Phytoplankton of lentic waters from the *Campus* of Santa Catarina University (Florianópolis, SC, Southern Brazil)

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ABSTRACT

Phytoplankton of lentic waters from the *Campus* of Santa Catarina University (Florianópolis, SC, Southern Brazil). Phytoplankton of lentic waters from the *Campus* of Santa Catarina University was studied from September 1993 to March 1994 and September 1994 to March 1995, excepting the class Bacillariophyceae. Samples were taken from three ponds, namely Horto Botânico, Centro de Convivência and Hospital Universitário. Forty two genera were identified, including 78 species, varieties and formae. Cellular measurements, occurrence at the sampling stations and pictures are given for each infrageneric taxon. In general, species composition of the ponds changed slightly from one period to another. Chlorophyta was the richest taxonomic group in the three localities; among them, the order Chlorococcales, which often abounds in eutrophic waters, prevailed in richness and frequency of species. The majority of the identified taxa is widespread throughout the world.

Key words: phytoplankton, eutrophic freshwaters, Southern Brazil.

RESUMO

Fitoplâncton de águas lênticas do *Campus* da Universidade Federal de Santa Catarina (Florianópolis, SC, Brasil meridional). Estudou-se o fitoplâncton de águas lênticas do *Campus* da Universidade Federal de Santa Catarina, excetuando-se a Classe Bacillariophyceae, de setembro de 1993 a março de 1994 e de setembro de 1994 a março de 1995. As amostras foram coletadas em três estações, denominadas «lagos» do Horto Botânico, Centro de Convivência e Hospital Universitário. Identificaram-se 42 gêneros, incluindo 78 espécies, variedades e formas. Para cada táxon infragenérico são fornecidas as medidas celulares, ocorrência nas estações de coleta e ilustrações. Em geral, a composição florística dos corpos d'água apresentou poucas modificações de um período a outro. Chlorophyta mostrou a maior riqueza taxonômica nas três localidades; dentre as algas verdes, a Ordem Chlorococcales, normalmente abundante em águas eutróficas, predominou em riqueza e freqüência de espécies. A maioria dos táxons identificados é cosmopolita.

Palavras-chave: fitoplâncton, águas eutróficas, Brasil meridional.

INTRODUCTION

The freshwater algal flora of Santa Catarina State (SC) is still very insufficiently known. Up to now, mainly the class Bacillariophyceae has been well studied, being the subject of several publications (Casagrande *et al.*, 2000). Just four recent studies, made by Couté & Franceschini (1998), Komárková-Legnerová *et al.* (1999), Laudares-Silva (1999) and Casagrande *et al.* (2000), increased the taxonomic and ecological knowledge on other algal groups from two lakes and one pond situated in Santa Catarina Island. Excepting the paper of Casagrande *et al.* (2000), which refers to epiphytic algae, the others are related to phytoplanktonic species.

This work represents the first taxonomic survey of the phytoplankton from three ponds located in the *Campus* of Santa Catarina University, Florianópolis, SC, Southern Brazil.

LOCALITIES

Florianópolis is the capital of Santa Catarina State. It is located on Santa Catarina Island, between 27°10' and 27°50' S, 48°25' and 48°35' W. The island has an area 425 km² (54km x 18km) (Fig. 1).

More details of this region are found in CARUSO (1990), COUTÉ & FRANCESCHINI (1998) and NIMER (1990).

The sampling stations are situated in the *Campus* of Santa Catarina University in the western region of the island, namely:

1. Horto Botânico pond: it is a very small and shallow pond with an area 3.6 m^2 and a maximum depth 0.3 m. A very abundant macrophyte vegetation is present during the whole year and is composed of *Salvinia* sp. (Salviniaceae), *Eichhornia* sp. (Pontederiaceae), *Pistia stratiotes* L. (Araceae) and *Utricularia* sp. (Lentibulariaceae). The waters were predominantly acidic during the studied period.

2. Centro de Convivência pond: its area is about 77.0 m^2 and the maximum depth 3.0 m (TAVARES, 1980/1981). The macrophytes are mainly represented by *Cyperus* sp. (Cyperaceae). The waters were predominantly alkaline.

3. Hospital Universitário pond: it has an area about 375.0 m^2. The maximum measured depth was 0.65 m in the sampling site. Some scattered floating specimens of *Eichhornia* sp. are present near the shores. The waters are very eutrophic with much organic matter deriving from sewage. They present a «green colour» caused by Chlorophyta or Euglenophyta species during the whole year. They were predominantly alkaline.

MATERIALS AND METHODS

Samples were taken monthly during spring and summer of two subsequent years, from September 1993 to March 1994 and September 1994 to March 1995. The sampling dates are the following: 29.IX.93, 21 and 22.X.93, 18 and 19.XI.93, 16.XII.93, 18.I.94, 22.II.94, 29.III.94, 19.IX.94, 21.X.94, 21.XI.94, 16.XII.94, 13.I.95, 15.II.95 and 24.III.95.

Plankton net samples (25 µm mesh) were taken by pulling the net horizontally at a superficial depth about 0.15 m at the shores of the ponds. The material was preserved in 4% formalin.

In the field, water temperature was measured with a chemical thermometer -10 +100°C, DIV 1/1°C, pH with a MINI-DIGI OP-110 pHmeter, transparency with a Secchi disk 0.30 m diam. and shore depth with a rule.

Phytoplankton analyses were made with a light microscope CARL ZEISS JENA model LABOVAL 4 equipped with a camera lucida, including drawings and measurements of the species. Methods for preparation and observation of some species with scanning electron

microscopy (SEM) were made as described in COUTÉ (1984), FRANCESCHINI (1992) and FRANCESCHINI *et al.* (1996). SEM micrographs were made with a JEOL JSM-840 A at the Service Commun des Laboratoires des Sciences de la Vie du Muséum National d'Histoire Naturelle de Paris.

The classification is based on HOEK *et al.* (1995).

All the samples are kept in the Laboratory of Phycology, Department of Botany, Santa Catarina University (UFSC).

RESULTS

Seventy eight taxa were identified (Bacillariophyceae excluded). They belong to 42 genera and 7 classes, namely: 38 Chlorophyceae, 15 Zygnematophyceae, 13 Euglenophyceae, 5 Cyanophyceae, 3 Chrysophyceae, 3 Xanthophyceae and 1 Dinophyceae.

Ticoplanktonic species are marked with an *.

The length measurements come before the width ones.

The following abbreviations mean: H.B. - Horto Botânico pond, C.C. - Centro de Convivência pond, H.U. - Hospital Universitário pond. They indicate the occurrence of each taxon at the sampling stations.

DIVISION CYANOPHYTA

Class Cyanophyceae

* *Calothrix braunii* Born. et Flah. (Fig. 3)
Filaments 7.0-9.5 µm width; basal cells 3.0-4.0 x 5.0-8.0 µm; heterocysts 4.0-7.0 µm diam.
H.B.

Lyngbya bourrellyana Compère (Fig. 4)
Cells 2.0-3.5 x 5.5-6.0 µm; apical cell 2.5-3.0 x 5.0-5.5 µm.
H.B., C.C., H.U.

Merismopedia punctata Meyen (Fig. 5)
Cells 2.0-3.0 µm diam.
H.B., C.C., H.U.

Microcystis aeruginosa (Kütz.) Kütz. (Fig. 6)
Cells 5.0-6.0 µm diam.
C.C.

Oscillatoria annae Van Goor (Fig. 7)
Cells 2.0-4.0 x 6.0-7.0 µm.
H.B., C.C., H.U.

DIVISION EUGLENOPHYTA

Class Euglenophyceaae

Euglena cf. *caudata* var. *minor* Defl. (Fig. 8)
Cells 55.0-67.0 x 18.0-23.0 µm.
Preserved material did not allow the observation of chloroplasts and euglenoid movement exhibited by *Euglena caudata* Hübn. necessary to the exact identification.
H.B., H. U.

Euglena oxyuris Schm. (Fig. 9)
Cells 134.0-146-0 x 22.0-28.0 µm.
C.C., H.U.

Euglena sp. (Fig. 10)
Species identification was not made because of the preserved material and plastic form of the cells.
H.U.

Lepocinclis ovum (Ehrbg.) Lemm. (Fig. 11)
Cells 27.0-34.0 x 15.0-22.0 µm.
H.U.

Lepocinclis salina Fritsch (Fig. 12)
Cells 41.0-52.0 x 27.0-39.0 µm.
H.B., C.C., H.U.

Lepocinclis salina Fritsch forma (Fig. 13)
Cells 41.0-45.0 x 25.0-31.0 µm.
Morphological features are similar to those observed by FRANCESCHINI (1992) in the material from Porto Alegre (RS, Southern Brazil).
C.C., H.U.

Phacus contortus Bourr. (Fig. 14)
Cells 37.0-44.0 x 29.0-33.0 µm.
H.B., H.U.

Phacus longicauda (Ehrbg.) Duj. (Fig. 15)
Cells 118.0-136.0 x 34.0-43.0 µm.
H.B., C.C., H.U.

Phacus pleuronectes (Müller) Duj. (Fig. 16)
Cells 45.0-51.0 x 31.0-34.0 µm.
H.B., H.U.

Phacus tortus (Lemm.) Skvortzov (Fig. 17)
Cells 86.0-90.0 x 42.0-48.0 µm.
H.B., C.C., H.U.

Trachelomonas hispida (Perty) Stein emend. Defl. (Fig. 18)
Loricae 30.0-32.0 x 19.0-23.0µm.
H.B., C.C., H.U.

Trachelomonas lefevrei Defl. (Fig. 19)
Loricae 25.0-32.0 x 20.0-22.0 µm; neck 2.0 x 5.0-6.0 µm.
H.B., C.C., H.U.

Trachelomonas cf. *volvocina-volvocinopsis* (Fig. 20)
Loricae 13.0-16.0 µm diam.
The number of chloroplasts necessary to the distinction between *Trachelomonas volvocina* Ehrbg. and *T. volvocinopsis* Swir. could not be observed in preserved material.
H.B., C.C., H.U.

DIVISION DINOPHYTA

Class Dinophyceae

Peridinium cunningtonii (Lemm.) Lemm. (Fig. 21 a-f)
Specimens 5 spines 37.0-41.0 x 24.0-29.0 µm (Fig. 21 a-d); specimens 4 spines 25.0-33.0 x 17.0-25.0 µm (Fig. 21 e, f).
H.B., C.C., H.U.

DIVISION HETEROKONTOPHYTA

Class Chrysophyceae

Dinobryon divergens var. *schauinslandii* (Lemm.) Brun. (Fig. 22)

Loricae 45.0-49.0 x 8.0-9.5 µm.
C.C.

Dinobryon sertularia Ehrbg. (Fig. 23)
Loricae 30.0-33.0 x 8.0-9.0 µm.
C.C.

Synura sp.
Very scarce species.
C.C., H.U.

Class Xanthophyceae

* *Characiopsis minor* Pascher (Fig. 24)
Cells 9.0-11.0 x 3.0-4.0 µm.
Grown on *Oedogonium* sp.
H.B.

Goniochloris sp. (Fig. 25)
Cells 13.0-17.0 µm diam.
H.U.

Tetraplektron sp. (Fig. 26)
Cells 27.0-31.0 µm diam. (with spines); 13.0-17.0 µm (without spines).
C.C., H.U.

Division CHLOROPHYTA

Class Chlorophyceae

Ankistrodesmus falcatus (Corda) Ralfs (Fig. 27)
Cells 44.0-89.0 x 2.0-3.0 µm.
H.B., C.C., H.U.

Botryococcus braunii Kütz. (Fig. 28)
Cells 8.0-15.0 x 3.0-6.0 µm.
H.B., C.C.

* *Bulbochaete* sp.
Just sterile filaments were found in the observed samples.
C.C.

Coelastrum cambricum Arch. (Fig. 29)
Coenobia 31.0-65.0 µm diam.; cells 11.0-18.0 µm diam.

H.B., C.C.

Coelastrum microporum Näg. (Fig. 30)
Coenobia 19.0-27.0 µm diam.; cells 6.0-7.0 µm diam.
H.B., C.C., H.U.

Coelastrum sphaericum Näg. (Fig. 31)
Coenobia 26.0-30.0 µm diam.; cells 11.0-12.0 µm diam.
H.B., C.C., H.U.

Dictyosphaerium pulchellum Wood (Fig. 32)
Cells 5.0-7.0 µm diam.
H.B., C.C., H.U.

Gloeocystis ampla (Kütz.) Rabenh. (Fig. 33)
Cells 13.0-14.0 µm diam.
H.B., C.C., H.U.

Gloeocystis bacillus Teil. (Fig. 34)
Cells 8.0-11.0 x 5.0-5.5 µm.
H.B., C.C., H.U.

Golenkinia paucispina W. et G. S. West (Fig. 35)
Cells 7.0-9.0 µm diam.; spines 6.0-9.0 µm long.
H.B., C.C., H.U.

Kirchneriella obesa (W. West) Schm. (Fig. 36)
Cells 5.0-7.0 x 2.0-4.0 µm.
H.B., C.C., H.U.

Micractinium pusillum Fres. (Fig. 37)
Cells 5.0-7.0 µm diam.; spines 27.0 µm long max.
C.C., H.U.

Monoraphidium arcuatum (Korch.) Hindak (Fig. 38)
Cells 18.0-26.0 x 2.0-4.0 µm.
H.B., C.C., H.U.

Monoraphidium contortum (Thur. ex Bréb.) Kom.-Legner. (Fig. 39)
Cells 27.0-44.0 x 3.0-5.0 µm.
H.B., H.U.

Monoraphidium komarkovae Nyg. (Fig. 40)
Cells 41.0-63.0 x 3.0-5.0 µm.
H.B., H.U.

Nephrochlamys subsolitaria (G. S. West) Korch. (Fig. 41)
Colonies 15.0-21.0 µm diam.; cells 7.0-13.0 x 3.0-6.0 µm.
H.B., C.C., H.U.

Nephrocytium agardhianum Näg. (Fig. 42)
Cells 14.5-19.0 x 3.0-5.0 µm.
H.B., C.C.

* *Oedogonium* sp.
Just sterile filaments were found.
H.B., C.C.

Oocystis lacustris Chod. (Fig. 43)
Cells 12.0-15.0 x 7.0-12.0 µm.
H.B., C.C.

Oocystis marssonii Lemm. (Fig. 44)
Cells 19.0-24.0 x 14.0-17.0 µm.
C.C., H.U.

Oocystis solitaria Wittr. (Fig. 45)
Colonies 24.0-44.0 x 23.0-35.0 µm; cells 12.0-25.0 x 7.0-16.0 µm.
H.B., C.C., H.U.

Pediastrum duplex Meyen (Fig. 46)
Coenobia 34.0-57.0 µm diam.; cells 9.0-13.0 x 7.0-11.0 µm.
H.B., C.C., H.U.

Pediastrum simplex Meyen (Fig. 47)
Coenobia 43.0-57.0 µm diam.; cells 19.0-26.0 x 6.0-13.0 µm.
H.B., C.C.

Pediastrum tetras (Ehrbg.) Ralfs (Fig. 48)
Cells 7.0-12.0 x 8.0-12.0 µm.
H.B., C.C.

Scenedesmus acuminatus (Lagerh.) Chod. var. *acuminatus* (Fig. 49)
Cells 22.0-46.0 x 4.0-11.0 µm.

H.B., C.C., H.U.

Scenedesmus acuminatus var. *minor* G. M. Smith (Fig. 50)
Cells 13.0-25.0 x 3.0-5.0 µm.
H.B., C.C., H.U.

Scenedesmus acutus Meyen (Fig. 51)
Cells 14.0-21.0 x 4.0-6.0 µm.
C.C., H.U.

Scenedesmus arcuatus (Lemm.) Lemm. (Fig. 52)
Cells 9.0-14.0 x 6.0-12.0 µm.
H.U.

Scenedesmus armatus (Chod.) Chod. (Fig. 53)
Cells 9.0-13.0 x 3.0-5.0 µm.
H.B., C.C., H.U.

Scenedesmus bernardii G. M. Smith (Fig. 54)
Cells 15.0-26.0 x 2.0-5.0 µm.
H.B., C.C., H.U.

Scenedesmus dimorphus (Turp.) Kütz. (Fig. 55)
Cells 23.0-32.0 x 4.0-7.0 µm.
C.C., H.U.

Scenedesmus oahuensis (Lemm.) G. M. Smith (Fig. 56)
Cells 22.0-33.0 x 6.0-11.0 µm; spines 18.0-22.0 µm long.
H.B., C.C., H.U.

Scenedesmus opoliensis P. Richt. (Fig. 57)
Cells 13.0-23.0 x 3.0-6.0 µm; spines 12.0-19.0 µm long.
H.B., C.C., H.U.

Scenedesmus producto-capitatus Schmula (Fig. 58)
Cells 16.0-19.0 x 5.0-8.0 µm.
C.C., H.U.

Scenedesmus quadricauda (Turp.) Bréb. (Fig. 59)
Cells 15.0-26.0 x 4.0-9.0 µm; spines 15.0-22.0 µm long.
H.B., C.C., H.U.

Sorastrum spinulosum Näg. (Fig. 60)
Cells 11.0-19.0 x 13.0-19.5 µm; spines 2.5-4.0 µm long.
H.B., C.C.

Tetraedron minimum (A. Br.) Hansg. (Fig. 61)
Cells 9.0-11.0 µm.
H.B., C.C., H.U.

Tetrallantos lagerheimii Teil. (Fig. 62)
Cells 13.0-19.0 x 4.5-6.0 µm.
C.C.

Class Zygnematophyceae

Closterium leibleinii Kütz. ex Ralfs (Fig. 63)
Cells 210.0-272.0 x 36.0-38.0 µm.
H.B., C.C., H.U.

Cosmarium angulosum Bréb. (Fig. 64)
Cells 13.0-16.0 x 10.0-13.0 µm; isthmus 2.0-4.0 µm.
H.B.

Cosmarium contractum var. *minutum* (Delp.) W. et G. S. West (Fig. 65)
Cells 15.0-19.5 x 12.0-13.0 µm; isthmus 3.0-5.0 µm.
H.B., C.C.

Cosmarium galeritum Nordst. (Fig. 66)
Cells 45.0-53.0 x 39.0-41.0 µm; isthmus 13.0-17.0 µm.
H.B.

Cosmarium granatum Bréb. ex Ralfs (Fig. 67)
Cells 25.5-37.0 x 21.0-22.0 µm; isthmus 6.0-7.0 µm.
H.B., C.C.

Cosmarium punctulatum Bréb. (Fig. 68)
Cells 21.0-23.0 x 18.0-20.0 µm; isthmus 5.0-7.0 µm.
C.C.

Cosmarium reniforme (Ralfs) Archer (Fig. 69)
Cells 53.0-62.0 x 43.0-48.0 µm; isthmus 9.0-15.0 µm.
H.B., C.C.

Euastrum denticulatum Gay forma (Figs. 70 a-c, 76-81)
Cells 39.0-44.0 x 29.0-35.0 µm; isthmus 4.0-7.0 µm.
Cells larger than the type but keeping the relation 1.2-1.3 times longer than broad; basal lobes diverging from the sinus; apex with a median notch deeper than those illustrated in KRIEGER (1937), PRESCOTT *et al.* (1977), RUZICKA (1981) and WEST & WEST (1905) (Figs. 76, 79); semicells with a mono- and/or bi-granulated central protuberance (Figs. 76, 78, 79). Because of the great variability shown by *Euastrum denticulatum* as discussed by RUZICKA (1981), the differences observed here induced us to consider this taxon as a regional forma rather than a new variety.
H.B., C.C., H.U.

Euastrum pulchellum Bréb. (Figs. 71, 82-85)
Cells 45.0-49.0 x 32.0-35.0 µm; isthmus 6.0-8.0 µm.
H.B.

Gonatozygon monotaenium De Bary var. *monotaenium* (Fig. 72)
Cells 144.0-168.0 x 10.0-13.0 µm.
H.B.

Gonatozygon monotaenium var. *pilosellum* Nordst. (Fig. 73)
Cells 97.0-260.0 x 9.0-14.0 µm.
H.B.

* *Mougeotia* spp.
Only sterile filaments were observed in the samples.
H.B., C.C.

Pleurotaenium ehrenbergii var. *elongatum* W. et G. S. West (Fig. 74 a-c)
Cells 580.0-600.0 x 29.0-31.0 µm; isthmus 22.0-28.0 µm.
H.B.

* *Spirogyra* sp.
No fertile individual was observed.
H.B., C.C.

Staurastrum brachioprominens Börg. forma (Fig. 75)
Cells 14.0-20.0 x 8.0-13.0 µm; isthmus 4.0-7.0 µm; projections 16.0-23.0 µm.
Size features are similar to those observed by Holsinger (*in* THOMASSON,

1956) in Sri Lanka (Asia) and by FRANCESCHINI (1992) in Porto Alegre (Brazil). Probably it is the same taxon.
C.C., H.U.

Water variables are summarised in tab. 1.

The richness of each class at the studied localities is presented in fig. 2.

Tab. 1. Ranges of water variables at the sampling stations during September 1993-March 1994 and September 1994-March 1995.

Locality	H.B.		C.C.		H.U.	
Period	93-94	94-95	93-94	94-95	93-94	94-95
Water variables						
Temperature(C°)	19.0-38.0	21.0-26.5	25.5-33.5	22.5-29.0	22.0-35.0	22.0-27.0
pH	6.45-8.26	6.20-6.72	7.93-8.80	5.98-7.91	7.20-10.60	6.23-11.88
Transparency(m)	(f)	0.06-0.18	0.25-0.37	0.20-0.48	0.12-0.30	0.18-0.35
Depth(m)	0.14-0.26	0.14-0.29	0.79-1.53	0.60-1.37	0.40-0.65	0.33-0.58

(f) means that Secchi disk touched the bottom, so water transparency was not measured.

DISCUSSION

The richness of each class at the sampling stations is seen in fig. 2. This algal flora is characterised by a majority of cosmopolitan species (BOURRELLY & COUTÉ, 1991; COMPÈRE, 1974, 1975, 1976, 1977, 1991; FRANCESCHINI, 1992; HUBER-PESTALOZZI, 1969; KOMÁREK & FOTT, 1983; PRESCOTT *et al.*, 1977, 1981; TELL & CONFORTI, 1986; TELL *et al.*, 1994). Fifty four, 47 and 36 taxa were respectively found in Horto Botânico, Centro de Convivência and Hospital Universitário pond from September 1993 to March 1994. Forty one, 54 and 51 taxa were observed in the same localities from September 1994 to March 1995. In general, species composition of these ponds changed slightly from one period to another.

Chlorophyceae, specially the order Chlorococcales, were the most diversified in the three localities, presenting 29 species at Horto Botânico pond, 33 at Centro de Convivência pond and 28 at Hospital Universitário pond. They correspond to 50% or more of the identified taxa in the sampling stations during the two studied periods

(fig. 2). Species of Chlorococcales were also the most frequent taxa in the whole study: *Scenedesmus quadricauda, Botryococcus braunii* and *Coelastrum sphaericum* were observed in a total of 31, 28 and 28 samples, respectively.

Botryococcus braunii, Oedogonium sp., *Cosmarium reniforme* and *Euastrum denticulatum* fo. occurred in all 14 samples from Horto Botânico pond, *Microcystis aeruginosa, Trachelomonas* cf. *volvocina-volvocinopsis, Botryococcus braunii, Coelastrum cambricum, C. sphaericum, Golenkinia paucispina, Pediastrum simplex, Tetraedron minimum* and *Cosmarium contractum* var. *minutum* were present in every sample from Centro de Convivência pond and just *Scenedesmus opoliensis* appeared in 14 samples from Hospital Universitário pond. The majority of the most frequent taxa belongs to Chlorococcales. Euglenophyceae and Zygnematophyceae (particularly the desmids) were well represented too. Desmids were found mainly in the predominantly acidic waters from Horto Botânico pond (pH was alkaline to almost neutral just in September: 7.50, October: 8.26 and November 1993: 6.90). Although species of Cyanophyceae were observed in the whole investigation, they never predominated in the samples. Chrysophyceae, Xanthophyceae and Dinophyceae were the least represented groups.

Several authors state the abundance of Chlorococcales, Euglenophyceae and Cyanophyceae in small eutrophic lakes and ponds. Species of *Ankistrodesmus, Coelastrum, Dictyosphaerium, Oocystis, Pediastrum, Scenedesmus, Tetraedron, Euglena, Phacus, Microcystis, Lyngbya, Oscillatoria*, e.g., are very common in nutrient-rich freshwaters and areas affected by sewage effluents (Dussart, 1992; Komarek & Fott, 1983; Reynolds, 1982, 1984; Round, 1984; Sze, 1993; Hoek *et al.*, 1995). Desmids are more common in oligotrophic and dystrophic lakes and ponds, but some species can occur in mesotrophic and eutrophic waters. Few species can be regarded as indicators of eutrophic conditions (Graham & Wilcox, 2000). They are generally common in acidic environments and are important indicator organisms especially when the absence of the bulk of species is taken into account (Round, 1984). Desmid populations tend to be more common and diverse in species composition as « metaphyton » than as true phytoplankton and many species are associated with submerged aquatic plants. This suggests that planktonic desmid populations are frequently derived from benthic algal communities by water mixing, e.g. (Behre, 1956; Brook, 1981). At Horto Botânico pond, the abundance of macrophytes and the lower values of pH probably favoured the development of a desmid community

during the whole period. In this pond, *Euastrum pulchellum* was found mainly on the sediments than in open water.

A particular abundance of certain species was observed in some samples: *Botryococcus braunii, Oocystis solitaria* and *Scenedesmus oahuensis* at Horto Botânico pond, *Peridinium cunningtonii, Coelastrum cambricum, C. sphaericum* and *Dictyosphaerium pulchellum* at Centro de Convivência pond and *Euglena oxyuris, Euglena* sp., *Lepocinclis salina, L. salina* fo., *Trachelomonas* cf. *volvocina-volvocinopsis, Kirchneriella obesa, Micractinium pusillum, Monoraphidium arcuatum* and *Oocystis marssonii* at Hospital Universitário pond. They caused a « green colour » in this sampling station during the whole investigation. The majority of these species are very common in eutrophic waters (Komarek & Fott, 1983; Rino, 1979).

The observations above corroborate the data from literature. Nevertheless, further analyses, especially in relation to species abundances during different seasons of a whole year, are necessary to know better the ecological preferences of each species and the seasonal distribution of these communities.

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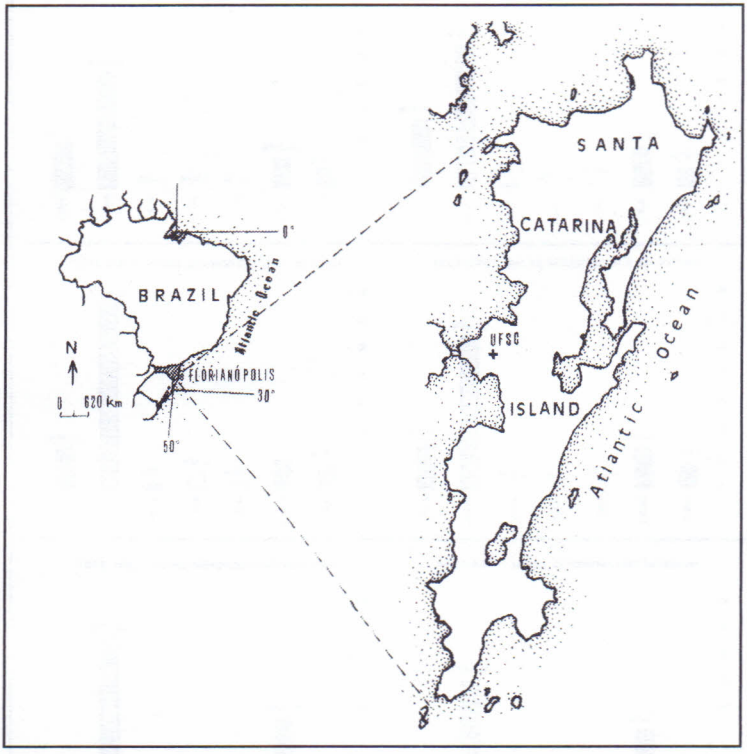


Fig. 1. Location of Santa Catarina University (+UFSC) in Santa Catarina Island (extracted of: PROTUR. Mapa Turístico. Ilha de Santa Catarina). At left, geographic situation of Santa Catarina State and Florianópolis.

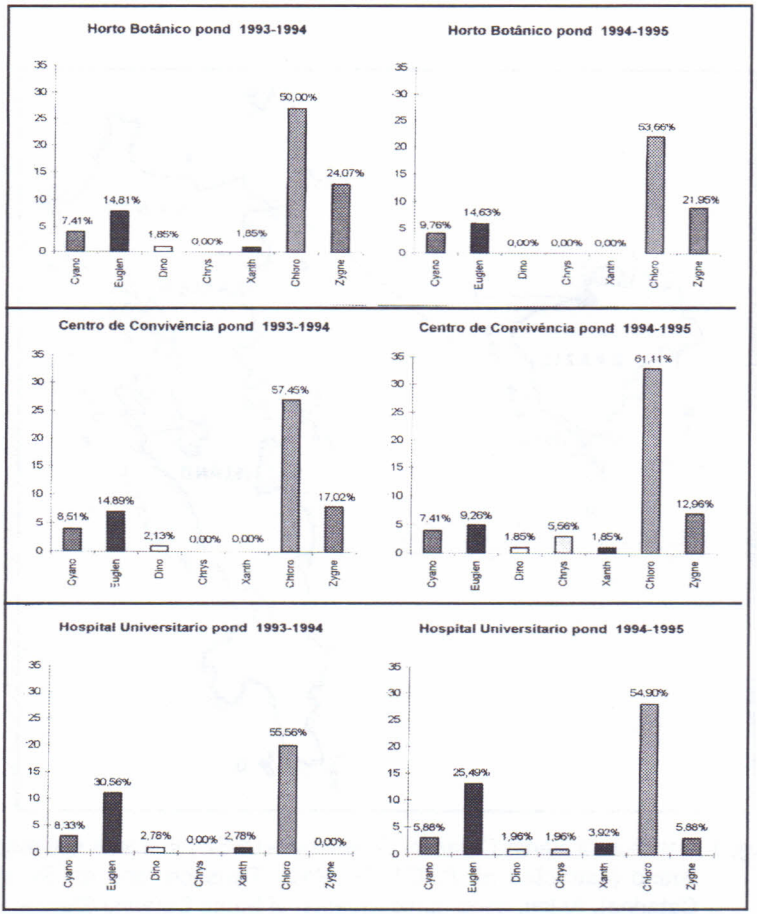


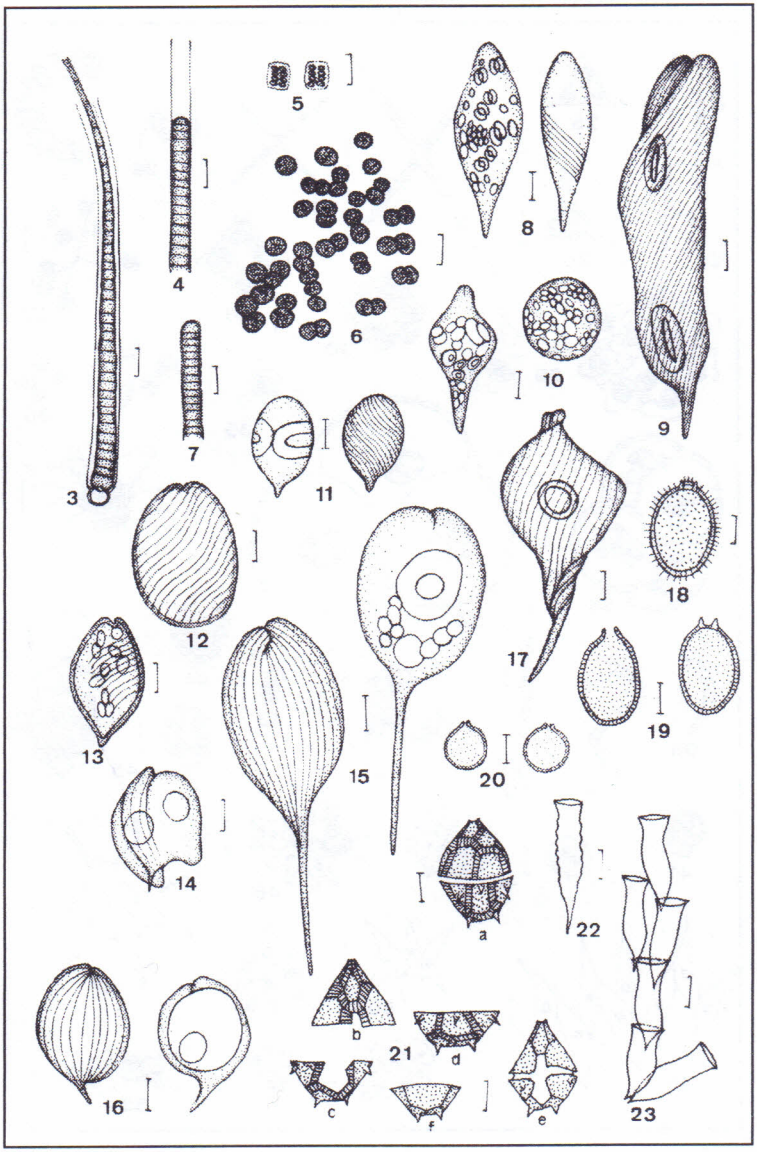
Fig. 2. Total of species (vertical axis) of each class (horizontal axis) at the sampling stations during the two studied periods.

Fig. 3: *Calothrix braunii.* Fig. 4: *Lyngbya bourrellyana.* Fig. 5: *Merismopedia punctata.* Fig. 6: *Microcystis aeruginosa.* Fig. 7: *Oscillatoria annae.* Fig. 8: *Euglena* cf. *caudata* var. *minor.* Fig. 9: *E. oxyuris.* Fig. 10: *Euglena* sp. Fig. 11: *Lepocinclis ovum.* Fig. 12: *L. salina.* Fig. 13: *L. salina* fo. Fig. 14: *Phacus contortus.* Fig. 15: *P. longicauda.* Fig. 16: *P. pleuronectes.* Fig. 17: *P. tortus.* Fig. 18: *Trachelomonas hispida.* Fig. 19: *T. lefevrei.* Fig. 20: *T.* cf. *volvocina-volvocinopsis.* Fig. 21: *Peridinium cunningtonii*; a-d: specimens with 5 spines; a: theca in dorsal side; b: epitheca in ventral side; c: hypotheca in ventral side; d: hypotheca in dorsal side; e, f: specimens with 4 spines; e: theca in ventral side; f: hypotheca in dorsal side. Fig. 22: *Dinobryon divergens* var. *schauinslandii.* Fig. 23: *D. sertularia.* (Scale bar: 10 µm).

Fig. 24: *Characiopsis minor.* Fig. 25: *Goniochloris* sp. Fig. 26: *Tetraplektron* sp. Fig. 27: *Ankistrodesmus falcatus.* Fig. 28: *Botryococcus braunii.* Fig. 29: *Coelastrum cambricum.* Fig. 30: *C. microporum.* Fig. 31: *C. sphaericum.* Fig. 32: *Dictyosphaerium pulchellum.* Fig. 33: *Gloeocystis ampla.* Fig. 34: *G. bacillus.* Fig. 35: *Golenkinia paucispina.* Fig. 36: *Kirchneriella obesa.* Fig. 37: *Micractinium pusillum.* Fig. 38: *Monoraphidium arcuatum.* Fig. 39: *M. contortum.* Fig. 40: *M. komarkovae.* Fig. 41: *Nephrochlamys subsolitaria.* Fig. 42: *Nephrocytium agardhianum.* Fig. 43: *Oocystis lacustris.* Fig. 44: *O. marssonii.* Fig. 45: *O. solitaria.* Fig. 46: *Pediastrum duplex.* Fig. 47: *P. simplex.* Fig. 48: *P. tetras.* Fig. 49: *Scenedesmus acuminatus* var. *acuminatus.* Fig. 50: *S. acuminatus* var. *minor.* Fig. 51: *S. acutus.* Fig. 52: *S. arcuatus.* Fig. 53: *S. armatus.* (Scale bar: 10 µm).

Fig. 54: *Scenedesmus. bernardii.* Fig. 55: *S. dimorphus.* Fig. 56: *S. oahuensis.* Fig. 57: *S. opoliensis.* Fig. 58: *S. producto-capitatus.* Fig. 59: *S. quadricauda.* Fig. 60: *Sorastrum spinulosum.* Fig. 61: *Tetraedron minimum.* Fig. 62: *Tetrallantos lagerheimii.* Fig. 63: *Closterium leibleinii.* Fig. 64: *Cosmarium angulosum.* Fig. 65: *C. contractum* var. *minutum.* Fig. 66: *C. galeritum.* Fig. 67: *C. granatum.* Fig. 68: *C. punctulatum.* Fig. 69: *C. reniforme.* Fig. 70: *Euastrum denticulatum* fo.; a: cell; b: semicell; c: apical view. Fig. 71: *E. pulchellum.* Fig. 72: *Gonatozygon monotaenium* var. *monotaenium.* Fig. 73: *G. monotaenium* var. *pilosellum.* Fig. 74: *Pleurotaenium ehrenbergii* var. *elongatum*; a: cell; b: median region of the cell; c: end of the cell. Fig. 75: *Staurastrum brachioprominens* fo. (Scale bar: 10 μm).

Figs. 76-81: *Euastrum denticulatum* fo.; 76: cell; 77: apical view; 78, 80, 81: profile views; 79: semicell. Figs. 82-85: *E. pulchellum*; 82: cell; 83: apical view; 84: profile view; 85: semicell. [Figs. 76-85: SEM]. (Scale bar: μm).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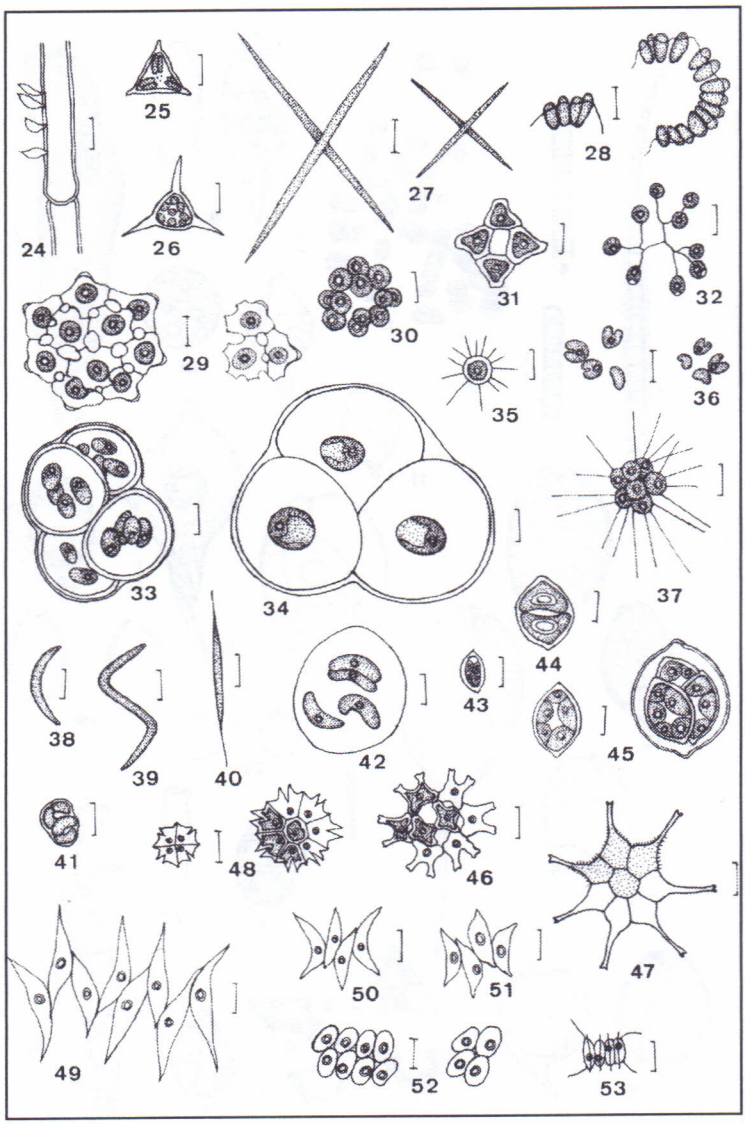
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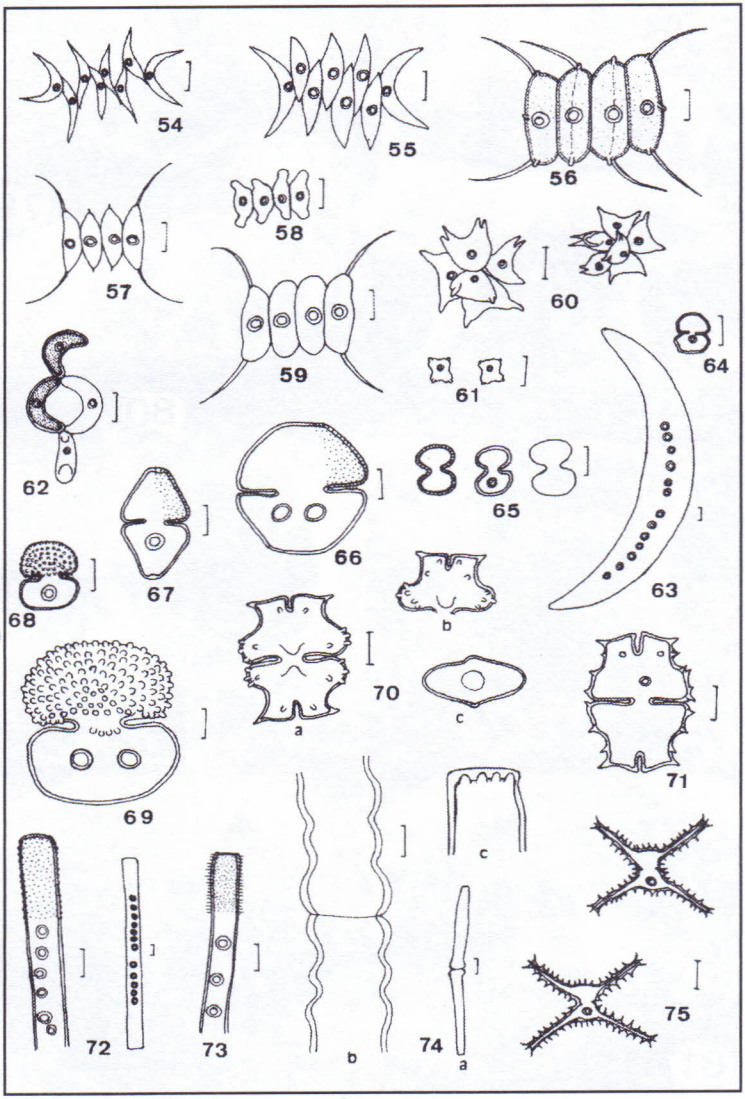
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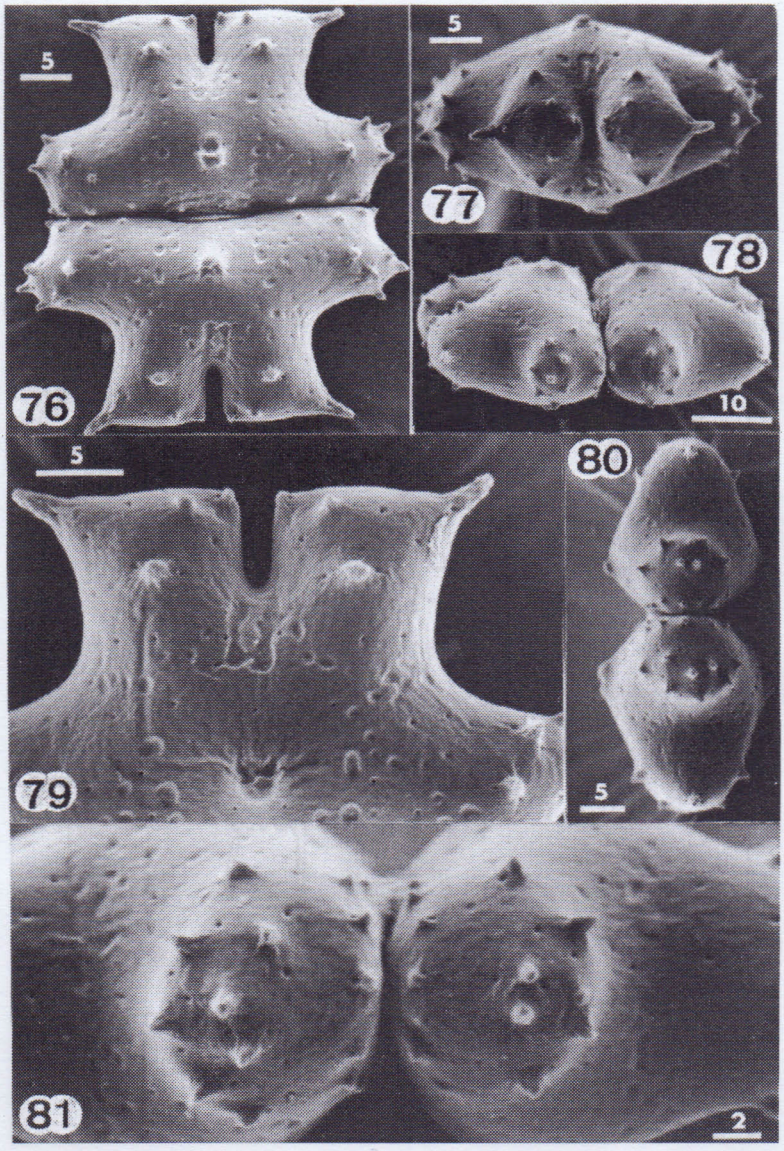
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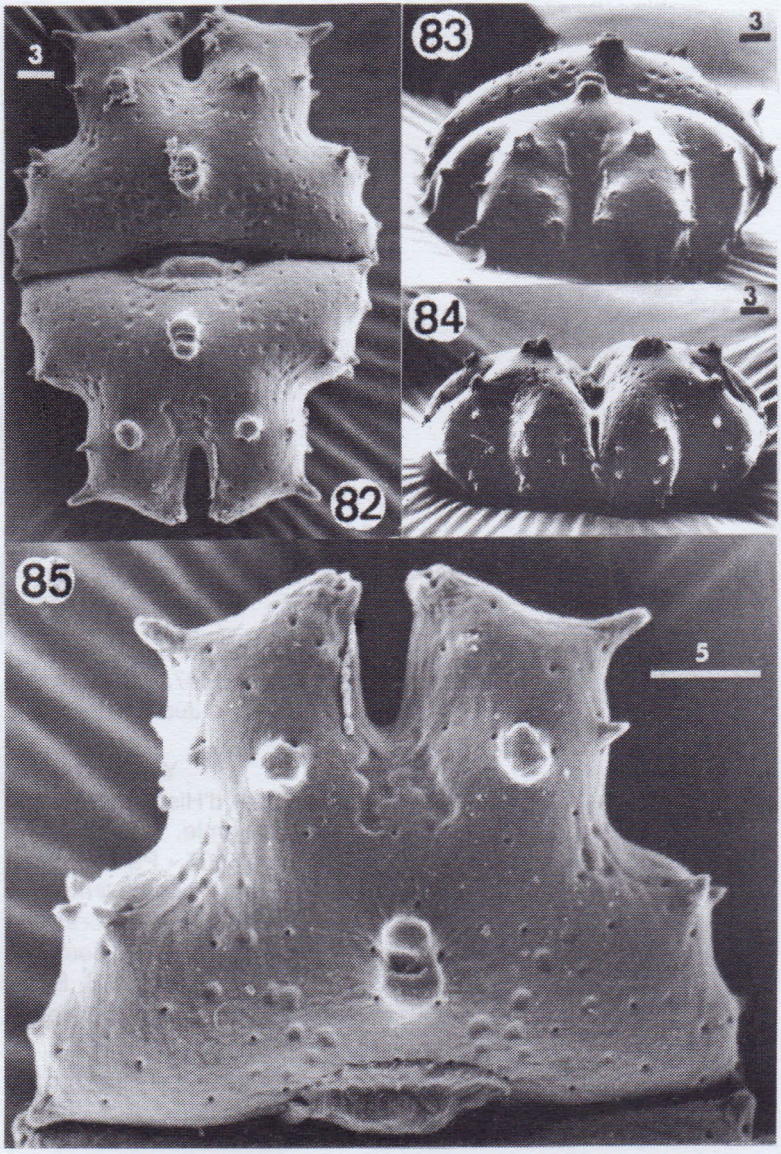
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