-9.2	0.1-2.9	3.3-9.5
E. deses var. *intermedia*	6-6.8.0	17.4-23.2	360-1,300	20-131	600-1,300	460-1,900	2.5-4.4	0.1-2.4	3.7-8.0
E. ehrenbergii	5.9-8.2	17.5-28.4	65-1,800	10-131	700-1,300	3.8-11,500	1.0-9.8	0.1-2.9	3.7-9.5
E. gaumei	5.9-6.8	13.1-27.4	15-1,800	10-131	400-1,500	240-11,500	1.0-9.2	0.3-2.4	1.6-9.5
E. hemichromata	6.6-7.0	14.4-15.5	20-100	2.0-3.0	700-1,200	290-2,120	4.5-7.9	0.3-1.0	6.0-7.0
E. limnophila var. *limnophila*	6-6.4.0	17.2-27.4	37-1,800	8.0-50	600-1,100	180-500	1.0-6.9	1.2-9.0	4.6-13.9
E. limnophila var. *minor*	6.8-7.4	23.2-28.0	37-600	19-131	1.3	180-500	3.1-6.9	0.1-2.2	7.2-13.9
E. mutabilis	6.2-6.6	17.4-21.8	20-900	20-40	700-900	180-500	3.9-9.2	0.4-2.2	3.6-8.8
E. oxyuris var. *oxyuris*	5.5-6.8	16.7-27.4	15-1,800	1.0-131	300-1,300	60-11,500	1.0-9.2	1.2-9.0	3.4-9.5
E.oxyuris var. *charkowiensis*	6.8-7.6	22-30.3	NM	NM	NM	NM	5.6-6.5	0.6-1.4	3.3-3.4
E. polymorpha	6.0-8.0	17.1-23.2	90-1,300	1.0-131	600-1,300	60-11,500	1.3-8.3	0.1-4.1	3.7-8.8
E. rostrifera	6.8	23.2	360	131	1.3	530	4.4	2.4	3.7
E. sanguinea	6.0-6.8	17.4-23.4	360-600	20-131	900-1,300	460-530	3.1-4.4	0.1-2.4	3.7-7.2
E. splendens	5.9-7.0	12.8-27.4	12-1,800	1.0-131	0.7-1,500	30-11,500	1.0-9.2	0.2-2.9	3.3-9.5
E. spirogyra var. *spirogyra*	5.5-7.0	18.4-28.0	20-1,800	4-131	600-1,300	30-1,900	4.4-9.2	0.3-2.4	3.4-9.5
E. spirogyra var. *fusca*	6.3-6.6	17.4-25.1	20-1,300	2.0-48	700-1,100	30-1,900	1.0-9.2	0.3-2.9	3.6-8.0
E. tripteris var. *tripteris*	5.9-6.8	13.1-24.9	30-1,300	1.0-131	300-2,100	30-1,900	1.0-9.2	1.0-9.2	1.4-9.5
E. viridis	5.9-6.8	17.3-23.2	12-600	1.0-131	500-1,300	100-530	4.4-7.8	0.2-2.4	3.6-7.0
Lepocinclis caudata	6.6-6.9	18.5-23.2	360-600	2.0-131	600-1,300	290-1,520	1.3-4.5	0.3-3.2	3.7-7.9
L. fusiformis	5.5-6.9	13.1-30.0	18-1,800	2.0-131	600-2,100	0.78-1,800	1.0-7.8	0.2-2.9	1.7-8.5
L. fusiformis var. *amphyrinchus*	6.8	23.1-23.2	60-360	107-131	1,300-2,100	340-530	4.4-5.3	1.0-2.4	3.6-3.7
L. ovum var. *ovum*	5.6-6.8	16.7-28.0	14-1,800	0.01-38	0.8-700	1.4-1,900	1.0-9.2	0.3-2.9	4.8-9.5
L. ovum var. *dimidio-minor*	5.5-6.8	14.5-28.0	20-1,800	0.01-38	0.7-1,400	0.4-1,900	1.0-9.2	0.4-2.9	3.4-6.0
L. ovum var. *globula*	6.3-7.0	22.5-28.0	240-1,300	38-131	600-1,300	360-1,900	4.4-5.8	1.7-2.4	2.0-8.0
L. playfairiana	6.2-7.4	17.6-23.2	14.5-512	2.0-131	500-1,300	180-530	4.0-5.3	0.3-2.4	3.6-7.0
L. piriformis	6.2-7.0	21.6-30.0	240-442	28-41	700-1,100	290-360	5.8-9.2	1.0-1.8	2.0-5.5
L. salina var. *salina*	5.6-7.0	12.8-28.0	14-1,300	0.05-131	0.7-2,100	0.4-1,900	1.3-8.3	0.2-3.2	1.6-8.0
L. salina f. *obtusa*	6.2-7.6	16.9-28.7	12-1,300	1.0-131	500-1,300	30-1,900	1.1-9.2	0.2-2.4	2.0-8.0
L. salina var. *vallicauda*	5.6-6.5	21.6-28.0	15-1,300	12.0-48	600-1,100	120-1,900	1.3-9.2	0.3-1.7	1.6-8.0
L. steinii	6.8-7.0	28-30.3.0	NM	NM	7.0-25	NM	5.6-6.5	0.6-1.4	3.3-3.4

Table 2. Local of sampling stations in the Jacuí Delta State Park, Rio Grande do Sul State, Brazil, collected data and registration number in Prof. Dr. Alarich R. H. Schultz Herbarium (HAS).

Sampling stations	Date	HAS
Saco do Cabral= SC	7/V/1998	34632
Saco do Cabral= SC	15/IX/1998	34791
Saco do Cabral= SC	10/XI/1998	34805
Saco do Cabral= SC	5/IV/1999	34881
Saco do Cabral= SC	14/VI/1999	34945
Saco do Cabral= SC	27/IX/1999	34959
Saco das Garças=SG	7/V/1999	34633
Saco das Garças=SG	15/IX/1998	34793
Saco das Garças=SG	10/XI/1998	34807
Saco das Garças=SG	5/IV/1999	34883
Saco das Garças=SG	14/VI/1999	34947
Saco das Garças=SG	27/IX/1999	34961
Ilha do Serafim=IS	7/V/1999	34635
Ilha do Serafim=IS	15/IX/1998	34795
Ilha do Serafim=IS	10/XI/1998	34809
Ilha do Serafim=IS	5/IV/1999	34885
Ilha do Serafim=IS	14/VI/1999	34949
Ilha do Serafim=IS	27/IX/1999	34963
Canal Feliz=CF	7/V/1999	34637
Canal Feliz=CF	15/IX/1998	34797
Canal Feliz=CF	10/XI/1998	34811
Canal Feliz=CF	5/IV/1999	34887
Canal Feliz=CF	14/VI/1999	34951
Canal Feliz=CF	27/IX/1999	34965
Saco do Quilombo=SQ	7/V/1999	34639
Saco do Quilombo=SQ	15/IX/1998	34799
Saco do Quilombo=SQ	10/XI/1998	34813
Saco do Quilombo=SQ	5/IV/1999	34889
Saco do Quilombo=SQ	14/VI/1999	34953
Saco do Quilombo=SQ	27/IX/1999	34967
Saco do Jacaré=SJ	7/V/1999	34643
Saco do Jacaré=SJ	15/IX/1998	34801
Saco do Jacaré=SJ	10/XI/1998	34815
Saco do Jacaré=SJ	5/IV/1999	34891
Saco do Jacaré=SJ	14/VI/1999	34957
Saco do Jacaré=SJ	27/IX/1999	34969
Saco da Pólvora=SP	7/V/1999	34645
Saco da Pólvora=SP	15/IX/1998	34803
Saco da Pólvora=SP	10/XI/1998	34817
Saco da Pólvora=SP	5/IV/1999	34893
Saco da Pólvora=SP	14/VI/1999	34955
Saco da Pólvora=SP	27/IX/1999	34971
Foz Rio Gravataí=FG	26/II/1998	34647
Foz Rio Gravataí=FG	19/V/1998	34665
Foz Rio Gravataí=FG	11/VIII/1998	34709
Foz Rio Gravataí=FG	16/XI/1998	34819
Foz Rio dos Sinos=FS	26/II/1998	34651
Foz Rio dos Sinos=FS	19/V/1998	34667
Foz Rio dos Sinos=FS	11/VIII/1998	34712
Foz Rio dos Sinos=FS	16/XI/1998	34822
Foz Rio Caí=FC	26/II/1998	34654
Foz Rio Caí=FC	19/V/1998	34670
Foz Rio Caí=FC	11/VIII/1998	34715
Foz Rio Caí=FC	16/XI/1998	34825
Foz Rio Jacuí=FJ	26/II/1998	34657
Foz Rio Jacuí=FJ	19/V/1998	34676
Foz Rio Jacuí=FJ	11/VIII/1998	34720
Foz Rio Jacuí=FJ	16/XI/1998	34831
Saco dos Cachoros=SCA	27/XII/1993	34992
Ilha do Cravo=ICR	15/XII/1993	26327
Ilha do Cravo=ICR	27/XII/1999	34998
Ilha da Formiga=IFO	15/XII/1993	26335
Ilha da Formiga=IFO	27/XII/1999	34990
Ilha da Siqueira=ISQ	15/XII/1993	26333
Ilha da Siqueira=ISQ	27/XII/1999	34994
Ilha da Cabeçuda=IC	15/XII/1993	26329
Ilha da Cabeçuda=IC	27/XII/1999	34996
Foz Sangua Pedras=FSP	27/XII/1993	26331
Foz Sangua Pedras=FSP	27/XII/1993	26332
Canal das Balseiras=CB	15/XII/1993	26342
Canal das Balseiras=CB	19/I/1999	34908
Foz Arroio Guaíba=FAG	4/I/1994	26347
Ilha das Pombas=IP	19/I/1999	34910
Ilha Grande Marinheiros=IM	19/I/1999	34914
Saco do Ferraz=SF	19/I/1999	34916
Ilha das Flores=IF	19/I/1999	34920
Saco Santa Cruz=SSC	19/I/1999	34922
Canal do Lage=CL	19/I/1999	34924

2. *Euglena acus* Ehr. var. ***longissima*** Defl., Revue algol., 1(3):238, pl. 4, fig. 1-3. 1924a.

Fig. 3

Cell fusiform, 259µm long, 11-13.9µm broad, Rl/b= 22-23.3.

Deposited sample: HAS 26331, HAS 34665, HAS 34791, HAS 34793, HAS 34815, HAS 34819, HAS 34822, HAS 34992, HAS 34908, HAS 34994.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: this variety is different from the typical of the species due to the larger cells sizes and length: broad ratio.

3. *Euglena agilis* Carter, Annals. Mag. nat. Hist., 18(105):240, pl. 6, fig. 62. 1856.

Fig. 4-5

Cell fusiform, 22.5-24µm long, 8.5-9.4µm broad, Rl/b=2.5-2.6; tail piece 2.0-2.5µm long; pellicle spiral striated, delicate; chloroplasts 2, shield-like, parietal,

almost reaching the whole cell length, double-pyrenoids present.

Deposited sample: HAS 34637, HAS 34807, HAS 34809, HAS 34817, HAS 34819, HAS 34947, HAS 34957, HAS 34991.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: a very agile species with intense metabolism. Wolowski (1998) mentioned that *E. agilis* is known to form water blooms. In the present study this specie ocurred with mean relative frequency.

4. *Euglena allorgei* Defl. var. ***allorgei***, Bull. Soc. Bot. Fr., 24: 116, fig. 1-2. 1924b.

Fig. 6-7

Cell oblong to oblong- elliptic, 100-127µm long, 16.6-18.5µm broad, Rl/b= 6.0-7.6; tail piece 22-28µm long; granulated pellicle, longitudinal striae, sometimes are of difficult observation; chloroplasts numerous, disc-shaped; paramylum granules 2, rod-shaped, 23.5-25.4µm long.

Deposited sample: HAS 34647, HAS 34699, HAS 34720, HAS 34791, HAS 34793, HAS 34822, HAS 34881, HAS 34885, HAS 34994.

Distribution in Brazil: Amazonas: Uherkovich (1981), Thomasson (1971).

General distribution: Europe, North and South America.

Comments: displacement through slow movements. If the cell shape is considered this species can be mistaken for *E. oxyuris* Schmarda and *E. gaumei* Allorge & Lef., from which differs in having granulated pellicle, longitudinal striae and cell posterior pole ending in a caudal process bent to one side

5. *Euglena bonettoi* (Tell & Zaloc.) Couté & Thérez., Nova Hedwigia, 58(1-2):247, fig. 1-4. 1994.

Cell narrow cilindrical, 268.2-277.5µm long, 14.8-18.5µm broad, tail piece 92.5-102µm long, Rl/b= 14.5-18.7; pellicle longitudinal striated, scarce; paramylon grains 2, lateral, elongate, opposite; chloroplasts numerous, disc-shaped.

Deposited sample: HAS 26327, HAS 34998.

Distribution in Brazil: Mato Grosso: Menezes & Fernandes (1989). Rio Grande do Sul: Alves-da-Silva & Crossetti (1999, as *Phacus bonettoi*).

General distribution: this taxa was found exclusively in South America (Argentina, Bolivia and Brazil).

Comments: third reference to the occurrence of the species. This species was described for the first time for the Chaco, in northern Argentina, as belonging to genus *Phacus*, by the slight dorsoventral flattening. Couté & Thérezien (1994) proposed that this species should be transferred to genus *Euglena* due to the circular section and their similarity to *Euglena acus* Ehr. The exemplars observed agree with the description of the species, but are slightly smaller in length and broad. This species was considered rare, because occured only in the island of the Cravo, in samples of December/ 1993 and December/1999.

6. *Euglena caudata* Hübner Progr., Realg. Stralsund, p. 13. 1886.

Fig. 8

Cell fusiform, 81-112µm long, 22-28µm broad, Rl/b= 3.8-5.3; tail piece 4.6-9.2µm long; pellicle spiral striated; chloroplasts disc-shaped, numerous, with a smooth or slighty lobed margin, each with a sheated pyrenoid; paramylon grains numerous, small, oval to rod-shaped.

Deposited sample: HAS 34637, HAS 34639, HAS 34662, HAS 34665, HAS 34667, HAS 34709, HAS 34715, HAS 34793, HAS 34807, HAS 34811, HAS 34819, HAS 34881.

Distribution in Brazil: Distrito Federal: Cardoso (1982). Goiás: Prescott (1957). Rio de Janeiro: Menezes (1989).

General distribution: cosmopolitan.

Comments: movement intense, very metabolic, assuming form "C".

7. *Euglena deses* Ehr. var. ***intermedia*** Klebs, Unters. Bot. Inst. Tübingen, 1(2):303. 1883.

Fig. 12

Cell cylindrical to oblong, 84.2-85µm long, 11µm broad. Rl/b= 7.5-7.6, pellicle with striae delicate, spiral, difficult to observe; chloroplasts numerous, more than 20, disc-shaped, 4-8µm long, parietal; with pyrenoids.

Deposited sample: HAS 34632, HAS 34712, HAS 34791, HAS 34805, HAS 34881.

Distribution in Brazil: commum.

General distribution: cosmopolitan.

Comments: movement reptant. According Zackrýs (1986), differences between *E. deses* Ehr. var. *deses* and *E. deses* var. *intermedia* are the kind of paramylum granule and the presence or absence of pyrenoid. In the var. *deses* representatives, pyrenoids are present and paramylum granules are small and rod-shaped, whereas in the var. *intermedia* there is no pyrenoid and paramylum granules are dimorphic. Zakrýs *et al.* (2001) studied the ultrastructure of the chloroplasts of the two varieties above and realized that both have pyrenoids

and that the plastid organization is exactly the same.

8. *Euglena ehrenbergii* Klebs, Unters. Bot. Inst. Tübingen 1:304. 1883.

Fig. 9

Cell cylindrical, 166.5-185µm long, 19.4-34µm broad. Rl/b= 7.5; round at both ends but slighty narrower anteriorlly; pellicle spiral striated; chloroplasts numerous, disc-shaped; paramylon grains one, two or varing in number, rod-shaped, long or small numerous, sphaerical.

Deposited sample: HAS 34632, HAS 34637, HAS 34665, HAS 34709, HAS 34791, HAS 34807, HAS 34819, HAS 34822, HAS 34831, HAS 34881, HAS 34908, HAS 34994, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: species with intense metabolism, change of form until sphaerical. This species can be easily identified by its reptant moviment, cilindrical flattened form and metabolism.

9. *Euglena gaumei* All. & Lefr., Bull. Soc. Bot. Fr., 24:122-150. 1925.

Fig. 10

Cell cylindrical, 55-65µm long, 11µm broad, Rl/b= 5.8; tail piece 10.3µm long; pellicle longitudinal striated, very delicate, difficult to observe; chloroplasts numerous, disc-shaped; paramylon grains 2, rod-shaped.

Deposited sample: HAS 34639, HAS 34791, HAS 34807, HAS 34819, HAS 34881, HAS 34885, HAS 34891, HAS 34908, HAS 34947, HAS 34955, HAS 34992.

Distribution in Brazil: Rio Grande do Sul: Alves-da-Silva, S. M. & Bicudo, C.E. de M. (2002). Rio de Janeiro: Triani (1990).

General distribution: Asia, Europe, North and South America.

Comments: third mention of the occurence for Brazil. Rotation and movement intense, cell fastens itself by the caudal process and begins rotation from one side to the other, from left to right and vice-versa.

10. *Euglena hemichromata* Skuja, Symb. bot. ups., 9(3):185, pl. 21, fig. 10-13. 1948.

Fig. 11

Cell fusiform to cylindric-fusiform 100-108µm long, 22-24µm broad, long Rl/b= 4.2-4.9; tail piece 11.0µm; pellicle flexible, striae very delicate, spiral; chloroplasts numerous, rod or disc-shaped, margins irregular, sometimes replaced anteriorly by the paramylon grains that gives a colorless appearance to the anterior portion of cell and a greenish one to the posterior portion.

Deposited sample: HAS 34953, HAS 34955.

Distribution in Brazil: Amazonas: Uherkovich (1981).

General distribution: Europe, North and South America.

Comments: cells very metabolic that swim very fast rotating along their longitudinal axis, changing continuously their shape through contractions of the anterior cell pole and of the median region, thus giving the cell a somewhat club shape.

11. *Euglena limnophila* Lemm. var. ***limnophila***, Beih. Bot. Zbl., 76(44-45):152. 1898.

Fig. 13

Cell fusiform, 84-97µm long, 10-11. 5µm broad, Rl/b= 8.4; tail piece ca. 10µm long; pellicle rigid, striae delicate, difficult to observe, chloroplasts numerous, disc-shaped parietal, ca. 1.8µm diam. paramylon grains 2, rod-shaped.

Deposited sample: HAS 26331, HAS 34632, HAS 34712, HAS 34791, HAS 34811, HAS 34819, HAS 34881, HAS 34908, HAS 34916, HAS 34920, HAS 34922, HAS 34990, HAS 34992, HAS 34994, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: little metabolic. *E. limnophila* has taxonomic varieties that were proposed mainly on the basis of cell dimensions. Starmach (1983) mentioned measures between 40-90×7.5-12(-13.6)µm for the tipical species. Some specimens presently identified were slightly higher than the metrical limits in the lenght cited by this author.

12. *Euglena limnophila* Lemm. var. ***minor*** Drez., Kosmos 50:245, 268. 1925.

Fig. 14

Cell fusiform 55.5-59.2µm long, 11-12µm broad, Rl/b= 4.6-5.2; tail piece 11.0µm long.

Deposited sample: HAS 34908, HAS 34994.

Distribution in Brazil: Amazonas: Conforti (1994). Rio de Janeiro: Triani (1990).

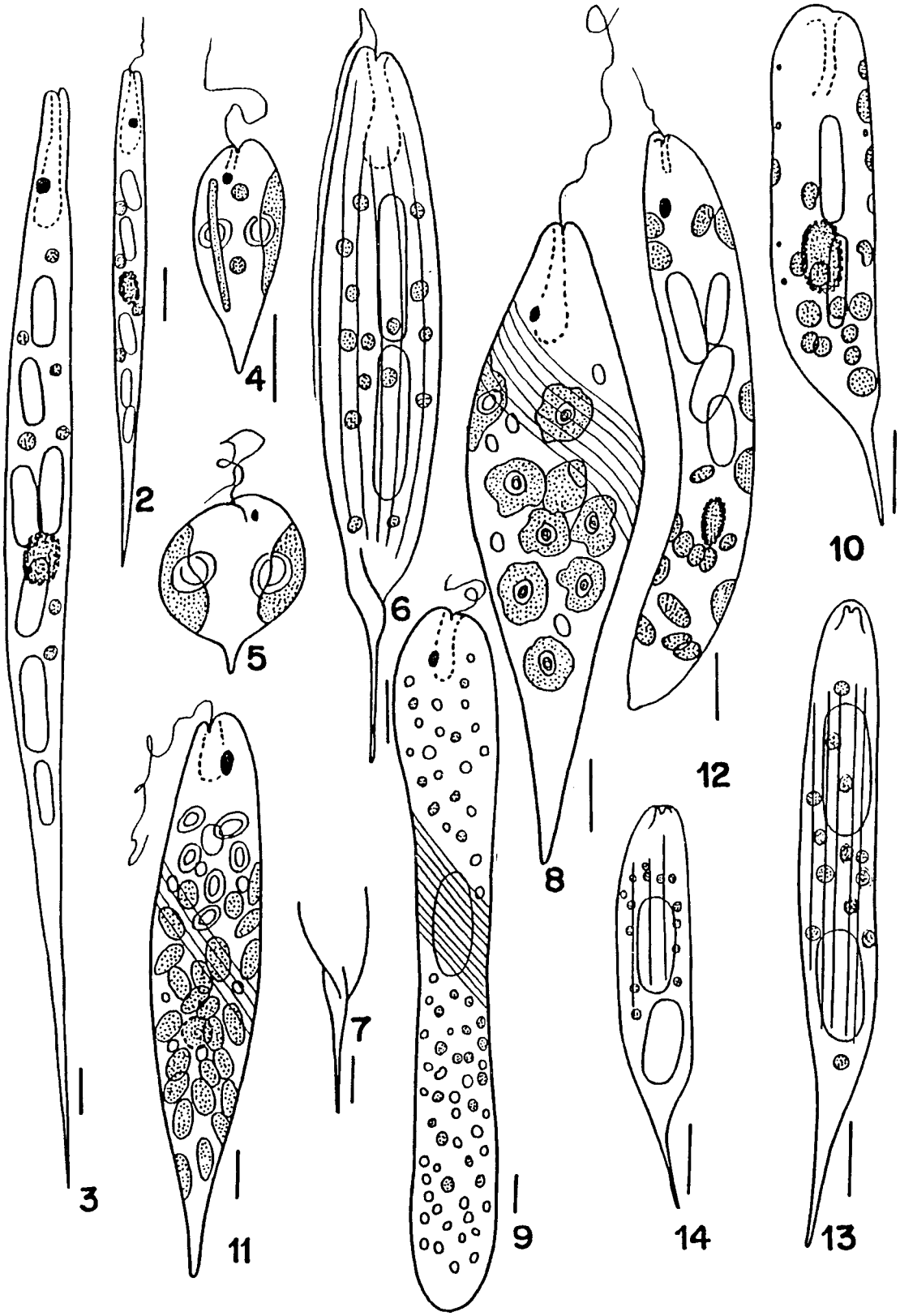
General distribution: Europe, South America.

Comments: this variety differ from the type by the smaller dimensions of the cell. Third reference of the ocorrence of the variety for Brazil.

13. Euglena *mutabilis* Schmitz, Jb. Wiss. Bot. 15:37, pl. 1, fig. 3. 1884.

Fig. 15

Cell narrow fusiform to nearly cylindrical, 95-128.5µm long, 9.5-12.8µm broad. Rl/b= 10; tail piece



Figures 2-14. 2- ***Euglena acus*** Ehr. var. ***acus***. 3. ***Euglena acus*** Ehr. var. ***longissima*** Defl. 4-5. ***Euglena agilis*** H.J. Carter var. ***agilis***. 5. Detail of the metabolic cell. 6-7. ***Euglena allorgei*** Defl. var. ***allorgei***. 7. Detail of caudal process. 8. ***Euglena caudata*** Hübner. 9. ***Euglena ehrenbergii*** Klebs. 10. ***Euglena gaumei*** All. & Lefr. 11. ***Euglena hemichromata*** Skuja. 12. ***Euglena deses*** Ehr. var. ***intermedia*** Klebs. 13. ***Euglena limnophila*** Lemm. var. ***limnophila***. 14. ***Euglena limnophila*** Lemm. var. ***minor*** Drez. (Bars =10µm).

cilindrical; pellicle spiral striated; chloroplasts 4-8 per cell single unilateral, scarcely visible pyrenoids; paramylon grains, numerous, rod-shaped.

Deposited sample: HAS 34709, HAS 34791, HAS 34807, HAS 34817.

Distribution in Brazil: Distrito Federal: Cardoso (1982); Rio Grande do Sul: Rosa *et al.* (1987), Alves-da-Silva & Torres (1994), Alves-da-Silva & Laitano (1994); Rio de Janeiro: Menezes (1989).

General distribution: Asia, Europe, North and South America.

Comments: movement reptant. Species cited especially for acid waters even of very low pH; the present study it occured in pH slightly acid (6.2-6.6). In Rio Grande do Sul state of the species ocurred in acid until alcaline water.

14. *Euglena oxyuris* Schmarda var. ***oxyuris***, Beitr. Nat. Infus. 17, pl. 1, fig. 17. 1846.

Cell cylindrical, 174-277.5µm long, 23-28µm broad, Rl/b= 8.4-9.9; tail piece ca. 48µm long; pellicle rigid to semi-rigid, striae spiral, following the cell body twisting; chloroplasts numerous, disc-shaped, parietal; paramylon grains 2, rod-shaped.

Deposited sample: HAS 26331, HAS 26335, HAS 26347, HAS 34632, HAS 34633, HAS 34645, HAS 34651, HAS 34665, HAS 34791, HAS 34803, HAS 34805, HAS 34807, HAS 34813, HAS 34819, HAS 34822, HAS 34881, 34908, HAS 34916, HAS 34990, HAS 34992, HAS 34994, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: movement reduced. Displacement helicoidal, slow, changes in the cell shape restricted to small bends of the cell body. This taxon is well represented in the area, occurring in 30,5% of the environments studied.

15. *Euglena oxyuris* Schmarda var. ***charkowiensis*** Bourr., Sinensia 17(1,6):95. 1946.

Fig. 16

Cell cilindrical, 111-116µm long, 20.3-23.1µm broad, Rl/b= 5.0; tail piece 18.5-23µm long.

Deposited sample: HAS 26342, HAS 34822, HAS 34825, HAS 34831, HAS 34901, HAS 34922, HAS 34992, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: this variety differ from the type by the smaller dimensions of the cell.

16. *Euglena polymorpha* Dang., Botaniste, 8:175, fig. 12. 1901.

Fig. 17

Cell fusiform, 53-82µm long, 16-18µm broad, Rl/b= 3.3-4.5; tail piece 5.5-7.5µm long; pellicle flexible, striae delicate, spiral; chloroplasts numerous, disc-shaped, margin irregular; double-pyrenoids present.

Deposited sample: HAS 34632, HAS 34647, HAS 34709, HAS 34720, HAS 34791, HAS 348053, HAS 34813, HAS 34881, HAS 34908, HAS 34969, HAS 34998.

Distribution in Brazil: Distrito Federal: Cardoso (1982). Rio Grande do Sul: Alves-da-Silva & Torres (1994). Rio de Janeiro: Cunha (1913a), Fernandes (1998). São Paulo: Xavier (1991; 1994).

General distribution: cosmopolitan.

Comments: highly metabolic, getting variats shapes during displacement, with strong contortions in the anterior cell pole, whereas the posterior pole remains attenuated (conical). Therefore, cell would assume an obvoid shape, with a strong tendency to spherical forms; however, caudal process remains always rigid.

17. *Euglena rostrifera* Johnson, Trans. Am. Micr. Soc., 43(2):123, fig. 29 a-d. 1944.

Fig. 18

Cell fusiform, usually bulged near middle anterior pole to a form a "snout", caracteristic of the species, 120-135µm long, 17.6-21.3µm broad, Rl/b= 5.9-6.3; tail piece 11µm long; pellicle spiral striated; cloroplasts numerous, elongates; paramylon grains, annular discoidal, 5-8µm of diam.; double-pyrenoids present, also rod-shaped free in cytoplasm.

Deposited sample: HAS 26342, HAS34881.

Distribution in Brazil: first mention of the occurence for Brazil.

General distribution: North and South America.

Comments: Gojdics (1953) mentioned this species with resemblence between *E. granulata* (Klebs) Scmithz and *E. polymorpha* because of the body and chloroplast shape, but it differs in having a flagellum of body lenght, proeminent colorless anterior end, longer canal, more proeminent striae, is slightly metabolic locomotion, lack of the cytoplasmic granules, and it is usually found under the water surface.

18. *Euglena sanguinea* Ehr., Abh. Berl. Akad. Wiss. Physik aus d. Jahre 1831, Berlin, p.71 (1832).

Fig. 19-20

Cell broadly fusiform to spindle shaped, 109-127µm long, 22-27µm broad, Rl/b= 3.4-4.4; tail piece ca.8.0µm long; pellicle spiral striated; chloroplasts numerous (more

than 25) with deeply incised lobate margins; pyrenoids bilateral, located in the centre of each chloroplast; paramylon grains small, oval or rod-shaped, numerous; haematochrome granules round (until 1.0µm diam.) very numerous located throughout cell; chloroplasts and pyrenoids frequently obscured by hematochrome.

Deposited sample: HAS 34632, HAS 34647, HAS 34791, HAS 34881, HAS 34908.

Distribution in Brazil: Distrito Federal: Cardoso (1982). Mato Grosso: Heckman, *et al*. (1993). Rio Grande do Sul: Alves-da-Silva & Torres (1994). Rio de Janeiro: Cunha (1913a). São Paulo: Xavier (1991).

General distribution: cosmopolitan.

Comments: most of the red blooms seen have beem atributed to this species. In this study *E. sanguinea* ocurred in low individual number.

19. *Euglena splendens* Dang., Botaniste, 8:69, fig. 9. 1901.

Fig. 21

Cell fusiform, 90-120µm long, 25µm broad, Rl/b= 4.8; tail piece 20.0µm long; pellicle flexible, striae spiral; chloroplasts ca. 12, axial, disc-shaped, longitudinal incisions deep, projections irradiating towards the cell periphery like narrow, anastomosing bands, disposed in a helix; double-pyrenoids present; mucocysts fusiform, ca. 0.9µm diam.

Deposited sample: HAS 34709, HAS 34791, HAS 34793, HAS 34797, HAS 34801, HAS 34805, HAS 34807, HAS 34809, HAS 34811, HAS 34813, HAS 34819, HAS 34881, HAS 34945, HAS 34947, HAS 34963.

Distribution in Brazil: Rio Grande do Sul: Alves-da-Silva (1998). Rio de Janeiro: Menezes (1989). São Paulo: Xavier (1991,1994).

General distribution: cosmopolitan.

Comments: movement active; displacement fast, around its longitudinal axis; rounding up very easily.

20. *Euglena spirogyra* Ehr. var. ***fusca*** Klebs, Unters. Bot. Inst. Tübingen, 1:77. 1883.

Fig. 22

Cell cylindrical, 178-199µm long, 30-51µm broad, Rl/b= 4.0-6.0; tail piece ca 28µm long.

Deposited sample: HAS 34632, HAS 34791, HAS 34803, HAS 34805, HAS 34891, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: this variety differ from the type for the largest dimensions, for developed and polygonal warts and for the coloration of the pellicle well darker (chestnut-red).

21. *Euglena spirogyra* Ehr. var. ***spirogyra***, Abh. Berl. Akad. Wiss. Physik aus d. Jahre 1830, Berlin, p.83, (1832).

Fig. 23

Cell cylindrical, 85-88µm long, 10-12µm broad, Rl/b= 7.3-8.0; tail piece 11-12µm long; pellicle yellowish bearing 12-14 rows of usually hemispherical, bead-like protuberans wich are usually spirally arranged; chloroplasts numerous, small disc, ca. 3µm diam.; paramylon grains 2.

Deposited sample: HAS 34651, HAS 34709, HAS 34805, HAS 34807, HAS 34809, HAS 34817, HAS 34819, HAS 34822, HAS 34881, HAS 34908, HAS 34994.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: the population showed wide variability of periplast colour and ornamentation.

22. *Euglena tripteris* (Duj.) Klebs var. ***tripteris***, Unters. Bot. Inst. Tübingen, 1: 306. 1883.

Cell fusiform 58-66µm long, 11.5-14µm broad, tail piece 10-16µm long. Rl/b= 4.7-5.8; 3-radiate in transverse optical section, pellicle flexible, striae longitudinal, delicate, following the cell torsion; chloroplasts numerous, disc-shaped, parietal, 2.8-3.7µm diam.; paramylum granules 2, rod-shaped.

Deposited sample: HAS 34805, HAS 34807, HAS 34809, HAS 34813, HAS 34819, HAS 34885, HAS 34881, HAS 34887, HAS 34891, HAS 34908, HAS 34910, HAS 34947, HAS 34965.

Distribution in Brazil: Amazonas: Thomasson (1971). Paraná: Cecy (1990), Jati & Train (1994). São Paulo: Cardoso (1979), Xavier (1994). Rio de Janeiro: Cunha (1913a; 1914), Menezes (1989), Triani (1990). Rio Grande do Sul: Alves-da-Silva & Torres (1994), Franceschini (1992).

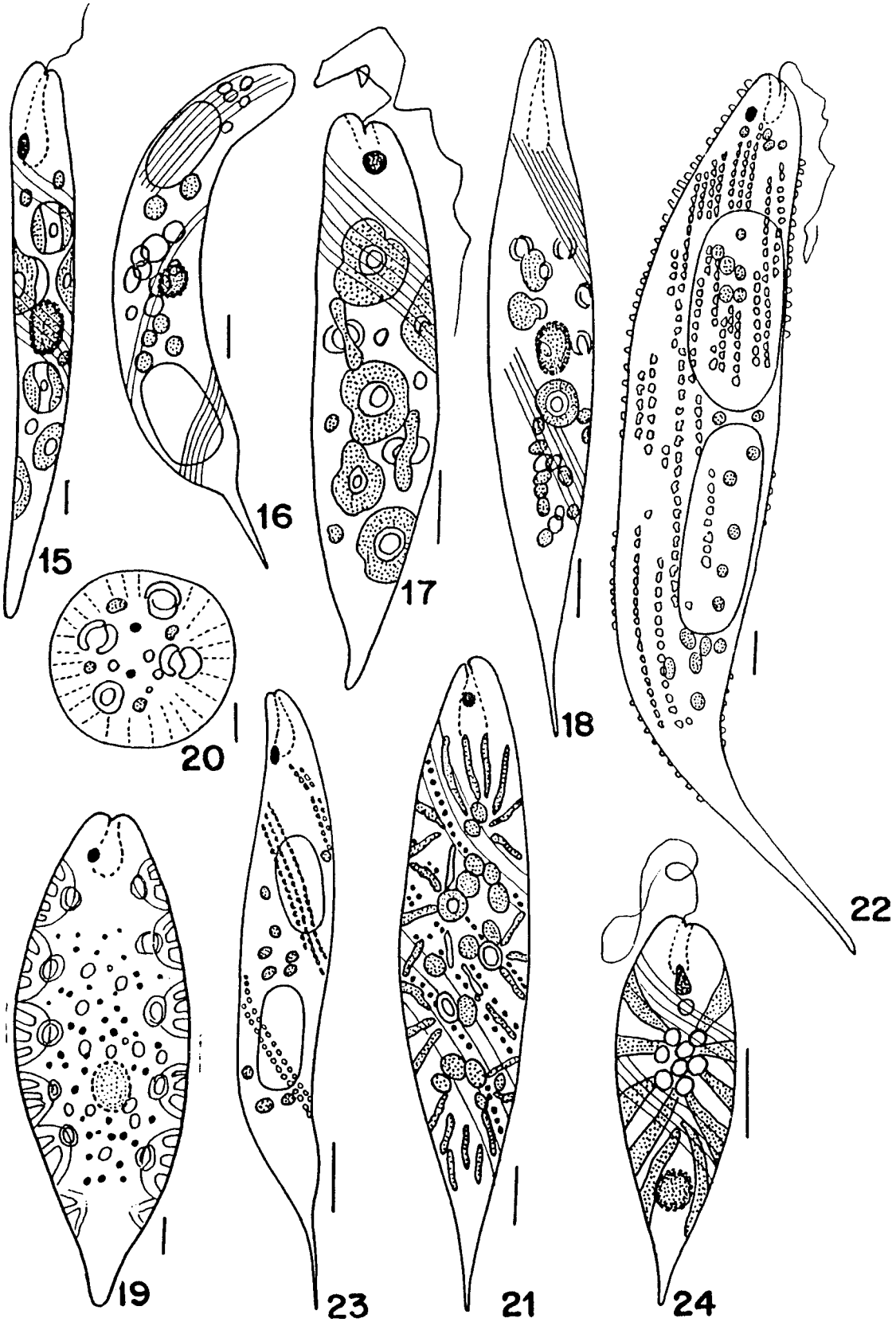
General distribution: cosmopolitan.

Comments: fast displacement, helicoidal rotation movement. *E. tripteris* resembles very much the morfology of *E. oxyuris*. It differs from *E. oxyuris* in the greater cell torsion and in the transverse optical section of the cell, wich is 3-radiate in *E. tripteris*, and elliptical in *E. oxyuris.*

23. *Euglena viridis* Ehr., Abh. Berl. Akad. Wiss. Physik Aus d. Jahre 1830, Berlin, p.39, 82 (1832).

Fig. 24

Cell fusiform to spindle shaped, 43-46µm long, 10.2-14.8µm broad, Rl/b= 2.9-4.2; tail piece ca 4.0µm



Figures 15-24. 15. ***Euglena mutabilis*** Schmitz. 16. ***Euglena oxyuris*** Schmarda var. ***charkowiensis*** Bourr. 17. ***Euglena polymorpha*** Dang. 18. ***Euglena rostrifera*** Johnson. 19-20. ***Euglena sanguinea*** Ehr. 21. ***Euglena splendens*** Dang. 22. ***Euglena spirogyra*** Ehr. var. ***fusca*** Klebs. 23. ***Euglena spirogyra*** Ehr. var. ***spirogyra***. 24. ***Euglena viridis*** Ehr. (Bars =10μm).

long; trichocystis fusiform; pellicle spiral striated; chloroplasts numerous, ribbon-shaped and radiate from paramylon centre, ever ramified towards the periplast.

Deposited sample: HAS 34632, HAS 34797, HAS 34803, HAS 34815, HAS 34817, HAS 34910, HAS 34992, HAS 34994, HAS 34998.

Distribution in Brazil: Distrito Federal: Cardoso (1979). Rio de Janeiro: Cunha (1913), Menezes (1989), Oliveira *et al.* (1967), Prowazek (1910). São Paulo: Cardoso (1982).

General distribution: cosmopolitan.

Comments: intense metabolism with contortions, getting bulging in the middle of the cell. When the contorsion, the cell bends, closing up the anterior and posterior poles. Wolowski (1998) mentioned that this specie ocurrs in pH 4.5-8.0. In the study the specimens ocurred in water with pH between 5.9-6.8, therefore slightly acid.

Genus *Lepocinclis* Perty 1852

24. *Lepocinclis caudata* (Cunha) Conr., Arch. Protistenk., 82(2):224, fig. 27. 1934.

Fig. 25

Cell broadly elliptic, 56.4-57.3µm long, 22.2-24µm broad, Rl/b= 2.3-2.5; tail piece 16-18.5µm long; pellicle striae spiral to the left; chloroplasts numerous, disc-shaped, ca. 3.5µm diam.; paramylon grains 2, lateral, ring-shaped, ca. de 20µm diam.

Deposited sample: HAS 26347, HAS 34632, HAS 34881, HAS 34908, HAS 34959, HAS 34998.

Distribution in Brazil: Amazonas: Conforti (1994). Rio Grande do Sul: Alves-da-Silva & Ferraz (1991), Alves-da-Silva *et al.* (1991), Alves-da-Silva & Torres (1992). Mato Grosso: Menezes & Fernandes (1989). Paraná: Jati & Train (1994). Rio de Janeiro: Cunha (1914), Menezes (1990).

General distribution: Indic Ocean (Sonda island), South America.

Comments: displacement fast, for the presence of one flagellum of 0.5 to 1 time the cellular length.This species was described by Cunha (1914) in an fresh water, in the city of Rio de Janeiro. This species has been registered in several Brazilian states. In Rio Grande do Sul has ocurred in waters with pH 6.4-9.2 and temperature between 12 and 32ºC, indicating that this species supports wide variation of those abiotics factors.

25. *Lepocinclis fusiformis* (Carter) Lemm. emend. Conr. var. ***fusiformis***, Arch. Protistenk., 82(2):225, fig. 30. 1934.

Fig. 26-27

Cell fusiform to lemon-shaped 31.4-42.0µm long, 24-28µm broad, tail piece 2.0-4.0µm long. Rl/b= 1.3-1.6; pellicle spiral striated to the left, very delicate; chloroplasts numerous, discoid to ellipsoid, ca. 2.8µm diam.; paramylon grains 2, lateral, ring-shaped, sometimes somewhat elliptical.

Deposited sample: HAS 26333, HAS 34632, HAS 34791, HAS 34805, HAS 34815, HAS 34817, HAS 34881, HAS 34885, HAS 34947.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: fast displacement, for the presence of one flagellum of 0.5 to 1 time the cellular length. This specie is characteristic by the fusiform to lemon-shaped cell, with the anterior pole nipple-shaped.

26. *Lepocinclis fusiformis* (Carter) Lemm. emend. Conr. ***amphirhynchus*** Nyg., Dank Vid. Selsk. Biol. Skr. 7(1):167, fig. 101. 1949.

Fig. 28

Cell fusiform to lemon-shaped, 32.3-37µm long, 23-25µm broad, long. Rl/b= 1.4-1.5; tail piece ca. 3µm long.

Deposited sample: HAS 34881, HAS 34885.

Distribution in Brazil: Amazonas: Uherkovich & Schmit (1974), Conforti (1994).

General distribution: Africa, Asia, South America.

Comments: third mention of the occurence for Brazil and the first for the State. This variety differ from the type by present anterior polo rounded-obtuse with up to 4.6µm long and tail piece small. This individuals presented slightly larger in lenght than mentioned in literature, that give length of the variety up to 31µm.

27. *Lepocinclis ovum* (Ehr.) Lemm. var. ***ovum***, Kryptog. Bradenburg, 3:504, fig. 13. 1910.

Fig. 29

Cell elliptic to oblong-elliptic 29.6-35µm long, 18.5-23µm broad, tail piece 4.0µm long. Rl/b= 1.3-1.8; pellicle spiral striated to the left; chloroplasts numerous, parietal, discoid, ca. 3,7µm diam.; paramylon bodies 2, lateral, ring-shaped, sometimes elongate.

Deposited sample: HAS 26327, HAS 26331, HAS 26347, HAS 34632, HAS 34647, HAS 34799, HAS 34805, HAS 34807, HAS 34819, HAS 34822, HAS 34908, HAS 34914, HAS 34916, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: *L. ovum* (Ehr.) Lemm. is the most characteristic species of the genus (Conrad 1935). The latter author also mentioned that the species is

highly polymorphic and frequently displays some variation in the shape and length of caudal process.

28. *Lepocinclis ovum* (Ehr.) Lemm. var. ***dimidio-minor*** Defl., Bull. Soc. Bot. Fr. 71:1121, fig. 25-28. 1924.

Fig. 30

Cell narrowly to broady elliptic, 16.6-17.5µm long, 8.3-12µm broad, tail piece ca. 1µm long. Rl/b= 1.4-2.0.

Deposited sample: HAS 26331, HAS 26346, HAS 34639, HAS 34645, HAS 34647, HAS 34651, HAS 34667, HAS 34709, HAS 34805, HAS 34807, HAS 34819, HAS 34822, HAS 34908, HAS 34914, HAS 34916, HAS 34922, HAS 34957, HAS 34990.

Distribution in Brazil: very common.

General distribution: Africa, Asia, Europe and South America.

Comments: this variety differs from the type by the smaller dimensions of the cell and caudal process reduced to a nipple.

29. *Lepocinclis ovum* (Ehr.) Lemm. var. ***globula*** (Perty) Lemm., Kryptogamenfl. Bradenburg, 3(4):505. 1910.

Fig. 31

Cell subglobe, 29-33.3µm long, 25-28.7µm broad, tail piece 2-3µm long. Rl/b= 1.1-1.2.

Deposited sample: HAS 34805, HAS 34807, HAS 34881, HAS 34883, HAS 34890, HAS 34998.

Distribution in Brazil: very commom.

General distribution: cosmopolitan.

Comments: this variety differs from the type by subglobe-shaped cell, some individuals presented cells larger than those mencioned by the literature, reaching up to 28.8µm of broad.

30. *Lepocinclis playfairiana* Defl. var. ***striata*** Conf., Nova Hedwigia, 53(1-2):79, pl.2, fig. 9. 1991.

Fig. 32-33

Cell oval 37-43.5µm long, 20.3-25µm broad, Rl/b= 1.7-1.8; tail piece 2-10µm long.

Deposited sample: HAS 26327, HAS 26333.

Distribution in Brazil: Amazonas: Conforti (1994).

General distribution: Exclusively in South America (Argentina, Brazil).

Comments: second mention of the occurence for Brazil. This variety differs from the type by spiral striae from left to right, whereas the species does not have visible striae. This variety is very similar to *L. caudata* var. *nasuta* Conrad, although it is larger. A few exemplars were recorded with smaller cells sizes than those mentioned by the author of the variety, but presented a similar general morphology. In her opinion, they are young individuals.

31. *Lepocinclis piriformis* Cunha, Mem. Inst. Osvaldo Cruz, 5(2):109, fig. 1,10. 1910.

Fig. 34

Cell obpyriform, 32.4-37µm long, 18.5-19.4µm broad, Rl/b= 1.7-1.9; tail piece 10.0µm long; pellicle striae right to left, chloroplasts numerous, parietal, discoid, ca. 3,7µm diam.; paramylon bodies 2, lateral, ring-shaped.

Deposited sample: HAS 26331, 34654, HAS 34712, HAS 34807, HAS 34819, HAS 34883.

Distribution in Brazil: Amazonas: Conforti (1994). Rio de Janeiro: Cunha (1913a; b).

General distribution: exclusively in South America (Argentina, Brazil).

Comments: this species present a morphology close to *L. turbiniformis* Defl., and is distinguished by the direction of the striae that is from left to right in this one and from right to left in *L. piriformis*.

32. *Lepocinclis salina* Fritsch var. ***salina***, New Phytol., 13:351, fig. 3 a, b, e. 1914.

Cell broadly elliptic, oblong to oval, 28-52µm long, 21-44.4µm broad. Rl/b= 1.2-1.4; spirally striated to the right; chloroplasts numerous, parietal, discoid, ca. 2.8µm diam.; paramylon bodies numerous, discoid, globose oe elongate, never ring-shaped, 4.0-7.0µm diam.

Deposited sample: HAS 26329, HAS 26331, HAS 26347, HAS 34632 HAS 34637, HAS 34639, HAS 34647, HAS 34699, HAS 34712, HAS 34720, HAS 34791, HAS 34793, HAS 34801, HAS 34803, HAS 34805, HAS 34811, HAS 34813, HAS 34817, HAS 34822, HAS 34825, HAS 34831, HAS 34881, HAS 34883, HAS 34885, HAS 34889, HAS 34891, HAS 34908, HAS 34916, HAS 34945, HAS 34947, HAS 34959, HAS 34992, HAS 34994, HAS 34998.

Distribution in Brazil: very common.

General distribution: cosmopolitan.

Comments: *Lepocinclis salina* is very similar morphologically with *L. texta* (Duj.) Lemm. emend. Conr. *L. salina* striae are twisted to the right, while in *L. texta*, are to the left. Furthermore, *L. salina* presents excentric pharyngeal openning, located at the bottom of a deep depression, and its transverse optical section is circular, while in *L. texta* the optical section is elliptic.

These taxa were well represented in the area, occurring in 44.4% of the study environments; it was also observed high polymorphism and some variations in the shape of the cell and lenght or caudal process.

33. *Lepocinclis salina* Fritsch f. ***obtusa*** (Hub.-Pest.) Conr., Verh. Internat. Ver. F. theor. U. angew. Limnologie, 4:349, fig. 10. 1929.

Fig. 35

Cell broad to moderately elliptic to slightly ovoid, 42-56.4µm long, 28-33.3µm broad, Rl/b= 1.4-1.7; tail piece until 5µm long.

Deposited sample: HAS 34632, HAS 34639, HAS 34712, HAS 34715, HAS 34791, HAS 34793, HAS 34805, HAS 34807, HAS 34809, HAS 34815, HAS 34822, HAS 34825, HAS 34832, HAS 34881, HAS 34992, HAS 34994.

Distribution in Brazil: Rio Grande do Sul: Franceschini (1992, como *L. salina* f.); Alves-da-Silva & Torres (1992, como *L. salina* var. *papulosa*).

General distribution: Africa, South America.

Comments: this variety differs of the typical of the species for posterior pole attenuated into a caudal process straight or slightly curved, colourless, conical-truncate. The cells occuring in our samples were larger than the taxon described by Conrad (1935, p. 63, fig. 58), with 37.5µm long, 26µm broad. The f. *obtusa* is close morphological resembles to *L. texta* (Duj.) Lemm. emend. Conr. var. *mamillata* Cunha but they are distinct in the twisting of the periplast striae and in the caudal process that is conical rounded in the var. *mamillata*, and conical truncate in the f. *obtusa*.

34. *Lepocinclis salina* Fritsch var. ***vallicauda*** Conr., Mem. Mus. r. Hist. nat. Belg., 2(10):63. 1942.

Fig. 36

Cell ovoid, 53-63µm long, 31.4-37µm broad, Rl/b= 1.7; tail piece 5.5-8.6µm long.

Deposited sample: HAS 34647, HAS 34715, HAS 34805, HAS 34807, HAS 34891, HAS 34922.

Distribution in Brazil: Minas Gerais: Giani *et al.* (1999). Rio Grande do Sul: Alves-da-Silva & Torres (1992), Alves-da-Silva & Laitano (1994), São Paulo: Bicudo *et al.* (1999), Sant'Anna *et al.* (1989).

General distribution: Africa, South America.

Comments: this variety differs of the type by the posterior pole that presents tail piece conic-rounded, oblique reaching up to 8.6µm long; present a morphology close to *L. texta* (Duj.) Lemm. emend. Conr. var. *richiardiana* Conr., and is distinguid by the direction of the striae that from left to right in this one and from right to left in var. *vallicauda*.

35. *Lepocinclis steinii* Lemm. emend. Conr. var. ***steinii***, Arch. Protistenk., 82(2):207, fig. 5 a-c. 1934.

Fig. 37

Cell narrow eliptical to fusiform, 24.5-26µm long, 7.3-7.9µm broad, tail piece 2.2µm long. Rl/b= 3.1-3.5; pellicle striae longitudinal; chloroplasts numerous, disc-shaped; paramylon grains 1-3, ring-shaped.

Deposited sample: HAS 26337, HAS 34908, HAS 34998.

Distribution in Brazil: Rio Grande do Sul: Alves-da-Silva & Torres (1992), Alves-da-Silva & Laitano (1994). Rio de Janeiro: Cunha (1913b), Menezes (1990). São Paulo: Sant'Anna *et al.* (1989), Bicudo *et al.* (1999).

General distribution: cosmopolitan.

Comments: Conrad (1935) mentioned this species as presenting great morphologic variability, with prolonged, truncated, round or chamfered anterior pole and the posterior with evident process or reduced conical process.

This species is very similar morphologically to *L. ovum* var. *dimidio-minor* distinguinshing for the longitudinal striae, by the anterior pole, the greater dimensions of cell, and R l/b= 3.1-3.5.

The specimens ocurred in State of Rio Grande do Sul in water with pH 6.2 to 9.7 and water temperature between 13 and 29.5ºC. In this study the species ocurred in water with pH 6.8-7.0 and water temperature from 28 to 30.3ºC, indicating that this species supports wide variation of these two abiotics factors.

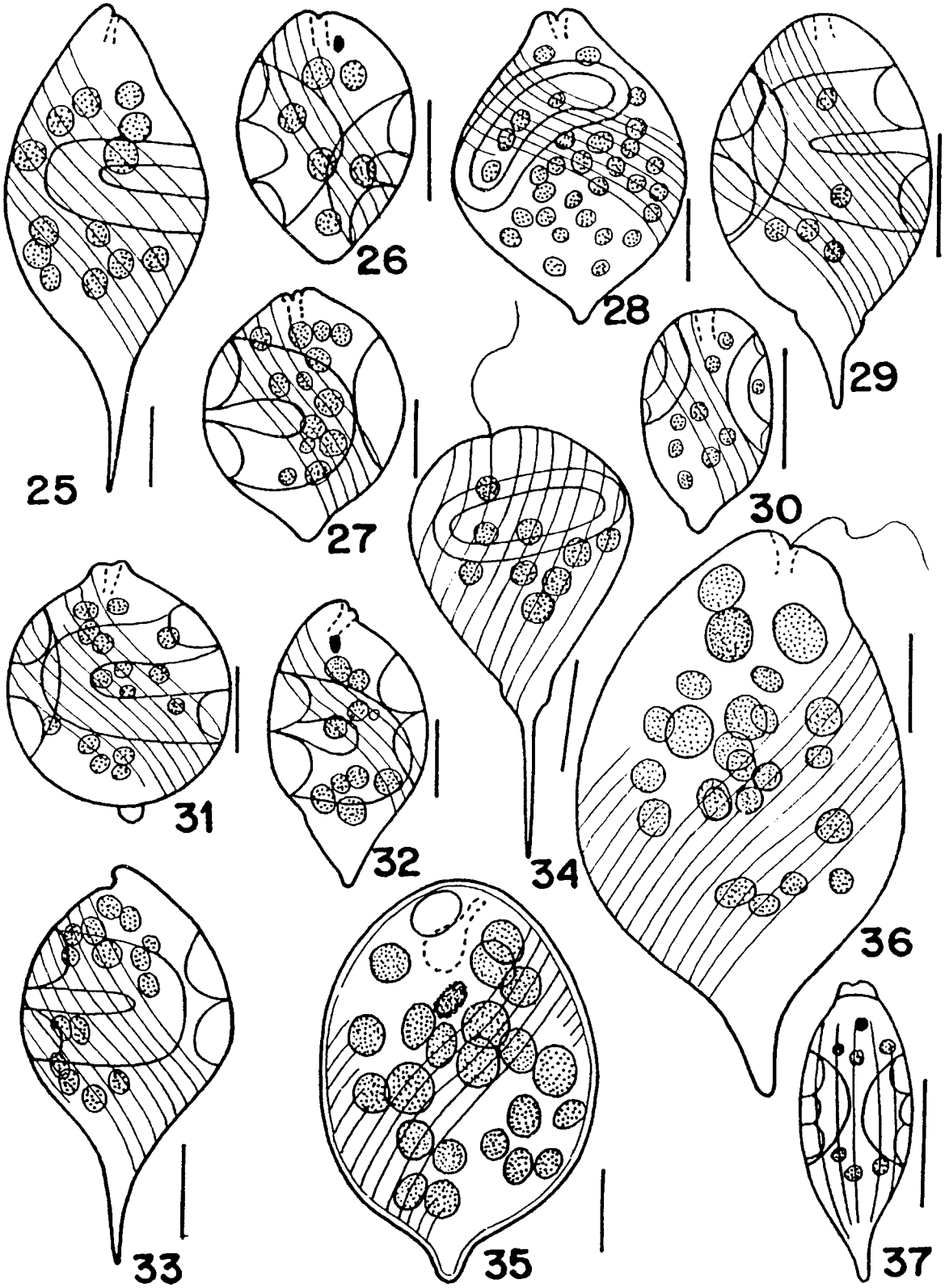
E. allorgei var. *allorgei*, *E. gaumei*, *E. limnophila* var. *minor* and *L. fusiformis* var. *amphirhynchus* were recorded only for Europa and South America. Sixteen taxa presented a widespread or cosmopolitan distribution. Three taxa were only recorded for South America. *E. bonettoi*, *L. playfairiana* var. *striata* and *L. caudata*. *E. bonettoi*, *L. playfairiana* var. *striata* and *L. steinii* var. *steinii* were considered rare species, because they occured only in one or two environments studied.

E. bonettoi, *E. oxyuris*, *E. tripteris* and *Lepocinclis salina* was already species found previously in the area by Alves-da-Silva & Ávila (1997) and Alves-da-Silva & Crossetti (1999).

E. acus var. *acus* and *L. salina* var. *salina* were the taxa best represented in the area of the Jacui Delta State Park, because they occurred in over 40% of the samples studied.

All taxa were found from acid to neutral pH, except for *E. acus*, *E. acus* var. *longissim*a, *L. limnophila* var. *minor*, *E. oxyuris* var. *charkowiensis* and *L. salina* var. *vallicauda* also found in neutral and slightly alkaline waters (from 7 to 7.6).

The temperature at wich the species were recorded varied from 12.8 to 30°C, therefore most of the species



Figures 25-37. 25. ***Lepocinclis caudata*** (Cunha) Conr. 26-27. ***Lepocinclis fusiformis*** (Carter) Lemm. emend. Conr. var. ***fusiformis***. 28. ***Lepocinclis fusiformis*** (Carter) Lemm. emend. Conr. var. ***amphirhynchus*** Nyg. 29. ***Lepocinclis ovum*** Lemm. var. ***ovum***. 30. ***Lepocinclis ovum*** Lemm. var. ***dimidio-minor*** Defl. 31. ***Lepocinclis ovum*** Lemm. var. ***globula*** (Perty) Lemm. 32-33. ***Lepocinclis playfairiana*** Defl. var. ***striata*** Conf. 34. ***Lepocinclis piriformis*** Cunha. 35. ***Lepocinclis salina*** Fritsch f. ***obtusa*** (Hub.-Pest.) Conr. 36. ***Lepocinclis salina*** Lemm. var. ***vallicauda*** Conr. 37. ***Lepocinclis steinii*** Lemm. emend. Conr. var. ***steinii*** (Bars = 10µm).

are tolerant to broad variations of temperature, despite the fact that there was a larger occurrence of the taxa in waters at 17-23°C.

Several authors mention that the Euglenophyta occur in organic matter and ammonium environments. During the 1998-1999 period, concentrations until 13.9mg.L^{-1} of organic matter and until 1,800 mg.L^{-1} of ammonium were recorded. It was observed that the greastest richness didn't coincide with higher concentrations of these two variables in the studied environments.

Among the sampled sites, the one that presented the greastest specific richness of genera *Euglena* and *Lepocinclis* was Saco do Cabral, with 33 taxa, followed by Saco das Garças, with 24 representatives of these two genera (Fig. 38). The greastest taxa number (22 and 11) of these two genera was verified in the summer station, in Saco do Cabral when the higher concentrations of the ammonium (360mg.L^{-1}) and the organic matter (3.7mg.L^{-1}) were not the highest ones registered in the study period, but possibly the slightly acid pH (6.8), ortophosfate concentration (530mg.L^{-1}), nitrate (1300mg.L^{-1}) and temperature of the water (23.2ºC), could be the factors that contributed in the presence of the greater taxa number in this season.

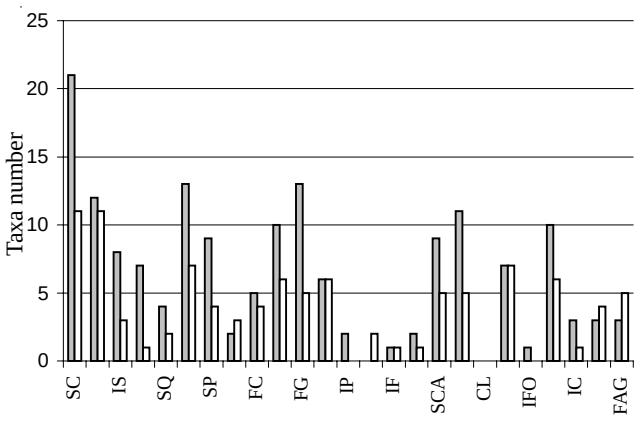


Figure 38. Distribution of taxa number (richness) of genera *Euglena* (dark) and *Lepocinclis* (white), in the different sampling stations, from left to right: SC= Saco do Cabral; Saco das Garças; IS= Island of Serafim; canal Feliz; SQ= Saco do Quilombo; Saco do Jacaré; SP= Saco da Pólvora; river mouth of Jacuí, FC= river mouth of Caí; river mouth of Sinos; FG= river mouth of Gravataí; Saco Santa Cruz; IP= Island das Pombas; Islands dos Marinheiros; IF= Island das Flores; Saco do Ferraz; SCA= Saco dos Cachorros; Canal das Balseiras; CL= Canal do Lage; Island do Cravo; IFO= Island da Formiga; Island dos Siqueiras; IC= Island da Cabeçuda; stream mouth of Sanga das Pedras; FAG= stream mouth of Guaíba.

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