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Genus *Lepocinclis* (Euglenophyceae) along five years in the area of influence of the Southern Petrochemical Pole, Rio Grande do Sul State, Brazil

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ABSTRACT - (Genus *Lepocinclis* (Euglenophyceae) along five years in the area of influence of the Southern Petrochemical Pole, Rio Grande do Sul State, Brazil). As part of an Euglenophyte's survey carried out during 2002-2006 at three different sites of Bom Jardim Creek, 13 *Lepocinclis* taxa were identified at species and infraspecific level. Bom Jardim Creek is a right side affluent of Caí River, Municipality of Triunfo, State of Rio Grande do Sul, and has its almost entire 10.5 km length within the Southern Petrochemical Pole area. Local climate is subtropical. Samplings were carried out monthly both for biological and abiotic analyses. Among the taxa identified, *Lepocinclis fusiformis* (Carter) Lemmermann emend. Conrad, *L. ovum* (Ehrenberg) Lemmermann var. *dimidio-minor* Deflandre and *Lepocinclis salina* Fritsch var. *salina* were the broadest geographically distributed ones in the creek during all five years, due to their standing to a wide range of environmental conditions. Seasonal species richness variation was observed in all creek sampling sites, summer being significantly different from all other climatic seasons of the year.
Key words: Euglenophyta, *Lepocinclis*, Southern Brazil, taxonomy

RESUMO - (O gênero *Lepocinclis* (Euglenophyceae) ao longo de cinco anos na área de influência do Pólo Petroquímico do Sul, Estado do Rio Grande do Sul, Brasil). Como parte do resultado do levantamento da comunidade de Euglenophyta realizado entre 2002 e 2006 em três trechos do arroio Bom Jardim foram identificados 13 *Lepocinclis* em níveis específico e infraespecífico. O arroio Bom Jardim é um afluente da margem direita do rio Caí, Município de Triunfo, no Rio Grande do Sul com quase todo seu percurso de 10,5 km situado na área do Pólo Petroquímico do Sul. O clima local é subtropical. As coletas foram realizadas mensalmente tanto para as análises biológicas quanto para as abióticas. Dentre os táxons identificados, *Lepocinclis fusiformis* (Carter) Lemmermann emend. Conrad, *L. ovum* (Ehrenberg) Lemmermann var. *dimidio-minor* Deflandre and *L. salina* Fritsch var. *salina* foram os que apresentaram a maior distribuição no arroio e suportaram ampla variação das condições ambientais. Foi constatada variação sazonal quanto à riqueza de espécies entre os três trechos do arroio, sendo o verão significativamente diferente das demais estações do ano.
Palavras-chave: Euglenophyta, *Lepocinclis*, Sul do Brasil, taxonomia

Introduction

Euglenophytes are present all over the world, especially in shallow, nutrient rich environments (Round 1983, Wetzel 2001). The State of Rio Grande do Sul includes a number of lentic and lotic environments that favor the existence of representatives of this algal group.

First papers published on the Euglenophytes flora from Rio Grande do Sul State freshwater systems are simple lists of genera and species, such as the ones by Rosa *et al*. (1974), Torgan *et al.* (1979), Lobo & Buselato-Toniolli (1985), Rosa *et al*. (1987) and Rosa *et al.* (1988). During the last three decades, however, Euglenophytes floristic surveys included descriptions and illustrations of material studied. Sommer (1977,

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not published), Huszar (1979), Alves-da-Silva & Torgan (1981), Alves-da-Silva (1988), Alves-da-Silva & Ferraz (1991), Alves-da-Silva *et al*. (1991, 2008), Franceschini (1992), Alves-da-Silva & Torres (1992, 1994a, b, c), Alves-da-Silva & Laitano (1994), Alves-da-Silva & Ávila (1997), Alves-da-Silva & Bicudo (2002, 2003, 2006), Alves-da-Silva & Crosssetti (1999), Alves-da-Silva & Hahn (2004) and Alves-da-Silva & Fortuna (2006) are examples of such publications.

Despite of the worldwide distribution of *Lepocinclis* in freshwaters, taxonomic revision papers are almost 80 years old and are reduced to those of Conrad (1934, 1935) and Chu (1935, 1936). Most of present knowledge of *Lepocinclis* is in Euglenophytes general floristic papers, such as the ones by Lemmernann (1910), Drezepolski (1925), Huber-Pestalozzi (1955), Starmach (1983) and Tell & Conforti (1986).

Several papers were published during the last two decades based on molecular biology attempting to elucidate taxonomic and phylogenetic problems within the Euglenophyceae, among them the works of Linton *et al*. (1999, 2000), Preisfeld *et al*. (2000, 2001), Leander *et al*. (2001), Busse & Preisfeld (2002, 2003), Brosnan *et al*. (2003), Marin *et al*. (2003) and Kosmala *et al.* 2005 can be highlighted. Emphasis should be given, however, to that by Marin *et al*. (2003) that compared *Euglena*, *Astasia*, *Phacus*, *Lepocinclis*, *Trachelomonas*, *Colacium*, *Cryptoglena*, *Eutreptia*, *Eutreptiella* and *Tetreutreptia* lineages. Last authors proposed that some species of the *Rigidae* Pringsheim Section of *Euglena* (for instance, *E. acus*, *E. oxyuris* and *E. spirogyra*), should be transferred to *Lepocinclis*. Besides the papers dealing with molecular biology, some other ones focused on the morphological aspects were carried out, especially on the structure and origin of the pellicle striae (Brosnan *et al*. 2005, Esson & Leander 2006, Leander & Farmer 2000a, b, Leander & Farmer 2001a, b, Leander *et al.* 2001, among others). Latter investigations showed that there are significant differences in the number, origin and type of striae among genera and species of Euglenophytes. There is, however, and enormous lack of studies dealing with *Lepocinclis* species (most with helicoidal striae) and absolutely none that would include, for example, *Euglena acus*, that has longitudinal striae.

Marin *et al.* (2003) proposal based on SSU rDNA sequence comparisons and synapomorphic signatures in the SSU rDNA secondary structure encompassed species that are very much different among themselves if cell morphology and metaboly, pellicle structure and paramylum granules morphology are considered.

Present research aimed at broadening knowledge and geographical distribution of genus *Lepocinclis* in the State of Rio Grande do Sul and worldwide, as well as knowing the interaction of different taxa with environmental conditions during the period 2002-2006. It is important to mention that the present is the first *Lepocinclis* long duration study ever carried out in Brazil.

Material and methods

Survey of genus *Lepocinclis* of Bom Jardim Creek, a right margin affluent of Caí River, in the Municipality of Triunfo, Rio Grande do Sul State was carried out during the period 2002-2006. The creek has almost its entire 10.5 km course within the Southern Petrochemical Pole area, and has an average declivity of 3.2 m, with portions with more intense current intercalated with some others of very calm waters. Altitude at its meeting point with the Caí River is less than 5 m.

Study derived from net samples collected between 2002 and 2006 at 3 Bom Jardim Creek sites (figure 1), namely ABJ Nascente located at 29º49'36"S and 51º27'11"W, ABJ Montante (29º50'21"S and 51º24'58"W) and ABJ Frente (29º50'12"S and 51º23'25"W), where SITEL are the initial letters for Sistema de Tratamento de Efluentes Líquidos (Treatment System of Liquid Effluents) of the Southern Petrochemical Pole. Station ABJ Nascente is located in the creek shallowest part (≤ 30 cm deep), close to the place were cows and sheep live, station ABJ Montante in the creek portion (≤ 80 cm deep) that receives human source contamination from a village with no sewage collection, and station ABJ Frente (≤ 130 cm deep) in the creek portion under the Petrochemical Pole influence.

Local climate is subtropical, with well marked seasons, summer including January-March, Fall April-June, winter July-September and Spring October-December. Rain precipitation yearly average for the state is 1,500 mm, the greatest monthly total precipitation in June-July (Conti & Furlan 2003).

Samples were gathered monthly from the creek's margin with a plankton net built with a 25 μm mesh

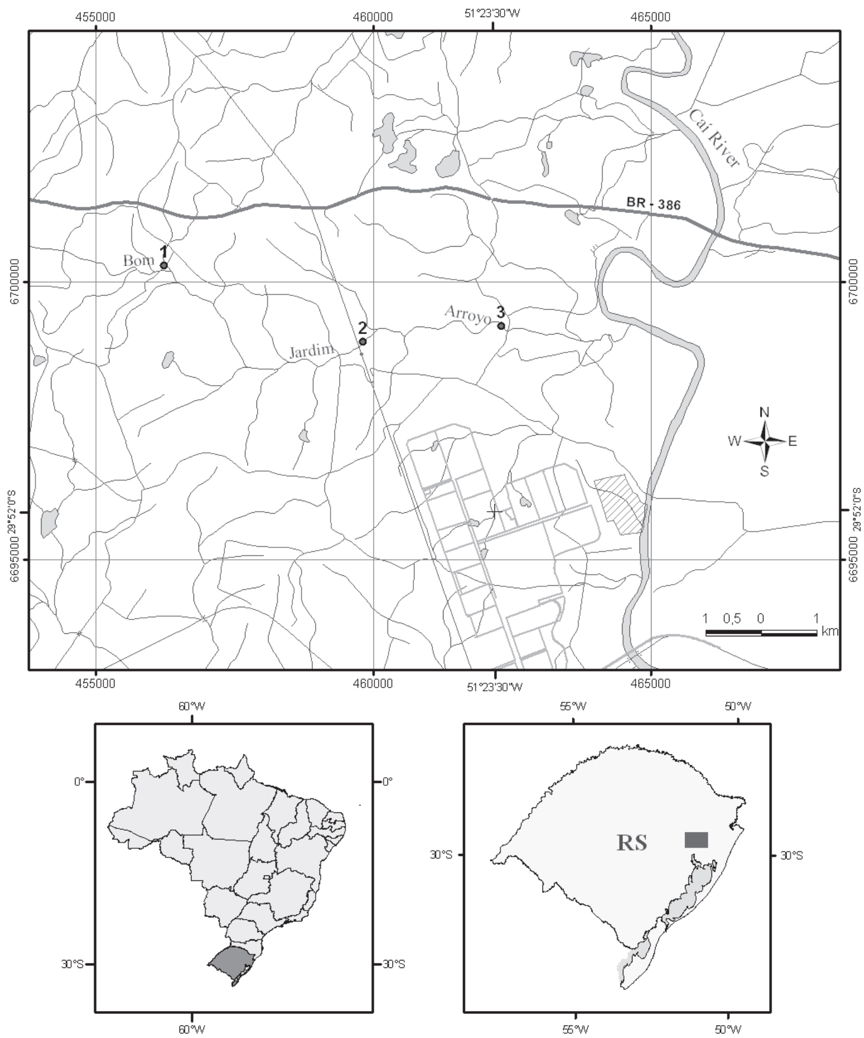


Figure 1. Location of the 3 sampling sites in the Bom Jardim Creek, Municipality of Triunfo, Rio Grande do Sul State, Brazil, during period from 2002 to 2006.

tissue, and were fixed and preserved with 4% formaldehyde. Due to technical problems, samples were not collected in May 2002 at the 3 sites and from ABJ Nascente in January 2006.

All 176 samples collected are deposited in the Herbarium Prof. Dr. Alarich R.H. Schultz (HAS) of the Natural Sciences Museum (Museu de Ciências Naturais), of the Zoological and Botanical Foundation (Fundação Zoobotânica of the State of Rio Grande do Sul) (table 1).

Analyses of algal material were performed using regular microscope slide and cover slip and a Leica microscope with measuring ocular. Illustrations were prepared using a camera lucida coupled to the microscope optical system.

Simultaneously to phytoplankton samplings, measurements in the field were taken for water transparency with a 0.25 m diam. Secchi disc, pH with a Digimed pHmeter, water electric conductivity and temperature with a Digimed conductivimeter. In the laboratory, concentrations of dissolved oxygen, oxygen biochemical demand, N-NH_4^+, N-NO_2^-, N-NO_3^-, P-PO_4^{-3}, silicates and organic matter were measured following proper methods in APHA (1992) (table 2).

Besides linear measurements of cell length and breadth, the rate between cell length and breadth (R l/b) was calculated. Illustration, geographic distribution in Brazil and information about the environment variables range under which each taxon was collected is also provided.

For species and infraspecific categories identification, ancient and recent classical works (Conrad 1935, Huber-Pestalozzi 1955, Németh 1980,

Table 1. Sample's access numbers to Prof. Dr. R. H. Schultz (HAS) herbarium, collecting locality, date, climatic season, and collector's names of *Lepocinclis* material in the 3 Bom Jardim Creek portions during 2002-2006. Legend: ABJNascente = spring; ABJMS = upper stream from Sitel; ABJFS = in front of Sitel, V = summer; O = fall, I = winter, P = spring e NR = collection not performed.

Nº HAS	Sampling station	Date	Season of year	Collector	Nº HAS	Sampling station	Date	Season of year	Collector
103163	ABJNasc	14-I-2002	V	Silva, S.M.A.	103993	ABJNasc	7-IV-2003	O	Silva,S.M.A.
35999	ABJMS	14-I-2002	V	Silva, S.M.A.	103996	ABJMS	7-IV-2003	O	Silva,S.M.A.
103156	ABJFS	14-I-2002	V	Silva, S.M.A.	103999	ABJFS	7-IV-2003	O	Silva,S.M.A.
103202	ABJNasc	6-II-2002	V	Nunes, M.	104014	ABJNasc	5-V-2003	O	Cunha, G.
103188	ABJMS	6-II-2002	V	Nunes, M.	104017	ABJMS	5-V-2003	O	Cunha, G.
103195	ABJFS	6-II-2002	V	Nunes, M.	104020	ABJFS	5-V-2003	O	Cunha, G.
103249	ABJNasc	25-III-2002	V	Silva, S.M.A.	104039	ABJNasc	2-VI-2003	O	Silva, S.M.A.
103250	ABJMS	25-III-2002	V	Silva, S.M.A.	104042	ABJMS	2-VI-2003	O	Silva, S.M.A.
103254	ABJFS	25-III-2002	V	Silva, S.M.A.	104045	ABJFS	2-VI-2003	O	Silva, S.M.A.
103391	ABJNasc	22-IV-2002	O	Silva, S.M.A.	104064	ABJNasc	1-VII-2003	I	Silva, S.M.A.
103394	ABJMS	22-IV-2002	O	Silva, S.M.A.	104067	ABJMS	1-VII-2003	I	Silva, S.M.A.
103397	ABJFS	22-IV-2002	O	Silva, S.M.A.	104070	ABJFS	1-VII-2003	I	Silva, S.M.A.
NR	ABJNasc	NR	O	NR	104277	ABJNasc	4-VIII-2003	I	Silva, S.M.A.
NR	ABJMS	NR	O	NR	104280	ABJMS	4-VIII-2003	I	Silva, S.M.A.
NR	ABJFS	NR	O	NR	104283	ABJFS	4-VIII-2003	I	Silva, S.M.A.
103420	ABJNasc	6-VI-2002	O	Silva, S.M.A.	104298	ABJNasc	1-IX-2003	I	Salomoni, S
103423	ABJMS	6-VI-2002	O	Silva, S.M.A.	104301	ABJMS	1-IX-2003	I	Salomoni, S
103426	ABJFS	6-VI-2002	O	Silva, S.M.A.	104304	ABJFS	1-IX-2003	I	Salomoni, S
103457	ABJNasc	3-VII-2002	I	Silva, S.M.A.	104316	ABJNasc	1-X-2003	P	Silva, S.M.A.
103459	ABJMS	3-VII-2002	I	Silva, S.M.A.	104319	ABJMS	1-X-2003	P	Silva, S.M.A.
103458	ABJFS	3-VII-2002	I	Silva, S.M.A.	104322	ABJFS	1-X-2003	P	Silva, S.M.A.
103521	ABJNasc	5-VIII-2002	I	Cunha, G.	104522	ABJNasc	3-XI-2005	P	Silva, S.M.A.
103524	ABJMS	5-VIII-2002	I	Cunha, G.	104525	ABJMS	3-XI-2005	P	Silva, S.M.A.
103527	ABJFS	5-VIII-2002	I	Cunha, G.	104528	ABJFS	3-XI-2005	P	Silva, S.M.A.
103615	ABJNasc	2-IX-2002	I	Silva, S.M.A.	104543	ABJNasc	1-XII-2003	P	Werner, V.
103618	ABJMS	2-IX-2002	I	Silva, S.M.A.	104546	ABJMS	1-XII-2003	P	Werner, V.
103621	ABJFS	2-IX-2002	I	Silva, S.M.A.	104549	ABJFS	1-XII-2003	P	Werner, V.
103640	ABJNasc	7-X-2002	P	Cunha, G.	104561	ABJNasc	5-I-2004	V	Silva, S.M. da
103643	ABJMS	7-X-2002	P	Cunha, G.	104564	ABJMS	5-I-2004	V	Silva, S.M. da
103646	ABJFS	7-X-2002	P	Cunha, G.	104567	ABJFS	5-I-2004	V	Silva, S.M. da
103665	ABJNasc	14-XI-2002	P	Silva, S.M.A.	104582	ABJNasc	3-II-2004	V	Silva, S.M.A.
103668	ABJMS	14-XI-2002	P	Silva, S.M.A.	104585	ABJMS	3-II-2004	V	Silva, S.M.A.
103671	ABJFS	14-XI-2002	P	Silva, S.M.A.	104588	ABJFS	3-II-2004	V	Silva, S.M.A.
103690	ABJNasc	2-XII-2002	P	Silva, S.M.A.	104767	ABJNasc	16-III-2004	V	Juliano, V.
103693	ABJMS	2-XII-2002	P	Silva, S.M.A.	104770	ABJMS	16-III-2004	V	Juliano, V.
103696	ABJFS	2-XII-2002	P	Silva, S.M.A.	104773	ABJFS	16-III-2004	V	Juliano, V.
103830	ABJNasc	6-I-2003	V	Cunha, G.	104783	ABJNasc	12-IV-2004	O	Cunha, G.
103833	ABJMS	6-I-2003	V	Cunha, G.	104786	ABJMS	12-IV-2004	O	Cunha, G.
103836	ABJFS	6-I-2003	V	Cunha, G.	104789	ABJFS	12-IV-2004	O	Cunha, G.
103856	ABJNasc	4-II-2003	V	Cunha, G.	104804	ABJNasc	11-V-2004	O	Silva, S.M.A.
103859	ABJMS	4-II-2003	V	Cunha, G.	104807	ABJMS	11-V-2004	O	Silva, S.M.A.
103862	ABJFS	4-II-2003	V	Cunha, G.	104810	ABJFS	11-V-2004	O	Silva, S.M.A.
103946	ABJNasc	10-III-2003	V	Silva, S.M.A.	104821	ABJNasc	7-VI-2004	O	Silva, S.M.A.
103949	ABJMS	10-III-2003	V	Silva, S.M.A.	104824	ABJMS	7-VI-2004	O	Silva, S.M.A.
103952	ABJFS	10-III-2003	V	Silva, S.M.A.	104827	ABJFS	7-VI-2004	O	Silva, S.M.A.
104844	ABJNasc	13-VII-2004	V	Cunha, G.	106703	ABJNasc	10-X-2005	P	Silva, S.M.A.
104847	ABJMS	13-VII-2004	V	Cunha, G.	106706	ABJMS	10-X-2005	P	Silva, S.M.A.
104850	ABJFS	13-VII-2004	V	Cunha, G.	106709	ABJFS	10-X-2005	P	Silva, S.M.A.
106095	ABJNasc	9-VIII-2004	V	Cunha, G.	106716	ABJNasc	8-XI-2005	P	Silva, S.M.A.
106098	ABJMS	9-VIII-2004	V	Cunha, G.	106718	ABJMS	8-XI-2005	P	Silva, S.M.A.
106101	ABJFS	9-VIII-2004	V	Cunha, G.	106721	ABJFS	8-XI-2005	P	Silva, S.M.A.
106116	ABJNasc	13-IX-2004	V	Silva, S.M.A.	106734	ABJNasc	5-XII-2005	P	Cunha, G.
106119	ABJMS	13-IX-2004	V	Silva, M.A.	106736	ABJMS	5-XII-2005	P	Cunha, G.

continue

Table 1 (continuation)

Nº HAS	Sampling station	Date	Season of year	Collector	Nº HAS	Sampling station	Date	Season of year	Collector
106122	ABJFS	13-IX-2004	V	Silva, M.A.	106740	ABJFS	5-XII-2005	P	Cunha, G.
106137	ABJNasc	7-X-2004	O	Cunha, G.	NR	ABJNasc	NR	NR	NR
106140	ABJMS	7-X-2004	O	Cunha, G.	106770	ABJMS	9-I-2006	V	Silva, S.M.A.
106143	ABJFS	7-X-2004	O	Cunha, G.	106773	ABJFS	9-I-2006	V	Silva, S.M.A.
106158	ABJNasc	8-XI-2004	O	Silva, S.M.A.	106780	ABJNasc	8-II-2006	V	Silva, S.M.A.
106161	ABJMS	8-XI-2004	O	Silva, S.M.A.	106783	ABJMS	8-II-2006	V	Silva, S.M.A.
106164	ABJFS	8-XI-2004	O	Silva, S.M.A.	106786	ABJFS	8-II-2006	V	Silva, S.M.A.
106387	ABJNasc	6-XII-2004	O	Silva, S.M.A.	106806	ABJNasc	8-III-2006	V	Silva, S.M.A.
106390	ABJMS	6-XII-2004	O	Silva, S.M.A.	106809	ABJMS	8-III-2006	V	Silva, S.M.A.
106393	ABJFS	6-XII-2004	O	Silva, S.M.A.	106812	ABJFS	8-III-2006	V	Silva, S.M.A.
106402	ABJNasc	11-I-2005	I	Cunha, G.	106820	ABJNasc	11-IV-2006	O	Juliano, V.
106405	ABJMS	11-I-2005	I	Cunha, G.	106823	ABJMS	11-IV-2006	O	Juliano, V.
106408	ABJFS	11-I-2005	I	Cunha, G.	106826	ABJFS	11-IV-2006	O	Juliano, V.
106423	ABJNasc	15-II-2005	I	Silva, S.M.A.	106840	ABJNasc	9-V-2006	O	Silva, S.M.A.
106426	ABJMS	15-II-2005	I	Silva, S.M.A.	106843	ABJMS	9-V-2006	O	Silva, S.M.A.
106429	ABJFS	15-II-2005	I	Silva, S.M.A.	106846	ABJFS	9-V-2006	O	Silva, S.M.A.
106443	ABJNasc	14-III-2005	I	Silva, S.M.A.	107032	ABJNasc	5-VI-2006	O	Salomoni, S.
106446	ABJMS	14-III-2005	I	Silva, S.M.A.	107035	ABJMS	5-VI-2006	O	Salomoni, S.
106449	ABJFS	14-III-2005	I	Silva, S.M.A.	107038	ABJFS	5-VI-2006	O	Salomoni, S.
106546	ABJNasc	11-IV-2005	P	Silva, S.M.A.	107052	ABJNasc	11-VII-2006	I	Rosa, Z.M.
106549	ABJMS	11-IV-2005	P	Silva, S.M.A.	107055	ABJMS	11-VII-2006	I	Rosa, Z.M.
106552	ABJFS	11-IV-2005	P	Silva, S.M.A.	107058	ABJFS	11-VII-2006	I	Rosa, Z.M.
106559	ABJNasc	12-V-2005	P	Cunha, G.	107118	ABJNasc	8-VIII-2006	I	Silva, S.M.A.
106562	ABJMS	12-V-2005	P	Cunha, G.	107121	ABJMS	8-VIII-2006	I	Silva, S.M.A.
106565	ABJFS	12-V-2005	P	Cunha, G.	107124	ABJFS	8-VIII-2006	I	Silva, S.M.A.
106576	ABJNasc	13-VI-2005	P	Cunha, G.	107131	ABJNasc	11-IX-2006	I	Cunha, G.
106579	ABJMS	13-VI-2005	P	Cunha, G.	107134	ABJMS	11-IX-2006	I	Cunha, G.
106582	ABJFS	13-VI-2005	P	Cunha, G.	107137	ABJFS	11-IX-2006	I	Cunha, G.
106602	ABJNasc	12-VII-2005	V	Silva, S.M.A.	107225	ABJNasc	9-X-2006	P	Silva, S.M.A.
106605	ABJMS	12-VII-2005	V	Silva, S.M.A.	107228	ABJMS	9-X-2006	P	Silva, S.M.A.
106608	ABJFS	12-VII-2005	V	Silva, S.M.A.	107231	ABJFS	9-X-2006	P	Silva, S.M.A.
106617	ABJNasc	9-VIII-2005	V	Silva, S.M.A.	107238	ABJNasc	13-XI-2006	P	Silva, S.M.A.
106620	ABJMS	9-VIII-2005	V	Silva, S.M.A.	107241	ABJMS	13-XI-2006	P	Silva, S.M.A.
106623	ABJFS	9-VIII-2005	V	Silva, S.M.A.	107244	ABJFS	13-XI-2006	P	Silva, S.M.A.
106646	ABJNasc	12-IX-2005	V	Cunha, G.	107251	ABJNasc	12-XII-2006	P	Juliano, V.
106649	ABJMS	12-IX-2005	V	Cunha, G.	107254	ABJMS	12-XII-2006	P	Juliano, V.
106652	ABJFS	12-IX-2005	V	Cunha, G.	107257	ABJFS	12-XII-2006	P	Juliano, V.

Starmach 1983, Tell & Conforti 1986, Wolowski 1998 and Shi *et al.* 1999) were used. Also, some recent papers by Alves-da-Silva (1988), Huszar *et al.* (1989), Menezes (1990), Cecy (1990), Xavier (1989, 1994), Alves-da-Silva & Torres (1992), Ferreira & Menezes (2000), Alves-da-Silva & Bicudo (2002) and Alves-da-Silva & Hahn (2004) were used.

Results and Discussion

One hundred and sixty two out of the 176 samples studied presented representatives of *Lepocinclis* Perty, allowing identification of 13 taxa of specific and infraspecific level, which were distributed among seven typical varieties, five varieties that are not the typical of their respective species and one taxonomic forma that is also not the typical.

Division Euglenophyta
  Class Euglenophyceae
    Order Euglenales
      Family Euglenaceae
        Genus *Lepocinclis* Perty 1852

L. fusiformis (Carter) Lemmermann emend. Conrad var. ***fusiformis***, Archiv für Protistenkunde 82(2): 225, fig. 30. 1934.
Figure 2

Table 2. Variation range of abiotic features of the 3 Bom Jardim Creek portions where *Lepocinclis* was collected during the period 2002-2006. Zero = not detected, X= average, δ = standard deviations.

Taxa / Abiotic feature / Variation range, average, deviation	Amonium ($\mu g\ L^{-1}$) Minimum	Maximum	X	δ	Conductivity ($\mu S\ cm^{-1}$) Minimum	Maximum	X	δ
L. fusiformis var. *fusiformis*	0	260	130	184	13,2	1450	732	1016
L. fusiformis var. *amphirynchus*	0	250	125	177	22,2	603	313	411
L. fusiformis var. *minor*	0	220	110	156	180	549	365	261
L. ovum var. *ovum*	0	250	125	177	13,2	762	388	529
L. ovum var. *dimidio-minor*	0	260	130	184	13,2	1092	553	763
L. ovum var. *globula*	40	220	130	127	45,4	398	222	249
L. playfairiana	0	60	30	42	62	249	156	132
L. salina var. *salina*	0	260	130	184	17,2	1450	734	1013
L. salina f. *obtusa*	0	260	130	184	13,2	670	342	464
L. salina var. *vallicauda*	0	80	40	57	38,2	762	400	512
L. steinii	0	150	75	106	44,3	762	403	507
L. truncata	0	250	125	177	17,2	736	377	508
L. turbiniformis	0	100	50	71	38,5	98	68	42

Taxa / Abiotic feature / Variation range, average, deviation	DBO5 ($mg\ L^{-1}$) Minimum	Maximum	X	δ	Org. Matter ($mg\ L^{-1}$) Minimum	Maximum	X	δ
L. fusiformis var. *fusiformis*	0,3	5,5	3	4	2,3	12	7	7
L. fusiformis var. *amphirynchus*	1,1	5,3	3	3	4,5	11,3	8	5
L. fusiformis var. *minor*	2,8	3,2	3	0	7,7	9	8	1
L. ovum var. *ovum*	0,6	8	4	5	3,1	11,3	7	6
L. ovum var. *dimidio-minor*	0,3	5,3	3	4	3,1	11,3	7	6
L. ovum var. *globula*	1,2	2,5	2	1	7	8,9	8	1
L. playfairiana	2,2	5,3	4	2	6,2	11	9	3
L. salina var. *salina*	0,3	8	4	5	2,3	12	7	7
L. salina f. *obtusa*	0,6	5,3	3	3	4,5	11	8	5
L. salina var. *vallicauda*	0,4	5,3	3	3	5,2	11	8	4
L. steinii	1,5	5,5	4	3	4,7	10	7	4
L. truncata	0,3	5,3	3	4	4,4	11	8	5
L. turbiniformis	0,5	5	3	3	5,3	7,5	6	2

Taxa / Abiotic feature / Variation range, average, deviation	Nitrite ($\mu g\ L^{-1}$) Minimum	Maximum	X	δ	Ortophosphate ($\mu g\ L^{-1}$) Minimum	Maximum	X	δ
L. fusiformis var. *fusiformis*	0	8	4	6	0	1440	720	1018
L. fusiformis var. *amphirynchus*	0	7	4	5	0	1440	720	1018
L. fusiformis var. *minor*	0	5	3	4	0	680	340	481
L. ovum var. *ovum*	0	7	4	5	0	850	425	601
L. ovum var. *dimidio-minor*	0	18	9	13	0	1440	720	1018
L. ovum var. *globula*	0	1	1	1	90	460	275	262
L. playfairiana	0	7	4	5	20	950	485	658
L. salina var. *salina*	0	38	19	27	0	1470	735	1039
L. salina f. *obtusa*	0	8	4	6	0	1440	720	1018
L. salina var. *vallicauda*	0	0	0	0	0	850	425	601
L. steinii	0	7	4	5	0	850	425	601
L. truncata	0	8	4	6	0	1470	735	1039
L. turbiniformis	0	4	2	3	20	130	75	78

continue

Table 2 (continuation)

Taxa / Abiotic feature / Variation range, average, deviation	DO (mg L^{-1}) Minimum	Maximum	X	δ	% DO Minimum	Maximum	X	δ
L. fusiformis var. *fusiformis*	2,2	9,3	6	5	27,1	95,2	61	48
L. fusiformis var. *amphirynchus*	2,8	9,2	6	5	33,9	96,6	65	44
L. fusiformis var. *minor*	2	7,6	5	4	23,3	90,3	57	47
L. ovum var. *ovum*	NM	9,2	NM	NM	NM	98,7	99	
L. ovum var. *dimidio-minor*	NM	8,9	NM	NM	NM	98,4	98	
L. ovum var. *globula*	4,8	8,2	7	2	46	81,3	64	25
L. playfairiana	2,8	7,2	5	3	33,9	83,4	59	35
L. salina var. *salina*	NM	9,2	NM	NM	NM	98,7	99	
L. salina f. *obtusa*	NM	8,7	NM	NM	NM	96,6	97	
L. salina var. *vallicauda*	3,4	6,7	5	2	38,7	92,6	66	38
L. steinii	2,5	8,7	6	4	29,1	84,4	57	39
L. truncata	2,2	9	6	5	27,1	96,6	62	49
L. turbiniformis	2,5	8,6	6	4	33,1	90,8	62	41

Taxa / Abiotic feature / Variation range, average, deviation	Nitrate (µg L^{-1}) Minimum	Maximum	X	δ	Temperatura (ºC) water Minimum	Maximum	X	δ
L. fusiformis var. *fusiformis*	0	800	400	566	9,7	33,6	22	17
L. fusiformis var. *amphirynchus*	0	800	400	566	15	33,6	24	13
L. fusiformis var. *minor*	0	200	100	141	18,1	24	21	4
L. ovum var. *ovum*	0	900	450	636	15	31,8	23	12
L. ovum var. *dimidio-minor*	0	1700	850	1202	9,7	33,6	22	17
L. ovum var. *globula*	0	200	100	141	15	25,6	20	7
L. playfairiana	0	800	400	566	18,1	30,6	24	9
L. salina var. *salina*	0	1700	850	1202	9,7	33,6	22	17
L. salina f. *obtusa*	0	1200	600	849	13	30,6	22	12
L. salina var. *vallicauda*	0	700	350	495	19,3	29,9	25	7
L. steinii	0	800	400	566	14,4	30,2	22	11
L. truncata	0	1100	550	778	13,1	33,6	23	14
L. turbiniformis	0	300	150	212	18,7	30,2	24	8

Taxa / Abiotic feature / Variation range, average, deviation	pH Minimum	Maximum	X	δ	Silicate (mg L^{-1}) Minimum	Maximum	X	δ
L. fusiformis var. *fusiformis*	5,6	7,1	6	1	1,3	20,6	11	14
L. fusiformis var. *amphirynchus*	6,2	7,1	7	1	1,3	16,3	9	11
L. fusiformis var. *minor*	6,5	7,1	7	0	5,1	12,8	9	5
L. ovum var. *ovum*	5,8	7,1	6	1	1,3	16,5	9	11
L. ovum var. *dimidio-minor*	5,6	7,1	6	1	1,3	23,1	12	15
L. ovum var. *globula*	6,3	6,6	6	0	13,2	15	14	1
L. playfairiana	6,4	6,9	7	0	10	16,3	13	4
L. salina var. *salina*	5,6	7,1	6	1	1,3	23,1	12	15
L. salina f. *obtusa*	6	7,5	7	1	5,7	19,2	12	10
L. salina var. *vallicauda*	6,2	7,1	7	1	7,7	16,5	12	6
L. steinii	6,3	7	7	0	5,7	16,5	11	8
L. truncata	5,6	7,1	6	1	5,8	19,2	13	9
L. turbiniformis	6,3	6,8	7	0	1,3	11,2	6	7

Cell lemon-shaped to fusiform, 35-40.5 μm long., 24-28 μm broad, Rl/b = 1.3-1.6; anterior pole with or without an obtuse nipple, opening of apical channel; posterior pole slightly acuminated; rigid pellicle, hyaline, spirally striated to the left, striae very delicate; numerous chloroplasts, discoid to ellipsoid, ca. 2.8 μm diam.; paramylon bodies 2, lateral, ring-shaped.

Material studied: HAS35999, HAS103156, HAS103249, HAS103250, HAS103254, HAS103394, HAS103397, HAS103458, HAS103524, HAS103665, HAS103668, HAS103690, HAS103693, HAS103696, HAS103833, HAS103836, HAS103856, HAS103859, HAS103862, HAS103952, HAS103993, HAS103996, HAS103999, HAS104014, HAS104017, HAS104020, HAS104045, HAS104283, HAS104319, HAS104522, HAS104528, HAS104564, HAS104582, HAS104585, HAS104588, HAS104767, HAS104770, HAS104773, HAS104786, HAS104804, HAS104807, HAS104810, HAS104824, HAS104827, HAS104847, HAS104850, HAS106101, HAS106137, HAS106164, HAS106390, HAS106393, HAS106402, HAS106405, HAS106423, HAS106426, HAS106429, HAS106446, HAS106449, HAS106565, HAS106718, HAS106721, HAS106780, HAS106812, HAS106823, HAS106846, HAS107055, HAS107058, HAS107121, HAS107137, HAS107231 and HAS107257.

Geographical distribution in Brazil: Amazonas, Distrito Federal, Mato Grosso, Paraná, Rio de Janeiro, Rio Grande do Sul, Rondônia, São Paulo and Santa Catarina.

L. fusiformis (Carter) Lemmermann emend. Conrad var. ***amphirhynchus*** Nygaard, K. Dansk Vid. Selsk. Biol. Skr., 7(1): 167, fig. 101. 1949.
Figures 3-4

Cell lemon-shaped, 29-31.5 μm long., 21.5-23 μm broad, Rl/b = 1.3-1.4; anterior pole with nipple obtuse prominent ca. of 4 μm long. by 5 μm broad, caudal process reduced to a nipple; rigid pellicle, spirally striated to the left, striae very delicate; numerous chloroplasts, discoid to ellipsoid, 2,0- 2.8 μm diam.; paramylon bodies 2, lateral, ring-shaped.

The variety differs from the typical of the species by the fact that the anterior pole is more prominent.

Material studied: HAS103249, HAS103250, HAS103856, HAS103862, HAS103996, HAS104020, HAS104045, HAS104283, HAS104319, HAS104522, HAS104528, HAS104564, HAS104770, HAS104773, HAS104585, HAS106101, HAS106122, HAS106408, HAS106428, HAS106429, HAS106446, HAS106449, HAS106552, HAS106565 and HAS106738.

Geographical distribution in Brazil: Amazonas, Paraná, Rio Grande do Sul and Rio de Janeiro.

L. fusiformis (Carter) Lemmermann emend. Conrad var. ***minor*** Chu, Sinensia 7: 286, fig. 21-22. 1936.
Figures 5-6

Cell broadly elliptical, 16-21 μm long., 14-17 μm broad, Rl/b = 1.1-1.2; anterior pole without an obtuse nipple, opening of apical channel; posterior pole slightly acuminated; rigid pellicle, hyaline, striae very delicate difficult to see; numerous chloroplasts, discoid ca. 2.0 μm diam.; paramylon bodies 2, lateral, ring-shaped.

The variety differs from the typical of the species in its smaller cell dimensions and without caudal process.

Material studied: HAS103391, HAS106449, HAS106806 and HAS107231.

Geographical distribution in Brazil: Rio Grande do Sul.

L. ovum (Ehrenberg) Lemmermann var. ***ovum***, Kryptogamenflora Brandenburg 3: 504, fig. 13. 1910.
Figures 7-9

Cell elliptical to oblong-elliptical, 30-40 μm long., 15-25 μm broad, Rl/b = 1.5-2.6; anterior pole rounded, opening of apical channel, posterior pole abruptly narrowed into a short, colourless, conical caudal process, 2.5-4.6 μm long.; rigid pellicle, spirally striated to the left; numerous chloroplasts, parietal, discoid, ca. 2.0 μm diam.; paramylon bodies 2, lateral, ring-shaped, sometimes elongate, overlapping each other along the longitudinal cell axis, 11-14 μm long.

Material studied: HAS103156, HAS103202, HAS103457, HAS103458, HAS103665, HAS103693, HAS103696, HAS103830, HAS103859, HAS103862, HAS103946, HAS104528, HAS104543, HAS104564, HAS104582, HAS104585, HAS104767, HAS104770, HAS104807, HAS106116, HAS106122, HAS106137, HAS106158, HAS106387, HAS106402, HAS106405, HAS106423, HAS106426, HAS106429, HAS106443, HAS106446, HAS106552, HAS106565, HAS106734, HAS106780, HAS106806, HAS106840, HAS107118, HAS107131 and HAS107244.

Geographical distribution in Brazil: Amazonas, Goiás, Mato Grosso, Paraná, Rio Grande do Sul, Rio de Janeiro, Rondônia, Santa Catarina, São Paulo and Tocantins.

L. ovum (Ehrenberg) Lemmermann var. ***dimidio-minor*** Deflandre, Bulletin de la Société botanique de France 24(4): 1121, fig. 25-28. 1924.
Figures 10-11

Cell narrowly elliptical to elliptical, 16-21 µm long., 9-16 µm broad, Rl/b = 1.3-1.8; anterior pole rounded, posterior pole attenuated into a caudal process; caudal process reduced to a nipple, ca. 1 µm long; flagellum as long as the cell.

L. ovum var. *dimidio-minor* differs from the type of the species in its smaller cell dimensions and in the caudal process reduced to a nipple about 1 µm long.

Material studied: HAS103156, HAS103163, HAS103195, HAS103202, HAS103250, HAS103254, HAS103394, HAS103397, HAS103458, HAS103646, HAS103665, HAS103668, HAS103671, HAS103690, HAS103693, HAS103696, HAS103830, HAS103833, HAS103836, HAS103856, HAS103859, HAS103862, HAS103946, HAS103949, HAS103993, HAS103996, HAS103999, HAS104014, HAS104017, HAS104020, HAS104039, HAS104045, HAS104070, HAS104319, HAS104522, HAS104528, HAS104543, HAS104549, HAS104561, HAS104564, HAS104582, HAS104585, HAS104770, HAS104783, HAS104807, HAS104827, HAS104847, HAS104850, HAS106119, HAS106137, HAS106143, HAS106158, HAS106165, HAS106387, HAS106390, HAS106402, HAS106405, HAS106408, HAS106423, HAS106426, HAS106429, HAS106443, HAS106449, HAS106546, HAS106549, HAS106559, HAS106562, HAS106565, HAS106620, HAS106706, HAS106709, HAS106716, HAS106718, HAS106721, HAS106734, HAS106770, HAS106773, HAS106780, HAS106786, HAS106806, HAS106809, HAS106840, HAS107038, HAS107055, HAS107124, HAS107131, HAS107134, HAS107231, HAS107238, HAS107241, HAS107251, HAS107254 and HAS107257.

Geographical distribution in Brazil: Amazonas, Distrito Federal, Goiás, Mato Grosso, Paraná, Rio Grande do Sul, Rio de Janeiro, Santa Catarina, São Paulo and Tocantins.

L. ovum (Ehrenberg) Lemmermann var. ***globula*** (Perty) Lemmermann, Kryptogamenflora Brandenburg 3(4): 505. 1910.
Figures 12-13

Cell subglobose, 23.5-30 µm long., 23.5-27 µm broad, Rl/b = 1.0-1.3; anterior pole rounded, opening of apical channel, posterior pole abruptly narrowed into a short, colourless, conical caudal process, 2.3-3.1 µm long; rigid pellicle, spirally striated to the left; numerous chloroplasts, parietal, discoid, ca. 2.3 µm diam.; paramylon bodies 2, lateral, ring-shaped, sometimes elongate, overlapping each other along the longitudinal cell axis, ca. 13 µm long.

The variety differs from the typical of the species by cell subglobose.

Material studied: HAS103156, HAS104546, HAS104767, HAS106122, HAS106387 and HAS106449.

Geographical distribution in Brazil: Amazonas, Mato Grosso, Paraná, Pernambuco, Federal District, Rio Grande do Sul, Rio de Janeiro and São Paulo.

L. playfairiana Deflandre var. ***playfairiana***, Annales de Protistologie. 2: 16, fig. 23. 1929.
Figures 14-15

Cell broadly fusiform to elliptical, 47-50 µm long., 20.5-24 µm broad, Rl/b = 2.0-2.4; anterior pole asymetric, with a boss reminding beak; posterior pole, colourless, conical caudal process slightly acuminated, straight, 7.5-11 µm long., pellicle smooth; numerous chloroplasts, parietal, discoid, ca. of 3.0 µm diam.; paramylon bodies 2, lateral, ring-shaped; emergent flagellum 1/2 of cell length.

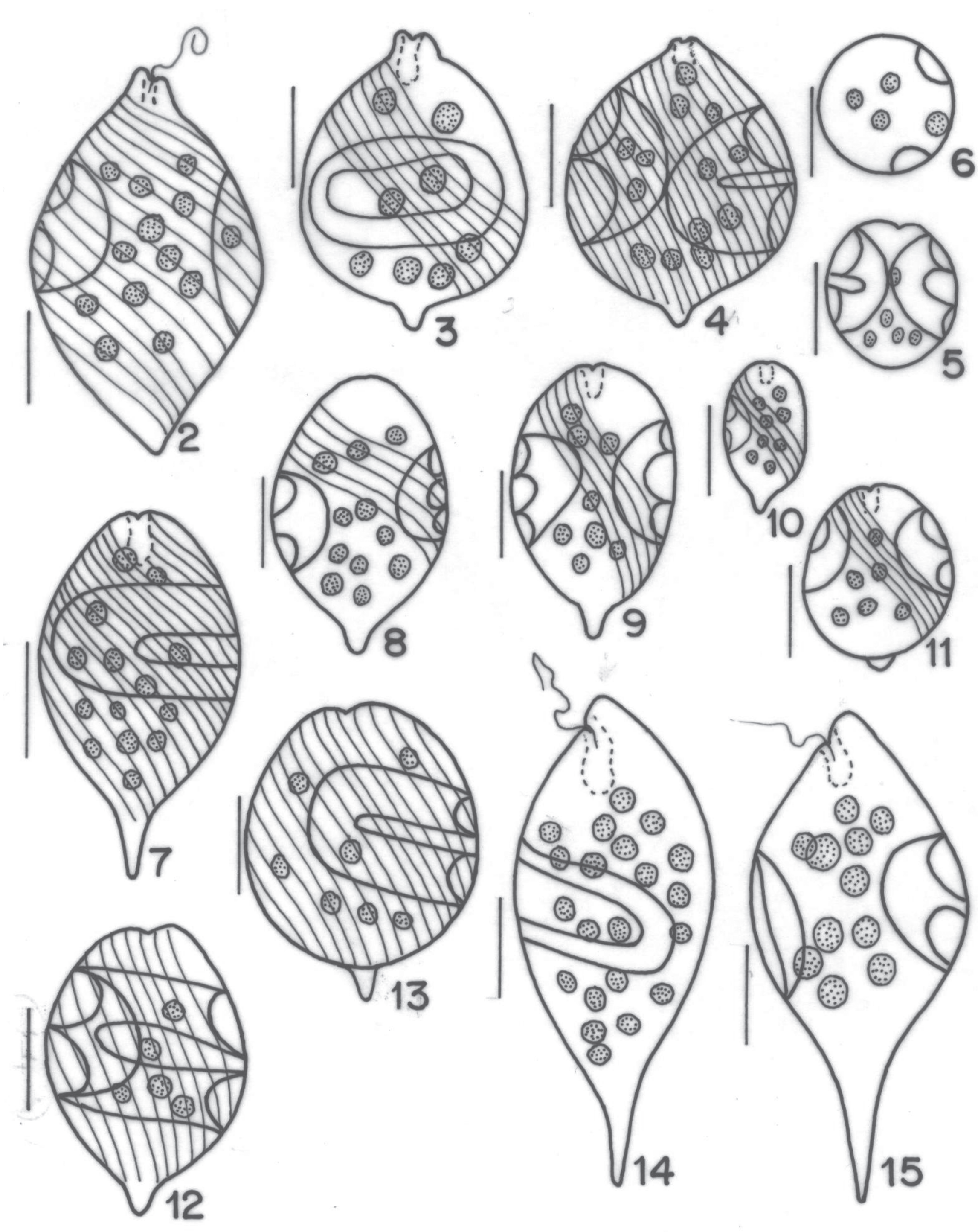
Material studied: HAS103156, HAS104528, HAS104582, HAS104585, HAS106408 and HAS106565.

Geographical distribution in Brazil: Amazonas and Rio Grande do Sul.

L. salina Fritsch var. ***salina***, New Phytologist 13: 351, fig. 3a-b, e. 1914.
Figure 16

Cell broad ovoid to ovoid, 38-52 µm long., 29-45 µm broad, Rl/b = 1.1-1.5; circular in cross-section; anterior pole rounded, opening of channel subapical, produced into a deep, oblique, lateral depression; caudal process usually absent; rigid pellicle, colourless, spirally striated to the right; numerous chloroplasts, parietal, discoid, ca. of 1.5 µm diam.; paramylon bodies numerous, discoid or globose, never ring-shaped, 3.0-3.5 µm diam., emergent flagellum 1/5 of cell length.

Material studied: HAS35999, HAS103156, HAS103163, HAS103188, HAS103202, HAS103249, HAS103250, HAS103254, HAS103397, HAS103457, HAS103458, HAS103527, HAS103640, HAS103665,



Figures 2-14. Taxa belonging to class Euglenophyceae. 2. *L. fusiformis* (Carter) Lemmermann emend. Conrad var. *fusiformis.* 3-4. *L. fusiformis* (Carter) Lemmermann emend. Conrad var. *amphirhynchus*. 5-6. *L. fusiformis* (Carter) Lemmermann emend. Conrad var. *minor* Chu. 6. apical view. 7-9. *L. ovum* (Ehrenberg) Lemmermann var. *ovum.* 10-11. *L. ovum* (Ehrenberg) Lemmermann var. *dimidio-minor*. 12-13. *L. ovum* (Ehrenberg) Lemmermann var. *globula* (Perty) Lemmermann. 14-15. *L. playfairiana* Deflandre var. *playfairiana.* Scale bars = 10 µm.

HAS103668, HAS103671, HAS103690, HAS103693, HAS103696, HAS103830, HAS103833, HAS103836, HAS103856, HAS103859, HAS103862, HAS103946, HAS103949, HAS103952, HAS103993, HAS103999, HAS104014, HAS104017, HAS104020, HAS104042, HAS104064, HAS104067, HAS104070, HAS104280, HAS104298, HAS104301, HAS104319, HAS104322, HAS104522, HAS104528, HAS104543, HAS104546, HAS104549, HAS104561, HAS104564, HAS104567, HAS104582, HAS104585, HAS104588, HAS104767, HAS104770, HAS104773, HAS104783, HAS104786, HAS104789, HAS104804, HAS104807, HAS104810, HAS104821, HAS104824, HAS104844, HAS104850, HAS106095, HAS106098, HAS106101, HAS106116, HAS106119, HAS106122, HAS106137, HAS106140, HAS106143, HAS106158, HAS106161, HAS106164, HAS106387, HAS106390, HAS106393, HAS106402, HAS106405, HAS106408, HAS106423, HAS106426, HAS106429, HAS106443, HAS106446, HAS106546, HAS106549, HAS106552, HAS106559, HAS106562, HAS106565, HAS106576, HAS106579, HAS106582, HAS106602, HAS106605, HAS106608, HAS106617, HAS106620, HAS106623, HAS106649, HAS106652, HAS106703, HAS106706, HAS106709, HAS106716, HAS106718, HAS106738, HAS106740, HAS106770, HAS106773, HAS106780, HAS106783, HAS106806, HAS106809, HAS106812, HAS106820, HAS106823, HAS106826, HAS106846, HAS107032, HAS106035, HAS107038, HAS107055, HAS107058, HAS107118, HAS107131, HAS107137, HAS107225, HAS107228, HAS107231, HAS107238, HAS107241, HAS107244, HAS107251, HAS107254 and HAS107257.

Geographical distribution in Brazil: Amazonas, Distrito Federal, Goiás, Mato Grosso, Paraná, Rio Grande do Sul, Rio de Janeiro, Rondônia, Santa Catarina, São Paulo and Tocantins.

L. salina Fritsch var. ***salina*** f. ***obtusa*** (Huber-Pestalozzi) Conrad, Mémoires du Musée royal d'histoire naturelle de Belgique 2(1): 63, fig. 58. 1935.
Figure 17

Cell broadly elliptical to ovoid, 42-48 µm long., 26-32 µm broad, Rl/b = 1.4-1.8; anterior pole rounded, posterior pole attenuated into a colourless, straight, conical-truncate caudal process, ca. 3.5 µm long.

L. salina var. salina f. *obtusa* differs from the typical variety of the species by present a caudal process conical-truncate.

Material studied: HAS35999, HAS103156, HAS106188, HAS103202, HAS103249, HAS103250, HAS103254, HAS103397, HAS103665, HAS103690, HAS103859, HAS103862 HAS103949, HAS103952, HAS103993, HAS103996, HAS104020, HAS104045, HAS104319, HAS104528, HAS104543, HAS104546, HAS104564, HAS104582, HAS104585, HAS104588, HAS104810, HAS104821, HAS106137, HAS106158, HAS106393, HAS106443, HAS106446, HAS106546, HAS106549, HAS106565, HAS106576, HAS106608, HAS106703, HAS106770, HAS106780, HAS106783, HAS106786, HAS106809, HAS106820 and HAS107137.

Geographical distribution in Brazil: Rio Grande do Sul and Santa Catarina.

L. salina Fritsch var. ***vallicauda*** Conrad, Mémoires du Musée royal d'histoire naturelle de Belgique 2(1): 63. 1935.
Figure 18

Cell broadly elliptical to ovoid, 61-63 µm long., ca. 33 µm broad, Rl/b = 1.8-1.9; anterior pole rounded, opening of subapical channel; caudal process conical-acute and slightly curved, 8.5 to 9.5 µm long.; rigid pellicle, colourless, spirally striated to the right; numerous chloroplasts, parietal, discoid, ca. 2.0 µm diam.; paramylon bodies 2, lateral, ring-shaped, 17-20 µm diam.; emergent flagellum 1/2 of cell length.

L. salina var. *vallicauda* differs from the typical variety of the species by present conical-acute and slightly curved caudal process.

Material studied: HAS35999, HAS103202, HAS103250, HAS104546, HAS104564, HAS104585, HAS104786, HAS104589, HAS106546, HAS106549, HAS106823 and HAS107244.

Geographical distribution in Brazil: Minas Gerais, Rio Grande do Sul and São Paulo.

L. steinii Lemmermann emend. Conrad, Archiv für Protistenkunde 82(2): 206-207, fig. 4-5. 1934.
Figures 19-20

Cell fusiform to elliptical, 22-25 µm long., 9.5-14 µm broad, Rl/b = 1.6-2.5; anterior pole rounded, opening of apical channel; posterior pole abruptly narrowed into a short, colourless, conical caudal process, 1.9-2.1 µm long.; rigid pellicle, striated longitudinal; numerous chloroplasts, parietal, discoid, 1.3-2.3 µm diam.; paramylon bodies 2, lateral, ring-shaped, 10-12 µm long.

Material studied: HAS103668, HAS104017, HAS106158, HAS106402, HAS106405, HAS106423, HAS106426, HAS106565, HAS106605, HAS106812 and HAS107244.

Geographical distribution in Brazil: Rio Grande do Sul, Rio de Janeiro and São Paulo.

L. truncata Da Cunha var. ***truncata***, Memórias do Instituto Oswaldo Cruz 6(3): 170, pl. 24, fig. 1. 1914.
Figures 21-22

Cell rhomboidal to 5-angular, 38-51 µm long., 30-47 µm broad, Rl/b = 1.1-1.3; anterior pole truncate, opening of apical channel, posterior pole rounded; rigid pellicle, spirally striated to the left; numerous chloroplasts, parietal, discoid, ca. 2.5 µm diam.; paramylon bodies 2, lateral, ring-shaped; emergent flagellum 1/2 of cell length.

Material studied: HAS103163, HAS103202, HAS103249, HAS103397, HAS103527, HAS103621, HAS103671, HAS103668, HAS103693, HAS103830, HAS103833, HAS103856, HAS103859, HAS103862, HAS103993, HAS104017, HAS104042, HAS104045, HAS104319, HAS104522, HAS104528, HAS104549, HAS104582, HAS104585, HAS106767, HAS104773, HAS106402, HAS106408, HAS106426, HAS106429, HAS106446, HAS106562, HAS106620, HAS106709, HAS106721, HAS106734, HAS106770, HAS106773, HAS106812, HAS106823, HAS106780, HAS106783, HAS106786, HAS106809, HAS106820, HAS106823 and HAS106826.

Geographical distribution in Brazil: Rio Grande do Sul and Santa Catarina.

L. turbiniformis Deflandre, Bulletin du Muséum d'Histoire naturelle de Paris 6: 422. 1926.
Figures 23-24

Cell turbiniform, 33-40 µm long., 20-22 µm broad, Rl/b = 1.5-2.0; circular in cross-section; anterior pole rounded, opening of apical channel; posterior pole abruptly narrowed in conical caudal process, straigt, 7.5-11.5 µm long.; rigid pellicle, spirally striated to the left; numerous chloroplasts, parietal, discoid, ca. 2.3 µm diam.; paramylon bodies 2, lateral, ring-shaped.

Material studied: HAS104770, HAS104804, HAS103671, HAS103402, HAS104298, HAS104402, HAS104405 and HAS107244.

Geographical distribution in Brazil: Mato Grosso, Rio Grande do Sul and Rio de Janeiro.

As mentioned before, Marins *et al.* (2003) proposed the transference of some *Euglena* species of Section *Rigidae* Pringsheim (1953) to *Lepocinclis*, despite of *Euglena acus* be usually straight, spindle-shaped, but may assume C, J, or S shapes, and *E. spirogyra* and *E. oxyuris* var. *fusca* may vary in shape from spindle-shaped to rounded. Also, these taxa have cell morphology and the shape (rod-shaped) of paramylum granules considerably different from those of *Lepocinclis*. Among *Lepocinclis* distinctive features in Conrad (1934, 1935) are the thick rigid pellicle, the elliptical, fusiform to ovoid cell shape, with helicoidal striae, the presence of lateral, ring-shaped paramylum granules and the lack of pyrenoids. All those characteristics are well fundamented and do work; for what reason we presently do not accept the transference of the above mentioned *Euglena* to *Lepocinclis*.

All 13 taxa presently identified have already been cited for the state of Rio Grande do Sul, with emphasis to *Lepocinclis fusiformis* var. *fusiformis*, *L. ovum* var. *ovum*, *L. ovum* var. *dimidio-minor* and *L. salina* var. *salina* that are widely distributed in Brazil.

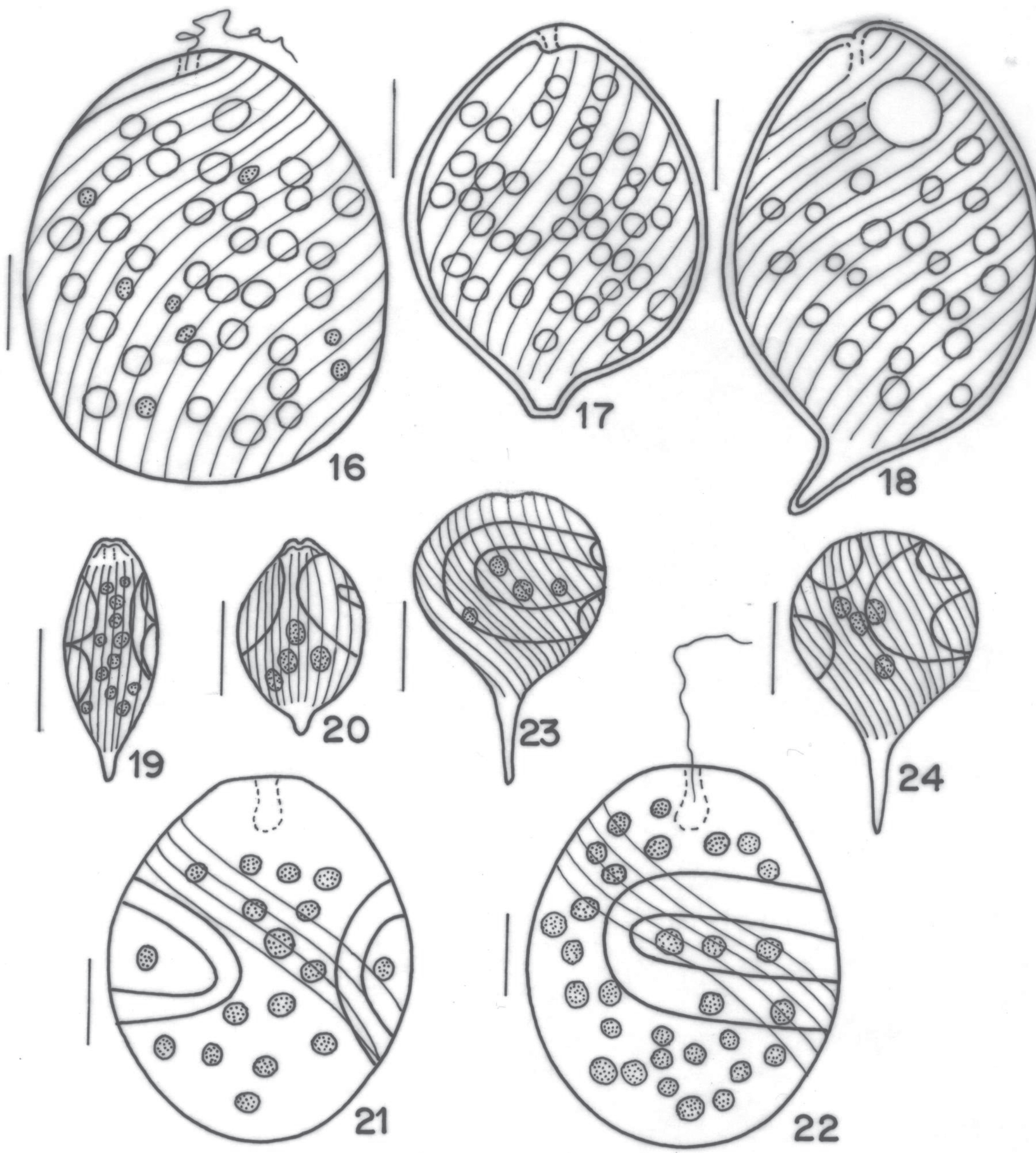
Lepocinclis salina var. *salina* was the widest distributed species in the Bom Jardim Creek during the five years period of present sampling, occurring in 142 sample units studied, and was immediately followed by *L. ovum* var. *dimidio-minor* present in 93 sample units and *L. fusiformis* var. *fusiformis* in 72 sample units. These three taxa were characterized by tolerating a wide variation of environmental conditions (table 2), especially of water temperature that varied from 9.7 to 33.6 ºC, ammonium from not detected by the method used to 260 µg L^{-1}, organic matter from 2.3 to 12 mg L^{-1}, orthophosphate from not detected by the method used to 1,470 µg L^{-1} and conductivity from 13.2 to 1450 µS cm^{-1}. Despite of have already been registered for several other aquatic systems of Rio Grande do Sul state, *L. salina* var. *salina* occurred in 81% of total samples collected from Bom Jardim creek, as well as during many months with a high number of individual specimens per preparation (> 30 ind preparation).

Lepocinclis ovum var. *globula*, *L. playfairiana* and *L. turbiniformis* were collected from acid water, whereas *L. steinii* from both acid and neutral waters, and all remaining taxa from acid to alkaline water (table 2).

According to Wetzel (2001), euglenophytes live best in shallow, organic matter rich water. *Lepocinclis* was collected from water with organic matter varying from oligosaprobic (2.3 mg L^{-1}) to β-mesosaprobic (12 mg L^{-1}), according to Hamm (1969) in Souza (2002), with average values oscillating between 6 and 8 mg L^{-1}.

Oxygen biochemical demand values also indicated, according to Hamm (1969) in Souza (2002), condition varying from oligosaprobic (0.3 mg L^{-1}) to α-mesosaprobic (8 mg L^{-1}), despite of the majority of its measurements be close to 5 mg L^{-1}, i.e. conditions moderately polluted by organic matter (α-mesosaprobic).

Lepocinclis species richness at the Bom Jardim Creek varied from to nine taxa, the greatest number



Figures 16-24. Taxa belonging to class Euglenophyceae. 16. *L. salina* Fritsch var. *salina.* 17. *L. salina* Fritsch var. *salina* f. *obtusa* (Huber-Pestalozzi) Conrad. 18. *L. salina* Fritsch var. *vallicauda* Conrad. 19-20. *L. steinii* Lemmermann emend. Conrad. 21-22. *L. truncata* Da Cunha var. *truncata.* 23-24. *L. turbiniformis* Deflandre. Scale bars = 10 µm

registered from ABJ Frente to Sitel, in November 2003 and May 2005.

Species richness varied seasonally among Bom Jardim Creek three sites presently studied, the summer being significantly different from all other seasons, possibly as a result of the greater water temperatures and organic matter availability, emphasis being given to orthophosphate and electric conductivity, which are the best eutrophication indicating organisms (Whitton 1975, Esteves 1998, Soininen *et al.* 2004).

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