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Planktonic algae, other than desmids, of three Amazonian systems (Lake Batata, Lake Mussurá and Trombetas River), Pará, Brazil

by

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Abstract

The phytoplankton composition of three clear-water Amazonian environments (Lakes Batata and Mussurá and Trombetas River) is presented. The results are based on 319 samples collected during one year. 136 of the 228 taxa recorded are described, except desmids which have been treated elsewhere. Lake Batata showed higher species richness (188) than both Lake Mussurá (139) and the Trombetas River (116), the Chlorophyceae and Zygnemaphyceae being best represented. Lower species richness was recorded in the area of Lake Batata influenced by bauxite tailings, when compared to the natural (non-impacted) area.

Keywords: **Taxonomy, phytoplankton, Amazonia, floodplain lakes.**

Résumo

São apresentadas as composições fitoplanctônicas de três ambientes amazônicos de águas claras (Lago Batata, Lago Mussurá e Rio Trombetas), com base em 319 amostras coletadas durante um ano. São descritos 136 dos 228 táxons registrados, excetuando-se as desmídias, objeto de outro artigo. O Lago Batata apresentou maior riqueza de espécies (188) do que o Lago Mussurá (139) e o Rio Trombetas (116), sendo Chlorophyceae e Zygnemaphyceae as classes com maior número de representantes. Menor riqueza de espécies foi registrada na área impactada por rejeito da lavagem de bauxita do Lago Batata, se comparada à área natural.

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Introduction

Taxonomic studies in tropical waters are recent, compared to studies in aquatic environments of temperate regions. The work of MARTIUS et al. (1833) constitutes the first taxonomic study of Brazilian algae, focusing principally on marine material. For Amazonia, the first article published was by EHRENBERG (1843), who cited three species of algae from Rio Coari, Amazonas.

Phycological knowledge of Amazonia is contained in 70 works, 46 of which treat taxonomic groups from samples collected in the most varied environments; 13 others constitute a floristic sampling of phytoplankton as a whole, from certain lakes and rivers; nine treated the phytoplankton quantitatively, citing genera and/or species of algae; and two articles are also quantitative, without however mentioning species of algae. To this list may be added the work of UHERKÓVICH (1984), which consists of a succinct revision, with commentary, of the 30 phycological works on Amazonia published up to 1981.

Forty years after the study of EHRENBERG (1834), the work of DICKIE (1881) appeared, which cited 188 taxa of diatoms, 31 desmids and 70 taxa of other algal groups for the Amazon River and its tributaries. GINZBERGER (1928) published his program of algal collections near Santarém, and the articles of GESSNER (1931), GESSNER & KOLBE (1934), KAMMERER (1938) and GRÖNBLAD (1945) were produced based on that material.

Subsequent phycological research in Amazonia was based principally on the abundant material collected by Dr. Harald Sioli between 1940 and 1954. Numerous works were based on Dr. Sioli's contribution, such as those of HUSTEDT (1952a, 1952b, 1955a, 1955b, 1965) on diatoms, and those of FÖRSTER (1963, 1964, 1966, 1969, 1974), GRÖNBLAD & KALLIO (1954) and SCOTT et al. (1965) on desmids.

In addition to the articles already mentioned on the taxonomy of Amazonian algae, there are those of MÖBIUS (1892), ZIMMERMANN (1913, 1914), DROUET (1937, 1938), GRÖNBLAD (1954), PRESCOTT (1957), WOODHEAD & TWEED (1957), THOMASSON (1955, 1977), WOOD (1966), GESSNER & SIMONSEN (1967), MARTINS (1980, 1982, 1986a, 1986b), SANT'ANNA & MARTINS (1987), HICKEL & POLLINGHER (1988), BICUDO (1986), CRONBERG (1989), PALAMAR-MORDVINTSEVA & TSARENKO (1990), BITTENCOURT-OLIVEIRA (1990a, 1992, 1993a, 1993b, 1994), LOPES (1992) and CONFORTI (1993, 1994).

The planktonic flora of waterbodies and watercourses was analyzed by several authors (THOMASSON 1971; UHERKÓVICH & SCHMIDT 1974; SCHMIDT & UHERKÓVICH 1973, 1974; UHERKÓVICH 1976, 1981; BITTENCOURT-OLIVEIRA 1990b). During this phase, there also appeared the only work on periphytic flora (UHERKÓVICH & FRANKEN 1980). Data on species dominance were furnished by SCHMIDT (1973b, 1982) and quantitative information on the phytoplankton community were presented by BRAUN (1952), RIBEIRO (1978), UHERKÓVICH & RAI (1979), FISHER (1978), FISHER & PARSLEY (1979), SCHMIDT (1969, 1970, 1973b, 1982), MAGRIN (1993), HUSZAR (1994) and RODRIGUES (1994).

It is also appropriate to mention some floristic and taxonomic phycological studies developed for the Bolivian Amazon by ILTIS & COUTÉ (1984), THÉREZIEN (1985, 1986a, 1986b, 1987) and CADIMA (1990).

The objective of the present work is to contribute to knowledge of the Amazonian

phycological flora, analyzing the floristic composition of three clear-water systems and including taxonomic considerations, excluding desmids which were the object of a study by SOPHIA & HUSZAR (1996).

Study Area

Lakes Batata (56°14' to 56°00'W, 1°28' to 1°33'S) and Mussurá (56°18' to 56°19'W, 1°26' to 1°29'S) are clear-water lakes and are situated on the right and left banks respectively of the Trombetas River, near Porto Trombetas in the Municipality of Oriximiná, State of Pará, Brazil (Fig. 1).

The regional climate corresponds to *Am* of Köppen (BRASIL 1984) - a humid tropical monsoon climate - with high precipitation during some months, compensated by the occurrence of one or two months with precipitation less than 60 mm.

Lake Batata is a lateral dam lake (PANOSSO 1993), with an area of about 29.5 km^2 water surface during the drowdown water stage, and is permanently connected to the Trombetas river. Depending on the amplitude of the hydrological pulse, the river waters may rise above the level of the dike which separates the river from Lake Batata. About 20 km southwest of Lake Batata, the bauxite mine worked by the company Mineração Rio do Norte S.A. is located, in the Serra do Saracá. From 1979 to 1989 the bauxite tailings resulting from ore processing were discharged into the west part of Lake Batata, eventually covering about 30 % of the total lake area during the high water stage (ROLAND & ESTEVES 1993) and about 20 % during low water (PANOSSO 1993).

Lake Mussurá, about 7.7 km^2 in area (during the drowdown water stage), is permanently connected to the Trombetas River by an outflow and its shores are totally preserved.

The waters of the systems studied (Tab. 1) are characterized by low values of electrical conductivity, pH, alkalinity and soluble reactive phosphorus (HUSZAR 1994).

Material and methods

The study of the phytoplankton community was based on 319 samples collected weekly and also every three months. The trimonthly collections were made at the four stages of the Rio Trombetas hydrological cycle: drowdown water (September/1988), low water (December/1988), filling water (March/1989) and high water (June/1989). Fifteen collection stations were established: Stations 1 and 13 in the Trombetas River, Stations 2 to 10C in Lake Batata and Stations 11 and 12 in Lake Mussurá (Fig. 1). The weekly collections were made in the subsurface layer of Lake Batata (Stations 8 and 10) from 04/September/88 to 05/October/89, thus also including the four stages of the hydrological cycle.

The subsurface samples were collected by filling bottles directely with water, and the others with a Van Dorn bottle; all were fixed in acetic Lugol's solution (VOLLENWEIDER 1974). For identification of populations, in addition to the quantitative samples processed by the UTERMÖHL (1958) method, live samples collected with and without a 25 µm mesh net were used, as well as samples collected with the same net and fixed with Transeau's solution. These last were deposited in the Herbarium of the Museu Nacional (R), Universidade Federal do Rio de Janeiro.

Results

The Composition of the Phytoplankton of Lake Batata, Lake Mussurá and Trombetas River

The phytoplankton communities of the systems studied were constituted by 228 taxa (species, varieties and taxonomic forms), distributed among 94 genera belonging to 10 taxonomic clases, as shown in Table 2.

Of the 228 taxa (Chart 1), 174 were identified to specific or infraspecific levels, (146 species, 21 varieties and 7 taxonomic forms). Of the 55 taxa not determined to this level, 32 were identified to the level of genus. A new species to science, belonging to the genus *Bitrichia*, is being described (MENEZES & HUSZAR, in prep.).

Of the total number of species recorded, 93 % occurred in the trimonthly and 75 % in the weekly collections. Lake Batata showed higher species richness than Lake Mussurá and the stretch of the Trombetas River that was studied; however the distribution of species numbers by class was similar in the three systems, with Chlorophyceae and Zygnemaphyceae predominating (Tab. 3).

In Lake Batata, all classes of algae occurred in greater or equal species number at the natural station than at the station impacted by bauxite tailings, with 162 taxa recorded from the natural area and 149 from the impacted area. Reduction in water transparency and increase in sedimentation rate of the algae carried down by the clays composing the tailings are the causes of the lower species richness in the impacted area (HUSZAR 1994).

Of the 228 species found in the three systems, 51 were exclusive to Lake Batata, 12 to Lake Mussurá and 6 to the stretch of the Rio Trombetas that was studied. Only 5 of these 51 species occurred in high densities; the remaining species found exclusively in Lake Batata and all those found exclusively in Mussurá and Trombetas were quite rare. It appears that such exclusivity occurred principally because of the lower chance that these species would be counted due to differences in sampling frequency, rather than because of environmental differences.

Lake Batata was more species-rich during all four stages of the hydrological cycle than were Lake Mussurá and Trombetas River (Tab. 4). Possibly these differences occurred not only as a function of greater environmental heterogeneity in Lake Batata, which has several distinct compartments (bay, natural area, impacted area, outlet, canal, etc.), but also because of the greater collection effort in Lake Batata.

Between 55 and 60 % of the species recorded for each environment studied could be found during each of the periods of drowdown water, low water and filling water, and only 17 to 28 % during the high water phase.

The phytoplankton species of the area studied are characterized by small size (ca. 60 % of the total), if their degree of variation and mean linear dimensions are compared with data established from the literature (Tab. 5). For this analysis, only the taxa identified with certainty to infrageneric levels were considered. For all taxonomic classes, except the Chrysophyceae, between 50 and 70 % of their taxa had dimensions smaller than or at the lower limit of the size interval recorded in the literature. This phenomenon was independent of the environment and of the spatial and temporal distributions in each of the three environments.

The low water conductivity in the systems studied indicated reduced content of dissolved salts, for example soluble reactive phosphorus. Such environments are located

in a region where the waters drain Precambrian terrain, leading to a scarcity of dissolved nutrients (SIOLI 1968). The hypothesis is suggested that the small size of the organisms, and consequently the higher surface/volume ratio, is a strategy to optimize absorption of scarce nutrients (HUSZAR 1994). This idea was corroborated when the sizes of the algae in this region were compared to those of other Amazonian limnetic ecosystems, principally white waters with higher nutrient contents, where the phycological flora, especially Chlorococcales and Desmids is relatively well known. This comparison indicated that the algae of Lake Batata, Lake Mussurá and Trombetas River were also smaller than algae recorded for other Amazonian waters.

The Phytoplanktonic Organisms of Lakes Batata and Mussurá and Trombetas River

In this section, the 136 taxa identified to infrageneric levels are listed and illustrated, except for the 40 taxa of desmids which are presented in SOPHIA & HUSZAR (1996). The taxa are briefly described, the range of variation in their dimensions is presented and most of them are illustred.

Cyanophyceae

Chroococcales

1. *Aphanothece clathrata* WEST & WEST (Pl. I, Fig. 1)

Trans. R. Ir. Acad. Ser. B 32: 111, pl. 10, figs. 9-11, 1906.

Colonies generally with 16 cells, rarely more, cells cylindrical, without pseudovacuoles. Cell length 1.5-4.8, width 0.5-1.1 μm.

2. *Chroococcus minor* (KÜTZING) NÄGELI (Pl. I, Fig. 6)

Gatt. einzell. Algen p. 47, pl. 1A, fig. 4, 1849.

Cells solitary, spherical, with conspicuous mucilaginous sheath. Cell diameter 1.5-3.5 μm.

3. *Eucapsis alpina* CLEMENTS & SHANTZ var. *minor* SKUJA (Pl. I, Fig. 2)

Acta Horti bot. Univ. latv. 1: 155, pl. 2, fig. 2, 1926.

Cubical colonies of 8-16 spherical cells. Cell diameter 1.0-3.2 μm.

4. *Merismopedia tenuissima* LEMMERMANN (Pl. I, Fig. 8)

Bot. Zbl. 76: 154, 1898.

Tabular colonies, 8-16-32-64-128 spherical cells, hemispherical after division. Cell diameter 1.2-2.4 μm.

5. *Microcystis aeruginosa* KÜTZING f. *flos-aquae* (WITTROCK) ELENKIN (Pl. I, Fig. 5)

Monogr. Alg. cyanoph. pars spec. 1: 106, 1938.

Spherical or elongate colonies, numerous spherical cells, with pseudovacuoles. Cell diameter 2.0-3.0 μm.

6. *Microcystis aeruginosa* KÜTZING f. *protocystis* (CROW) ELENKIN (Pl. I, Fig. 13)

Monogr. Alg. cyanoph. pars spec. 1: 106, 1938.

Spherical colonies, numerous spherical cells, with pseudovacuoles. Cell diameter 0.8-1.6 μm.

7. *Microcystis elachista* (WEST & WEST) COMPÈRE (Pl. I, Fig. 4)
Bull. Jard. Bot. Nat. Belg. 37: 245, 1967.

Spherical colonies, 16 spherical cells, without pseudovacuoles. Cell diameter 0.8-1.5 μm.

8. *Synechococcus elegans* (WOLOSZYNSKA) KOMÁREK (Pl. I, Fig. 7)
Arch. Protistenk. 112: 367, 1970.

Colonies filamentous, irregularly curved, of 2-4-8 cylindrical cells. Cell length 2.4-4.8, width 0.8-1.5 μm.

9. *Synechococcus elongatus* NÄGELI (Pl. I, Fig. 9)
Gatt. einzell. Algen p. 56, fig. 5, 1849.

Cells generally solitary, rarely in chains of 2 cylindrical cells. Cell length 3.5-6.0, width 1.0-2.4 μm.

10. *Synechocystis aquatilis* SAUVAGEAU (Pl. I, Fig. 3)
Bull. Soc. bot. Fr. 14: 121, pl. 6, fig. 2, 1892.

Cells solitary, spherical. Cell diameter 2.0-3.5 μm.

Oscillatoriales

11. *Lyngbya cebennensis* (GOMONT) COMPÈRE (Pl. I, Fig. 12)
Bull. Jard. bot. nat. Belg. 44: 18, 1974.

Straight trichomes formed by cells 1.1-1.4 times longer than wide. Cell length 1.5-2.1, width 1.3-1.5 μm.

12. *Oscillatoria chalybea* MERTENS var. *insularis* GARDNER (Pl. I, Fig. 15)
Mem. N. York. Bot Gard 7: 36, pl. 7, fig. 68, 1927.

Trichomes straight, constricted at the cross walls; cells 1.4-1.6 times longer than wide. Cell length 3.4-5.3, width 6.6-7.5 μm.

13. *Oscillatoria geminata* (MENEGHINI) GOMONT (Pl. I, Fig. 14)
Annls Sci. nat. Ser. 7, Bot. 16: 222, 1892.

Trichomes straight, constricted at the cross walls; cells 1.4-4.6 times longer than wide, with refringent granules dispersed in protoplasm. Cell length 3.7-12.1, width 2.1-3.4 μm.

14. *Oscillatoria limnetica* LEMMERMANN (Pl. I, Fig. 11)
Ber. dt. bot. Ges. 18: 310, 1900.

Trichomes straight, contricted at the cross walls; cells 4.5-4.8 times longer than wide. Cell length 4.5-9.6, width 1.0-2.0 μm.

15. *Oscillatoria quadripunctulata* BRÜHL & BISWAS (Pl. I, Fig. 10)
J. Dep. Sci. Calcutta Univ. 4: 5, pl. 1, fig. 6, 1922.

Trichomes straight, not constricted at the cross walls; cells 2.0-2.5 times longer than wide, with 1 refringent granule at each pole. Cell length 2.0-5.0, width 1.0-2.0 μm.

16. *Oscillatoria* cf. *transvaalensis* CHOLNOKY (Pl. I, Fig. 16)
Hydrobiologia 7(3): 192, fig. 116-117, 1955.

Trichomes straight, constricted at the cross walls; cells 3.7-4.8 times wider than long. Cell length 3.6-5.8, width 17.5-22.4 μm.

Chlorophyceae

Chlorococcales

17. *Ankistrodesmus bernardii* KOMÁREK (Pl. II, Fig. 1)
Nova Hedwigia 37: 138, pl. 25, fig. 65, 1983.

Colonies of 4-8 fusiform-elongate cells, slightly curved in median region. Cell length 29.1-60.0, diameter 1.5-2.0 μm.

18. *Ankistrodesmus fusiformis* CORDA *sensu* KORSIKOV (Pl. II, Fig. 2)
Protococcineae p. 300, fig. 263, 1953.

Colonies of 2-4 fusiform-elongate cells, straight, arranged in cross. Cell length 40.0-48.4, diameter 1.5-1.8 μm.

19. *Ankistrodesmus gracilis* (REINSCH) KORSIKOV
Protococcineae p. 305, fig. 267, 1953.

Colonies of 4 lunate cells, convex sides turned toward center. Cell width ca. 13.0, diameter 2.7-2.9, distance between apices ca. 7.3 μm.

20. *Botryococcus fernandoi* KOMÁREK & MARVAN (Pl. II, Fig. 8)
Arch. Protistenk. 141: 89, 1992.

Colonies rounded or elongate; numerous obovate cells, 3/4 covered by mucilaginous sheath, radially oriented. Diameter of rounded colonies 16.9-24.2 μm, length of elongate colonies 72.6-81.5, width 48.4-60.5 μm; cell length 5.0-11.0, width 2.1-6.3 μm.

21. *Chlorella homosphaera* SKUJA (Pl. II, Fig. 6)
Symb. bot. Upsal. 9(3): 130, pl. 15, figs. 13a-k, 1948.

Cells solitary, spherical, chloroplast poculiform, without pyrenoid. Cell diameter 2.4-5.0 μm.

22. *Choricystis cylindracea* HINDÁK (Pl. II, Fig. 7)
Biol. Prace 34(1/2): 182, pl. 65, figs. 1-2, 1988.

Cells solitary, cylindrical to ovate. Cell length 5.0-9.0, width 1.9-2.0 μm.

23. *Closteriopsis longissima* (LEMMERMANN) LEMMERMANN (Pl. II, Fig. 13)
Forsch. Ber. biol. Stn. Plön 7: 124, pl. 2, figs. 36-38, 1899.

Cells solitary, fusiform-elongate, 16 pyrenoids arranged in row. Cell length 169.4-204.0, width 2.4-3.0 μm.

24. *Coccomyxa lacustris* (CHODAT) PASCHER (Pl. II, Fig. 14)
Süsswass. Flora V. 5, p. 210, 1915.

Colonies rounded, 4-16 elliptical cells, without pyrenoid, arranged irregularly in mucilaginous sheath. Cell length 4.8-8.9, width 1.2-3.6 μm.

25. *Coelastrum indicum* TURNER (Pl. II, Fig. 15)
Bih. K. svenska Vetensk Akad. Handl. 25(5): 161, pl. 20, fig. 11, 1898.

Cenobia spherical, 24 cells subovate in lateral view, polyhedrical in vertical view; outer pole with conical-rounded projection, 6 interconnecting processes, each uniting with a neighboring cell. Cell length 5.2-9.7, width 7.7-14.5 μm. Autospores 2.5-5.0 μm.

26. *Coelastrum polychordum* (KORSIKOV) HINDÁK
Biol. Prace 23(4): 176, pl. 73, figs. 3-6, 1977.

Cenobia spherical, 4 cells discoid in lateral and vertical view, 8 interconnecting processes on each cell, each group of 2 processes uniting with each neighboring cell. Cell diameter 7.2-7.5 μm.

27. *Coelastrum reticulatum* (DANGEARD) SENN (Pl. II, Fig. 11)
Bot. Ztg. 57: 66, pl. 2, figs. 1-10, 1899.

Cenobia spherical, of 4 cells that are discoid in lateral and vertical view; 5 intercon-

necting processes, each process uniting with a neighboring cell. Frequent syncenobia. Cell diameter 5.3-7.4 μm; autospores 1.8-3.9 μm.

28. *Coenochloris piscinalis* FOTT (Pl. III, Fig. 1)
Preslia 46: 17, figs. 9a-f, 1974.

Rounded colonies of 4-32 spherical cells, close to each other, arranged in tetrahedron, with 2 fragments in form of irregular, opposed and parallel skullcaps. Cell diameter 8.6-10.5 μm; autospores spherical, 4.5-6.1 μm.

29. *Crucigenia tetrapedia* (KIRCHNER) WEST & WEST (Pl. II, Fig. 10)
Trans. R. Ir. Acad. Ser. B 32: 62, pl. 1, figs. 11-12, 1902.

Cenobia flat, quadrangular, 2-4 triangular cells, arranged in cros. Cell width 2.0-4.8 μm.

30. *Crucigeniella apiculata* (LEMMERMANN) KOMÁREK (Pl. II, Fig. 9)
Arch. Protistenk. 116: 38, 1974, Fig.

Cenobia flat, rectangular, 4 ovate cells, thickened at apex and at outer base of each cell. Cell length 5.3-5.8, width 2.1-3.4 μm.

31. *Dictyosphaerium pulchellum* WOOD (Pl. III, Fig. 2)
Smithson. Contr. Knowl. 19(241): 84, pl. 10, fig. 4, 1872.

Colonies rounded, groups of 2-4 spherical cells, united by mucilaginous strands. Cells frequently isolated. Cell diameter 4.8-5.5 mm; autospores elliptical, ca. 2.0 x 2.4-2.5 μm.

32. *Diplochloris lunata* (FOTT) FOTT
Algol. Stud. 23: 143, figs. 4a-e, 1979.

Colonies of 2 curved cylindrical cells, united by convex part and arranged approximately in cross. Cell length 7.0-14.5, width1.5-3.2 μm.

33. *Elakatothrix gelifacta* (CHODAT) HINDÁK (Pl. II, Fig. 16)
Preslia 59: 207, figs. 6, 7, 8-11, 1987.

Cells solitary, fusiform, usually constricted at middle, 2 pyrenoids, rarely 1. Cell length 16.8-29.0, width 2.4-4.8 μm.

34. *Elakatothrix genevensis* (REVERDIN) HINDÁK (Pl. II, Fig. 12)
Preslia 34: 287, pl. 27, figs. 3, 32, f 1-2, 1962.

Cells solitary, fusiform, without pyrenoid. Cell length 6.0-14.5, width 1.0-2.5 μm.

35. *Euastropsis richteri* (SCHMIDLE) LAGERHEIM
Tromsö Mus. Aarsh. 17: 20, pl. 1, figs. 8-27, 1894.

Cenobia flat, of 2 trapezoidal cells, outer margin with 2 processes. Cell width ca. 4.5 μm.

36. *Eutetramorus planctonicus* (KORSIKOV) BOURRELLY (Pl. III, Fig. 3)
Int. Revue ges. Hydrobiol. Hydrogr. 51(1): 2, 1966.

Colonies rounded, of 4-16 cells, with groups of 2-4 spherical cells, arranged 2 by 2 in different planes. Cell diameter 9.6-12.0 μm.

37. *Golenkinia paucispina* WEST & WEST
Trans. R. Ir. Acad. 32: 68, pl. 1, fig. 18, 1902.

Cells solitary, spherical, with numerous straight spines arranged regularly, 1 reniform pyrenoid. Cell diameter 6.5-7.3 μm; spines ca. 4.8 μm.

38. *Golenkiniopsis parvula* (WORONICHIN) KORSIKOV (Pl. V, Fig. 3)
Protococcineae p. 265, fig. 218, 1953.

Cells solitary, spherical, numerous straight spines arranged regularly, 1 spherical pyrenoid. Cell diameter 3.5-8.9 μm, spines 5.0-14.0 μm.

39. *Kirchneriella dianae* (BOHLIN) COMAS (Pl. III, Fig. 12)
Acta bot. cubana 2: 1980.

Colonies rounded, 8-32 lunate cells, apices acuminate, arranged in same plane and turned toward periphery of colony, 1 pyrenoid. Cell diameter 7.3-7.5, width 8.0-8.4 μm; diameter of autospores ca. 2.3, width ca. 4.2 μm.

40. *Kirchneriella roselata* HINDÁK (Pl. IV, Fig. 14)
Biol. Prace 30: 232, pl. 84, 1984.

Colonies rounded or elongate, 8 lunate cells, apices acuminate, concave side oriented toward center of colony, mucilaginous remnants present. Cell diameter 1.0-1.5, width 5.9-6.1 μm.

41. *Korshikoviella limnetica* (LEMMERMANN) SILVA
Taxon 8(2): 63, 1959.

Cells solitary, fusiform - straight; one apex terminating in spine, other apex in delicate seta, without basal disc or bifurcation. Cell length ca. 53.5, width ca. 2.8 μm.

42. *Lagerheimia chodati* BERNARD (Pl. III, Fig. 4)
Protoc. Desm. Java p. 170, figs. 349-350, 1908.

Cells solitary, spherical, 4 spines arranged in cross. Cell diameter 6.5-7.5 μm, spines ca. 12.1 μm.

43. *Lagerheimia ciliata* (LAGERHEIM) CHODAT
Nuova Notarisia 4: 90, 1895.

Cells solitary, elliptical, 3 curved spines on each pole. Cell length ca. 10.0, width ca. 8.0 μm; spines ca. 12.1 μm.

44. *Lagerheimia subsalsa* LEMMERMANN
Forsch. Ber. biol. Stn. Plön 6: 28, pl. 5, figs. 2-6, 1898.

Cells solitary, elliptical, 4 straight spines on each pole. Cell length ca. 5.0, width 2.5-3.0 μm; spines 5.5 μm.

45. *Micractinium appendiculatum* KORSIKOV (Pl. III, Fig. 17)
Protococcineae p. 402, fig. 406, 1953.

Colonies of 4-8 subovate cells, arranged in parallel; outer margin with 3 setae. Cell length 3.1-4.8, width 5.3-7.3 μm; setae ca. 24.2 μm.

46. *Micractinium pusillum* FRAESENIUS (Pl. III, Fig. 13)
Abh. senckenb. naturforsch. Ges. 2: 236, pl. 11, figs. 46-49, 1858.

Colonies of 4 spherical cells, arranged in tetrahedron; outer margin with 3-4 setae. Cell diameter 2.4-4.8 μm; setae 6.8-14.5 μm.

47. *Monoraphidium circinale* (NYGAARD) NYGAARD (Pl. III, Fig. 7)
Bot. Tidsskr. 73(3/4): 212, 1979.

Cells solitary, fusiform-elongate, spiral. Cell diameter 1.5-3.0, width 4.8-8.1 μm.

48. *Monoraphidium contortum* (THURET) KOMÁRKOVA-LEGNEROVÁ (Pl. III, Fig. 6)
Stud. Phycol. p. 104, pl. 18, fig. 1-5, 1969.

Cells solitary, fusiform-elongate, helicoidal, 0.5 to 1.0 rotations. Cell diameter 1.0-3.0, distance between apices 7.2-16.0 μm.

49. *Monoraphidium convolutum* (CORDA) KOMÁRKOVA-LEGNEROVÁ (Pl. III, Fig. 9)
Stud. Phycol. p. 107, pl. 20, 1969.

Cells solitary, lunate. Cell diameter 1.5-2.0, width 7.2-7.5, distance between apices ca. 7.2 μm.

50. *Monoraphidium* cf. *dybowskii* (WOLOSZYNSKA) HINDÁK & KOMÁRKOVA-LEGNEROVÁ (Pl. III, Fig. 15)
Stud. Phycol. p. 108, pl. 21, figs. 1-4, 1969.

Cells solitary, fusiform-elongate, apices rounded. Cell length 12.0-25.3, diameter 2.4-4.0 μm.

51. *Monoraphidium fontinale* HINDÁK (Pl. III, Fig. 5)
Biol. Prace 26(6): 144, pl. 60, fig. 2, 1980.

Cells solitary, fusiform, slightly curved, apices acute. Cell diameter 3.7-4.0, distance between apices 7.3-19.3 μm.

52. *Monoraphidium irregulare* (G.M. SMITH) KOMÁRKOVA-LEGNEROVÁ (Pl. V, Fig. 2)
Stud. Phycol. p. 106, pl. 19, 1969.

Cells solitary, fusiform-elongate, helicoidal, ca. 2.0 rotations. Cell diameter 0.8-2.4, distance between apices 9.7-30.0 μm.

53. *Monoraphidium komarkovae* NYGAARD (Pl. III, Fig. 16)
Bot. Tidsskr. 73(3/4): 212, 1979.

Cells solitary, fusiform-elongate, straight. Cell length 24.2-50.4, diameter 1.5-2.5 μm.

54. *Monoraphidium longiusculum* HINDÁK (Pl. III, Fig. 14)
Biol. Prace 30: 222, pl. 80, figs. 2-4, 1984.

Cells solitary, fusiform-elongate, curved, median nuclear region extensive. Cell diameter 1.0-2.4, distance between apices 33.6-77.4 μm.

55. *Monoraphidium nanum* (ETTL) HINDÁK (Pl. III, Fig. 8)
Biol. Prace 26(6): 145, pl. 59, figs. 2-4, 1980.

Cells solitary, lunate, apices rounded. Cell diameter 2.0-4.5, width 5.0-7.3 μm.

56. *Nephrochlamys* cf. *dannica* KOMÁREK
Algol. Stud. 24: 253, 1979.

Colonies lunate, incision acute, 4 lunate cells, apices acute. Cell diameter 0.9-1.2, width 2.4-4.0 μm.

57. *Nephrochlamys subsolitaria* (G.S. WEST) KORSIKOV
Protococcineae p. 311, fig. 278, 1953.

Colonies lunate, incision rounded, 2-4 lunate cells, apices rounded. Cell diameter ca. 1.0, width 3.4-4.5 μm.

58. *Nephrochlamys willeana* (PRINTZ) KORSIKOV (Pl. III, Fig. 18)
Protococcineae p. 312, fig. 281, 1953.

Colonies lunate, incision acute, 4 curved cylindrical cells, apices rounded. Cell diameter 1.8-2.5, width 3.5-5.7 μm.

59. *Nephrocytium agardhianum* NÄGELI (Pl. V, Fig. 1)
Gatt. eizell. Algen. p. 79, pl. 3, fig. Ca-p, 1849.

Colonies rounded, of 2-8 curved cylindrical cells, poles rounded, arranged linearly. Cell diameter 1.6-2.0, length 6.0-19.6 μm.

60. *Nephrocytium shilleri* (KAMMERER) COMAS (Pl. III, Fig. 19)
Acta bot. cubana 2: 1980.

Colonies rounded, of 4 lunate cells, apices rounded, arranged irregularly. Cell diameter 2.0-5.8, length 4.8-10.5 μm.

61. *Oocystis lacustris* CHODAT (Pl. IV, Fig. 1)
Bull. Herb. Boissier 5: 119, pl. 10, figs. 1-7, 1897.

Cells solitary, rarely in colonies, elliptical, poles acute, generally with thickening, 2 parietal shield-shaped chloroplasts; autospores released by dissolution of wall of mother cell, with 1 alveiform chloroplast. Cell length 6.8-12.0, width 2.4-4.8 μm; length of autospores 4.2-5.8, width 1.8-3.4 μm.

62. *Pediastrum privum* (PRINTZ) HEGEWALD (Pl. IV, Fig. 3)
In: HEGEWALD & SCHNEPF, Algol. Stud. 22: 25, 1979.

Cenobia quadrate, 4 triangular cells arranged in cross, outer margin with 2 projections on each angle. Cell length 4.7-5.5, width 6.8-9.5 μm.

63. *Pediastrum tetras* (Pl. IV, Fig. 2)
Ann. Mag. nat. Hist. 14: 464, pl. 2, fig. 4, 1844.

Cenobia rounded, 4-8 polygonal cells, outer margin with 2 bifurcate processes. Cell width 7.0-7.3 μm.

64. *Quadricoccus ellipticus* HORTOBÁgYI
Acta bot. hung. 18: 126, fig. 19, 1973.

Colonies of 4 elliptical cells, arranged with lateral part longitudinal in mucilaginous remnants of mother cell wall like a scale. Cell length ca. 6.8, width ca. 4.0 μm.

65. *Quadrigula closterioides* (BOHLIN) PRINTZ (Pl. IV, Fig. 6)
K. norske Vidensk. Selsk. Skr. 1915(2): 49, 1915.

Colonies of 4 fusiform cells, arranged in longitudinal bundles. Cell length 26.6-36.3, width 2.4-3.1 μm.

66. *Quadrigula quaternata* (WEST & WEST) PRINTZ
K. norske Vidensk. Selsk. Skr. 1915(4): 29, 1915.

Colonies of 4 cylindrical cells, curved, poles rounded, arranged in longitudinal bundles. Cell length 12.0-16.9, width 6.0-7.3 μm.

67. *Radiococcus nimbatus* (DE WILDEMANN) SCHMIDLE (Pl. IV, Fig. 7)
Allg. Bot. Z. 8: 41, 1902.

Colonies tetrahedral, with 1-4 groups of spherical cells, touching one another, arranged in tetrahedron in extensive mucilaginous sheath, radially structured or not; autospores spherical. Cell diameter 6.0-11.0; diameter of autospores 1.5-4.0 μm.

68. *Scenedesmus acutiformis* SCHRÖDER (Pl. IV, Fig. 4)
Forsch. Ber. Biol. Stat. Plön 5: 45, pl. 2, fig. 4a-b, 1897.

Cenobia of 4 oblong cells, linearly arranged in 1 row; cells with 1 longitudinal rib on each anterior and posterior face. Cell length 6.3-7.0, width 2.3-2.4 μm.

69. *Scenedesmus arcuatus* (LEMMERMANN) LEMMERMANN var. *platydiscus* G.M. SMITH (Pl. IV, Fig. 8)
Trans. Wisc. Acad. Sci. Arts Lett. 18: 451, pl. 30, figs. 101-105, 1916.

Cenobia of 4 oblong or ovate cells, linearly arranged in 2 rows; cell wall smooth. Cell length 4.5-6.3, width 2.4-3.4 μm.

70. *Scenedesmus bicaudatus* (HANSGIRG) CHODAT (Pl. IV, Fig. 10)
Z. Hydrol. 3: 248, 1926.

Cenobia of 2 oblong cells, linearly arranged in 1 row; outer cells with 1 spine on one of the poles, diagonally arranged. Cell length 5.0-7.4, width 2.1-2.4 μm; spines ca. 6.0 μm.

71. *Scenedesmus denticulatus* LAGERHEIM (Pl. IV, Fig. 9)
Öfvers. K. Vetensk. Akad. Forh. 39(2): 61, pl. 2, figs. 13-16, 1882.

Cenobia with 4 subovate cells, alternately arranged in 1 row; cells with 1-2 short spines on each pole. Cell length 9.0-12.0, width 4.2-5.2 μm.

72. *Scenedesmus ellipticus* CORDA (Pl. IV, Fig. 5)
Alm. Carlsbad 5: 208, pl. 4, figs. 48-49, 1835.

Cenobia of 2-4 oblong cells, linearly arranged in 1 row, cell wall smooth. Cell length 4.2-7.5, width 1.5-3.0 μm.

73. *Scenedesmus* cf. *heteracanthus* GONZÁLEZ-GUERRERO (Pl. V, Fig. 6)
An. Jard. bot. Madr. 1: 154, figs. 1-8, 1941.

Cenobia of 4 oblong cells, alternately arranged in 1 row; outer cells with 1 spine on each pole, of different sizes, the larger spines perpendicularly arranged along the longitudinal axis, and the smaller spines obliquely; poles of inner cells with 0-1 teeth. Cell length 9.0-12.0, width 3.0-4.5 μm; smaller spines 1.0-2.7, larger spines 6.7-7.3 μm.

74. *Scenedesmus intermedius* CHODAT var. *bicaudatus* HORTOBÁGYI
Arb. ung. biol. Forsch. Inst. 15: 111, pl. 7, figs. 160-162, 1943.

Cenobia of 4 oblong to ovate cells, alternately arranged in 1 row; outer cells with 1 spine on one of the poles, arranged diagonally. Cell length ca. 5.0, width ca. 2.4 μm; spines ca. 5.0 μm.

75. *Scenedesmus quadricauda* (TURPIN) BRÉBISSON *syne typus sensu* CHODAT var. *quadricauda* (Pl. IV, Fig. 13)
Z. Hydrol. 3(3/4): 229, fig. 133, 1926.

Cenobia of 2-4 oblong cells, linearly arranged in 1 row; outer cells with 1 spine on each pole. Cell length 4.8-7.3, width 2.3-3.0 μm; spines 4.5-5.2 μm.

76. *Scenedesmus quadricauda* (TURPIN) BRÉBISSON var. *longispina* G.M. SMITH (Pl. IV, Fig. 11)
Trans. Wisc. Acad. Sci. Arts Lett. 18: 480, 1916.

Cenobia of 2 oblong cells, linearly arranged in 1 row; outer cells with 1 spine and 1 tooth on each pole. Cell length ca. 7.3, width 2.3-4.8 μm; spines 4.8-5.0μm.

77. *Scenedesmus quadricauda* (TURPIN) BRÉBISSON var. *longispina* G.M. SMITH f. *asymmetricus* (HORTOBÁGYI) UHERKÓVICH (Pl. IV, Fig. 12)
Scenedesmus-Art ung. p. 81, figs. 471-477, 1966.

Cenobia of 2-4 oblong cells, linearly arranged in 1 row; cells with 1 spine on 1 of the poles, diagonally arranged and 1 tooth on both the poles. Cell length 6.3-7.4, width 2.4-3.0 μm; spines 4.8-5.0 μm.

78. *Scenedesmus spinosus* CHODAT
Monogr. Alg. Cult. Pure p. 74, pl. 2, fig. 7, 1913.

Cenobia of 2 oblong cells, linearly arranged in 1 row; cells with 1 spine on each pole and 1 on each outer margin. Cell length ca. 6.5, width ca. 2.4 μm; spines ca. 5.0 μm.

79. *Tetrachlorella incerta* HINDÁK
Biol. Prace 23(4): 144, pl. 59, figs. 1-3, 1977.

Cenobia rhomboidal, of 4 elliptical cells; 2 inner cells parallel to each other, poles touching inner margin of outer cells; longitudinal axes of inner cells arranged obliquely relative to outer cells. Cell length 4.6-5.0 μm, width 2.0-3.0 μm.

80. *Tetraedron caudatum* (CORDA) HANSGIRG (Pl. IV, Fig. 17)
Hedwigia 27: 131, 1888.

Cells solitary, 5-angled, one of angles in different plane, each with 1 process; concave margin more pronounced between two angles. Cell width 4.8-7.8 μm.

81. *Tetraedron minimum* (A. BRAUN) HANSGIRG (Pl. IV, Fig. 15)
Hedwigia 27: 131, 1888.

Cells solitary, 4-angled, one angle in different plane, angles rounded, with 1 papilla. Cell width 4.5-5.5 µm.

82. *Tetrallantos lagerheimii* TEILING (Pl. IV, Fig. 18)
Svensk. bot. Tidsskr. 10: 62, 1916.

Cenobia of 4 lunate cells, apices rounded; cells in 2 pairs and in 2 planes, 1 pair facing each other and in contact at their poles, the other pair in a longitudinal plane vertical to these and so arranged that each member has 1 pole at the point of contact of the poles of the other pair. Cell diameter 2.3-2.9, distance between apices 9.7-12.0 µm.

83. *Tetrastrum glabrum* (ROLL) AHLSTROM & TIFFANY
Am. J. Bot. 21: 504, figs. 22-24, 1934.

Cenobia of 4 cells, 2 trapezoidal and 2 subtriangular, outer margin convex, arranged in cross. Cell length 4.8-5.0, width 3.0-4.8 µm.

84. *Tetrastrum staurogeniaeforme* (SCHRÖDER) LEMMERMANN
Ber. dt. bot. Ges. 18: 95, 1900.

Cenobia of 4 cells, 2 subtrapezoid and 2 subtriangular, arranged in cross; outer margin convex, with 3 spines of equal size. Cell length ca. 3.0, width ca. 2.4 µm; spines ca. 8.0 µm.

85. *Treubaria* cf. *euriacantha* (SCHMIDLE) KORSIKOV
Protococcineae p. 143, fig. 83, 1953.

Cells solitary, protoplast triangular, 3 broad-based conical spines. Cell width ca. 4.8 µm; spines ca. 48.4 µm.

86. *Treubaria planctonica* (G.M. SMITH) KORSIKOV
Protococcineae p. 145, fig. 84, 1953.

Cells solitary, protoplast tetrahedral, each angle with 1 spine. Cell width ca. 5.3 µm; spines ca. 15.3 µm.

87. *Treubaria setigera* (Arch.) G.M. SMITH (Pl. IV, Fig. 16)
Freshwat. Alg. U.S.A. p. 499, 1933.

Cells solitary, protoplast triangular, sides concave, each angle with 1 spine. Cell width 3.0-4.2 µm; spines 5.6-6.0 µm.

88. *Westella botryoides* (W. WEST) DE WILDEMANN (Pl. V, Fig. 4)
Bull. Herb. Boissier, Ser. 1, 5(6): 532, 1897.

Cenobia of 4 spherical cells, arranged in cross, forming syncenobia. Cell diameter 3.2-8.2 µm.

Volvocales

89. *Chlamydomonas* cf. *microscopica* G.S. WEST (Pl. II, Fig. 3)
J. Bot. 54: 1, 1916.

Cells solitary, elliptical-elongate, 2 apical flagella, 1 pyrenoid. Cell length 5.0-7.9, width 1.5-4.8 µm.

90. *Chlamydomonas* cf. *skujae* PASCHER
Arch. Protistenk. 65: 442, fig. 19, 1929.

Cells solitary, spherical, 2 apical flagella, 2 pyrenoids. Cell diameter ca. 10.0 µm.

91. *Chloromonas* cf. *flos-aquae* (BRABEZ) GERLOFF & ETTL (Pl. II, Fig. 4)
In: ETTL, H. Nova Hedwigia, Beih. 34: 1970.

Cells solitary, elliptical, 2 apical flagella, without pyrenoid. Cell length 5.8-7.3, width 2.0-3.0 µm.

92. *Chloromonas* cf. *grovei* (G.S. WEST) GERLOFF & ETTL (Pl. II, Fig. 5)
In: ETTL, H. Nova Hedwigia, Beih. 34: 1970.

Cells solitary, spherical, 2 apical flagella, without pyrenoid. Cell diameter 2.4-5.0 μm.

93. *Eudorina elegans* EHRENBERG
Abh. dt. Akad. Wiss. Berl. 1831: 78, pl. 2, figs. 10A-10B, 1832.

Colonies rounded, of 32 spherical cells, arranged in groups of 4 in transverse series. Cell diameter 4.8-8.4 μm.

Ulotrichales

94. *Koliella longiseta* (VISCHER) HINDÁK f. *tenuis* NYGAARD (Pl. III, Fig. 11)
K. danske Vidensk. Selsk., Biol. Skr. 21(1): 72, fig. 65, 1977.

Cells solitary, fusiform-elongate, apices acuminate, hairlike. Cell length 19.4-48.4, diameter 0.5-1.5 μm.

95. *Koliella longiseta* (VISCHER) HINDÁK f. *variabilis* NYGAARD (Pl. III, Fig. 10)
K. danske Vidensk. Selsk., Biol. Skr. 21(1): 72, fig. 66, 1977.

Cells solitary, fusiform-elongate, helicoidal. Distance between apices 5.8-8.8, diameter 0.5-0.8 μm; 1.0-1.5 turns.

Zygnemaphyceae
Zygnematales

96. *Mougeotia* cf. *delicata* BECK (Pl. V, Fig. 7)
Arch. Protistenk. 55: 179, fig. 17, 1926.

Cells cylindrical, forming filaments of 2-10 cells, rarely isolated, 19-47 times longer than wide, 4-6 pyrenoids in single row; material sterile. Cell lenght 40.0-151.3, width 1.5-3.7 μm.

97. *Mougeotia* cf. *viridis* (KÜTZING) WITTROCK (Pl. V, Fig. 8)
Bih. K. svenska Vetensk. Akad. Handl. 1: 39, 1872.

Cells cylindrical forming filaments of 2-5 cells, rarely isolated, 12-13 times longer than wide, 3-5 pyrenoids in single row, conjugation scalariform, zygospores 4-angled, sides concave, cell wall smooth. Cell length 40.0-56.0, width 4.2-6.8 μm; sides of zygospores 23.2-23.6 μm.

Euglenophyceae
Euglenales

98. *Euglena oxyuris* SCHMARDA var. *minima* BOURRELLY (Pl. VI, Fig. 1)
Bull. Mus. natn. Hist. nat., Ser. 2, 21(5): 615, 1949.

Cells cylindrical, posterior pole abruptly attenuated in caudal process. Cell length with process 60.5-82.1, width 11.6-14.2 μm; process 20.4-24.6 μm.

99. *Euglena* cf. *splendens* DANGEARD (Pl. VI, Fig. 2)
Le Botaniste 8: 69, fig. 9, 1901.

Cells elliptical. Cell length 21.0-28.0, width 9.7-13.2 μm.

100. *Trachelomonas volvocinopsis* SWIRENKO var. *volvocinopsis* (Pl. VI, Fig. 3)
Arch. Hydrobiol. 9: 33, pl. 19, figs. 1-3, 1914.

Lorica spherical, wall smooth, numerous discoidal chloroplasts. Lorica diameter 12.1-15.0 μm.

Bacillariophyceae

Centrales

101. *Cyclotella stelligera* CLEVE & GRUNNOW (Pl. VI, Fig. 7)

In: CLEVE, P.T. Bih. K. svenska Vetensk. Akad. Handl. 18: 22, pl. 5, fig. 63a-c, 1881.

Cells solitary, valves circular, marginal region with radiating ribs, central region with 1 isolated point surrounded by 7 points, forming rosette. Frustule diameter 4.8-7.5 or 9.7-19.4 μm; 10 ribs in 10 μm.

102. *Aulacoseira agassizii* (OSTENFELD) SIMONSEN var. *malayensis* (HUSTEDT) SIMONSEN (Pl. VI, Fig. 8)

Bacillaria 2: 56, 1979.

Filaments of 4-8 cylindrical cells, valves with 12 marginal teeth, mantle with striae parallel to pervalvar axis. Frustule length 5.8-15.4, width 11.0-20.2 μm, ca. 15 areolae in 10 μm and ca. 12 lines in 10 μm.

103. *Aulacoseira distans* (EHRENBERG) SIMONSEN (Pl. VI, Fig. 4)

Bacillaria 2: 57, 1979.

Filaments of 2-3 cylindrical cells, valve with marginal teeth, mantle finely punctate, sulcus and pseudosulcus distinct. Frustule length 3.8-5.5, width 3.7-4.5 μm.

104. *Aulacoseira granulata* (EHRENBERG) SIMONSEN var. *granulata* (Pl. VI, Fig. 5)

Bacillaria 2: 58, 1979.

Filaments of 3-6 cylindrical cells, valve with 2 larger and 1 smaller spines, or with only 1 spine, or lacking spines; mantle with heavy striae, oblique to pervalvar axis. Frustule length 10.0-32.8, width 5.3-15.7 μm, 8-12 areolae in 10 μm.

105. *Aulacoseira granulata* (EHRENBERG) SIMONSEN var. *angustissima* (F.O. MÜLLER) SIMONSEN (Pl. VI, Fig. 9)

Bacillaria 2: 58, 1979.

Differs from typical variety in greater length/width ratio of cells. Frustule length 14.0-19.4, width 2.0-4.8 μm.

106. *Aulacoseira pseudogranulata* (A. CLEVE-EULER) SIMONSEN (Pl. VI, Fig. 6)

Bacillaria 2: 62, 1979.

Filaments of 2-3 cylindrical cells, valve with 2 spines of equal size, mantle with striae parallel to pervalvar axis, not always visible with optical microscope. Frustule length 17.0-43.1, width 5.5-9.0 μm, ca. 12 areolae in 10 μm.

107. *Rhizosolenia eriensis* H.L. SMITH var. *eriensis* (Pl. VII, Fig. 4)

The Lens 1: 44, 1872.

Cells solitary, cylindrical, poles conical, with setae. Frustule length 48.0-68.8, width 4.7-7.8 μm, setae 26.4-33.2 μm, 3-4 intercalary bands in 10 μm.

108. *Rhizosolenia eriensis* H.L. SMITH var. *eriensis* f. *brevispina* WOLOSYNSKA

In: SCHRÖDER, B. Hedwigia 55: 1916.

Differs from typical form in smaller size of cells and setae. Frustule length 29.0-55.7, width 4.0-7.3 μm, setae 3.0-5.0 μm.

109. *Rhizosolenia eriensis* H.L. SMITH var. *morsa* WEST & WEST (Pl. VII, Fig. 8)

Trans. R. Soc. Edinb. 41(3): 509, pl. 6, fig. 23, 1905.

Differs from typical variety in narrower intercalary bands and in conical-truncate pole, with recess on ventral side. Frustule length 50.8-61.1, width 8.0-17.0 μm, 9-10

intercalary bands in 10 μm.

110. *Rhizosolenia longiseta* ZACHARIASI (Pl. VII, Fig. 5)
Forsch. Ber. biol. Stn. Plön 1: 38, fig. 7, 1893.

Cells solitary cylindrical, poles acuminate with setae. Frustule length 70.0-100.0, width 3.4-3.5 μm, setae 48.0-50.0 μm, intercalary bands inconspicuous.

Pennales

111. *Brachysira vitrea* (GRUNNOW) R. ROSS (Pl. VII, Fig. 1)
In: HARTLEY, J. mar. biol. Ass. U.K. 66: 607, 1986.

Cells solitary, valves lanceolate, extremities attenuated, sometimes capitate ends, central area ovoid; striae radiate, finely punctate. Frustule length 19.8-38.7, width 4.8-7.3 μm, 30 striae in 10 μm.

Xanthophyceae
Mischococcales

112. *Centritractus belenophorus* LEMMERMANN (Pl. VII, Fig. 6)
Ber. dt. bot. Ges. 18: 274, 1900.

Cells solitary, cylindrical, poles conical with 1 spine, numerous discoidal chloroplasts. Cell length not including spines 36.8-50.8, width 6.0-7.9, spines 39.5-45.0 μm.

113. *Goniochloris mutica* (A. BRAUN) FOTT (Pl. VII, Fig. 2)
Preslia 32: 146, figs. 2, 3a, 1960.

Cells solitary, with 3 rounded angles, 2-3 chloroplasts. Cell width 7.0-7.5 μm.

114. *Isthmochloron gracile* (REINSCH) SKUJA (Pl. VII, Fig. 9)
Nova Acta R. Soc. sci. upsal., Ser. 4, 14(5): 173, 1949.

Cells solitary, 4-angled, each angle with 1 bifurcate process ending in spines, numerous discoidal chloroplasts. Cell width including process 31.0-43.6 μm.

115. *Tetraedriella jovetii* (BOURRELLY) BOURRELLY (Pl. VII, Fig. 3)
Algues d'Eaux Douces V. 2. p. 186, fig. 10, 1968.

Cells solitary, tetrahedral, poles rounded, numerous discoidal chloroplasts. Cell width 9.0-11.0 μm.

116. *Tetraplektron deniseae* BITTENCOURT-OLIVEIRA (Pl. VII, Fig. 7)
Hoehnea 17(2): 49, fig. 1, 1991.

Cells solitary, tetrahedral, each angle with 1 process terminating in spine, numerous discoidal chloroplasts. Cell width including process 31.0-58.0 μm.

Chrysophyceae
Ochromonadales

117. *Chromulina* cf. *gyrans* STEIN (Pl. VII, Fig. 10)

Cells solitary, obovate, flattened in lateral view, 1 apical flagellum ca. 1.5 times length of body. Cell length 6.8-9.6, width 2.5-3.5 μm.

118. *Chromulina mikroplankton* (PASCHER) PASCHER (Pl. VII, Fig. 11)
Süsswass. Flora V. 2, Part 2, p. 15, fig. 13, 1913.

Cells solitary, ovate, 1 apical flagellum. Cell length 2.6-4.3, width 1.6-2.5 μm.

119. *Chrysococcus punctiformis* PASCHER (Pl. VIII, Fig. 3)
Ber. dt. bot. Ges. 29: 529, pl. 19, fig. 18a-d, 1911.

Cells solitary, spherical, cell wall smooth, 1 apical flagellum, ca. 5 times body length. Cell diameter 2.4-3.7 μm.

120. *Dinobryon bavaricum* (SCHÜTT) LEMMERMANN (Pl. VIII, Fig. 1)
Zool. Anz. 13: 484, 1890.

Individuals solitary, rarely colonial; lorica subcylindrical, posterior pole tapering gradually, lateral margins crenulate. Lorica length 36.3-51.0, width 6.0-9.7 μm.

121. *Dinobryon crenulatum* WEST & WEST
Phytopl. eng. Lake Distr. p. 325, fig. 7c-d, 1909.

Individuals solitary, lorica subcylindrical, posterior pole tapering abruptly, lateral margins crenulate. Lorica length 36.3-41.4, width 7.3-9.7 μm.

122. *Dinobryon divergens* IMHOF
Jber. naturf. ges. Granbündens 30: 134, 1887.

Individuals colonial, lorica subcylindrical, posterior pole tapering abruptly, recurved, lateral margins crenulate. Lorica length ca. 37.6, width 8.5 μm.

123. *Dinobryon petiolatum* WIL LÉN
Nova Hedwigia 6(1/2): 44, pl. 9(1), figs. 30-32.

Individuals solitary, lorica campanulate, posterior pole conical with peduncle, lateral margins smooth. Lorica length not including peduncle ca. 39.4, width ca. 4.8 μm; peduncle ca. 40.0 μm.

124. *Dinobryon sertularia* EHRENBERG (Pl. VIII, Fig. 5)
Abh. K. Akad. Wiss. Berlin 1833: 280, 1835.

Individuals solitary, rarely colonial, lorica subcampanulate, posterior pole conical, lateral margins smooth. Lorica length 26.3-31.6, width 7.9-11.0 μm.

Mallomonadales

125. *Chrysodidymus synuroides* PROWSE (Pl. VIII, Fig. 2)
Gdns' Bull. Singapore 19: 128, pl. 4, fig. m, 1962.

Colonies of 2 obovate cells, united by broadened pole, 2 parietal chloroplasts, 2 flagella of unequal lengths. Cell length 13.7-16.9, width 8.0-12.1 μm.

126. *Synura* cf. *uvella* EHRENBERG (Pl. VIII, Fig. 6)
Infusthierchen p. 61, pl. 3, figs. 9_1-9_5, 1838.

Colonies of 6-12 pyriform cells, rarely isolated, covered with scales; 2 parietal chloroplasts, laminar, 2 anterior flagella of unequal lengths. Cell length 9.7-24.2, width 7.3-9.7 μm.

Cryptophyceae

Cryptomonadales

127. *Chroomonas acuta* UTERMÖHL (Pl. VIII, Fig. 4)
Arch. Hydrobiol., Suppl. 5: 399, fig. 34, 1925.

Cells ovate in lateral view, posterior pole tapering, directed ventrally; 1 lobate chloroplast, 1 dorsal pyrenoid in anterior half of cell and 1 refringent granule in posterior half. Cell length 5.0-9.7, width 2.4-4.8 μm.

128. *Cryptomonas curvata* EHRENBERG
Proc. Acad. nat. Sci. Philad. 73: 148, 1921.

Cells sigmoid in lateral view, bilaterally flattened, posterior pole ventrally curved; 2 parietal chloroplasts, lateral, 1 cynetonucleus in median posterior region. Cell length 29.1-50.8, width 12.1-19.4 μm.

129. *Cryptomonas* cf. *marsonii* SKUJA (Pl. IX, Fig. 1)
Symb. bot. upsal. 9(3): 357, pl. 37, figs. 41-42, 1948.

Cells sigmoid in lateral view, posterior pole tapering, directed dorsally; 2 parietal chloroplasts, lateral. Cell length 10.0-13.2, width 5.5-10.7 μm or length 19.4-25.3, width 12.1-15.3 μm.

130. *Cryptomonas obovata* SKUJA

Symb. bot. upsal. 9(3): 356, pl. 38, figs. 4-6, 1948.

Cells obovate to elliptical in lateral view, 2 parietal chloroplasts, lateral; 2 Maupas' corpuscles, dorsal in anterior half of cell. Cell length 17.0-20.0, width 7.3-11.6 μm.

131. *Cryptomonas phaseolus* SKUJA

Symb. bot. upsal. 9(3): 356, pl. 38, figs. 4-6, 1948.

Cells obovate in lateral view; 2 parietal chloroplasts, lateral. Cell length 7.2-14.0, width 3.0-7.3 μm.

132. *Crytomonas* cf. *pyrenoidifera* GEITLER (Pl. VIII, Figs. 7-9).

Int. Rev. ges. Hydrobiol. Hydrogr. 10: 684, figs. e-f, 1922.

Cells obovate in lateral view, posterior pole tapering, directed dorsally; 2 parietal chloroplasts, lateral, each with 1 pyrenoid. Cell length 6.3-12.1, width 3.2-6.8 μm.

Dinophyceae

Peridiniales

133. *Gymnodinium* cf. *cnecoides* HARRIS (Pl. IX, Fig. 2)

Proc. Linn. Soc. Lond. 152: 9, fig. 2A-D, 1939/40.

Cells ovate to elliptical, epicone rounded or conical, hypocone rounded; sulcus reaching ca. 2/3 of posterior pole, not extending through epicone; 1-2 chloroplasts. Cell length 10.5-11.0, width 7.4-7.9 μm.

134. *Peridinium umbonatum* STEIN var. 1 (Pl. IX, Fig. 3)

Cells ovate, epitheca hemispherical, cingulum spiralling left, apical pore present; plates with rows of dots; 4 apical plates, 2 intercalary, 7 pre-cingular, 5 post-cingular, 2 antiapical (4', 2a, 7'', 5''', 2''''). Cell length 11.0-16.3, width 11.8-12.6 μm.

135. *Peridinium umbonatum* STEIN var. 2 (Pl. IX, Fig. 4)

Cells ovate, epitheca conical, cingulum spiralling left, apical pore present; plates with rows of dots; 4 apical plates, 2 intercalary, 7 pre-cingular, 5 post-cingular, 2 antiapical (4', 2a, 7'', 5''', 2''''). Cell length 14.5-22.6, width 12.1-25.8 μm.

136. *Peridinium umbonatum* STEIN var. 3 (Pl. IX, Fig. 5)

Cells ovate, epitheca conical, cingulum spiralling left, apical pore and antiapical spines present; plates with rows of dots; 4 apical plates, 2 intercalary, 7 pre-cingular, 5 post-cingular, 2 antiapical (4', 2a, 7'', 5''', 2''''). Cell length 14.5-21.8, width 16.8-24.2 μm.

Final considerations

1) The phytoplankton community of the three systems studied is constituted of 228 taxa distributed among 94 genera belonging to 10 taxonomic classes. Lake Batata had a greater number of taxa than did Lake Mussurá and Trombetas River.

2) The number of species recorded in Lake Batata in the weekly and trimonthly collections was similar, indicating that the phytoplankton community was reliably represented in the collections.

3) A greater number of species was recorded during the drowdown water and low

water stages, than during the high water stage, in all three systems studied.

4) The species studied were characterized by their smaller size than has been recorded in the literature for the same taxa.

5) The distribution of species numbers by class was similar in the three systems, with Chlorophyceae and Zygnemaphyceae predominating.

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Chart 1. List of taxa recorded in all samples (Lake Batata, Lake Mussurá, Trombetas River)

	CYANOPHYCEAE		
1	*Anabaena* sp. 1	2	*Anabaena* sp. 2
3	*Aphanothece clathrata*	4	*Chroococcus minor*
5	*Eucapsis alpina* var. *minor*	6	*Lyngbya cebennensis*
7	*Merismopedia tenuissima*	8	*Microcystis aeruginosa* f. *flos-aquae*
9	*M. aeruginosa* f. *protocystis*	10	*M. elachista*
11	*Microcystis* sp.	12	*Oscillatoria chalybea* var. *insularis*
13	*O. limnetica*	14	*O. geminata*
15	*O. quadripunctulata*	16	*O.* cf. *transvaalensis*
17	*Synechococcus elegans*	18	*S. elongatus*
19	*Synechocystis aquatilis*		
	CHLOROPHYCEAE		
20	*Ankistrodesmus bernardii*	21	*A. fusiformis*

22	*A. gracilis*	23	*Botryococcus fernandoi*
24	*Chlamydomonas* cf. *microscopica*	25	*Chlamydomonas* cf. *skujae*
26	*Chlamydomonas* sp.	27	*Chlorella homosphaera*
28	*Chloromonas* cf. *flos-aquae*	29	*C.* cf. *grovei*
30	*Choricystis cylindracea*	31	*Closteriopsis longissima*
32	*Coccomyxa lacustris*	33	*Coelastrum polychordum*
34	*C. indicum*	35	*C. reticulatum*
36	*Coenochloris piscinalis*	37	*Crucigenia tetrapedia*
38	*Crucigeniella apiculata*	39	*Dictyosphaerium pulchellum*
40	Chlorophyceae 5	41	*Diplochloris lunata*
42	*Elakatothrix gelifacta*	43	*E. genevensis*
44	*Euastropsis richteri*	45	*Eudorina elegans*
46	*Eutetramorus planctonicus*	47	*Golenkinia pauscispina*
48	*Golenkiniopsis parvula*	49	*Kirchneriella dianae*
50	*Kirchneriella* sp.	51	*Koliella longiseta* f. *tenuis*
52	*K. longiseta* f. *variabilis*	53	*Korshikoviella* cf. *limnetica*
54	*Lagerheimia chodatii*	55	*L. ciliata*
56	*L. subsalsa*	57	*Micractinium apendiculatum*
58	*M. pusillum*	59	*Monoraphidium circinale*
60	*M. contortum*	61	*M. convolutum*
62	*M.* cf. *dybowskii*	63	*M. fontinale*
64	*M. irregulare*	65	*M. komarkovae*
66	*M. longiusculum*	67	*M. nanum*
68	*Monoraphidium* sp. 3	69	*Monoraphidium* sp. 1
70	*Monoraphidium* sp. 2	71	*Nephrochlamys* cf. *dannica*
72	*N. subsolitaria*	73	*N. willeana*
74	*Nephrocytium shillerii*	75	*N. agardhianum*
76	*Oocystis lacustris*	77	*Pediastrum tetras*
78	*P. privum*	79	*Quadricoccus ellipticus*
80	*Quadrigula closterioides*	81	*Q. quaternata*
82	*Radiococcus numbatus*	83	*Scenedesmus acutiformis*
84	*S. arcuatus* var. *platydiscus*	85	*S. bicaudatus*
86	*S. ellipticus*	87	*S. denticulatus*
88	*S.* cf. *heteracanthus*	89	*S. intermedius* var. *bicaudatus*
90	*S. quadricauda* var. *longispina*	91	*S. quadricauda* var. *longispina* f. *asymetricus*
92	*S. quadricauda* var. *quadricauda*	93	*Scenedesmus spinosus*
94	*Kirchneriella roselata*	95	*Tetrachlorella incerta*
96	*Tetraedron caudatum*	97	*Tetraedron minimum*
98	*Tetrallanthos lagerheimii*	99	*Tetrastrum glabrum*
100	*Tetrastrum* sp.	101	*T. staurogeniaeforme*
102	*T.* cf. *euriacantha*	103	*T. planctonica*
104	*T. setigera*	105	*Westella botryoides*
106	Chlorophyceae 1	107	Chlorophyceae 2
108	Chlorophyceae 3	109	Chlorophyceae 4

ZYGNEMAPHYCEAE

110	*Actinotaenium perminutum*	111	*Closterium gracile*
112	*Closterium* sp.	113	*Cosmarium arctoum*
114	*C. pseudotaxichondrum* var. *longii*	115	*C. pusillum*
116	*C. sphagnicolum* var. *apertum*	117	*C. tinctum* var. *subretususm*
118	*C. trilobulatum* var. *minutum*	119	*C. abbreviatum*

120 *Cosmarium* sp. 1
121 *C. contractum*
122 *Cosmarium* sp. 3
123 *Cosmarium* sp. 4
124 *Euastrum ornans*
125 *Gonatozygon pillosum*
126 *Mesotaenium chlamydosporum* var. *violascens*
127 *M. chlamydosporum* var.
128 *Mesotaenium* sp. 1
129 *Mesotaenium* sp. 2
130 *Mougeotia* cf. *delicata*
131 *Mougeotia* cf. *viridis*
132 *Pleurotaenium tenuissimum*
133 *P. trabecula*
134 *Staurastrum brachiatum*
135 *S. leptocladum* var. *cornutum*
136 *S. longipes*
137 *S. muticum*
138 *S. pseudotetracerum*
139 *S. quadrinotatum*
140 *S. rotula*
141 *S. octangulare*
142 *S. subamericanum*
143 *S. tetracerum* var. *tortum*
144 *Staurastrum* sp.
145 *Staurodesmus crassus*
146 *S. cuspidatus* var. *groenbladii*
147 *S. dickiei*
148 *S. glaber* var. *hirundinella*
149 *S. lobatus* var. *ellipticus* f. *minor*
150 *S. mamillatus*
151 *S. pseudoarthrodesmus*
152 *S. phimus* var. *robustus*
153 *S. triangularis*
154 *S. controversus*
155 *Staurodesmus* sp. 2
156 *Staurodesmus* sp. 3
157 *Staurodesmus* sp. 4
158 *Teilingia granulata*
159 *Xanthidium octocorne*

EUGLENOPHYCEAE

160 *Euglena oxyuris* var. *minima*
161 *E.* cf. *splendens*
162 *Phacus* sp.
163 *Trachelomonas volvocinopsis* var. *volvocinopsis*
164 *T. volvocina/volvocinopsis*

RAPHYDOPHYCEAE

165 Raphidomonadales 1
166 Raphidomonadales 2

BACILLARIOPHYCEAE

167 *Brachysira vitrea*
168 *Cyclotella stelligera*
169 *Eunotia* sp.
170 *Aulacoseira agassizii* var. *malayensis*
171 *A. distans*
172 *A. granulata* var. *angustissima*
173 *A. granulata* var. *granulata*
174 *A. pseudogranulata*
175 *Nitzschia* sp. 1
176 *Nitzschia* sp. 21
177 *Rhizosolenia eriensis* var. *eriensis* f. *brevispina*
178 *R. eriensis* var. *eriensis*
179 *R. eriensis* var. *morsa*
180 *R. longiseta*
181 *Synedra* sp.
182 *Pinnularia* sp.

XANTHOPHYCEAE

183 *Centritractus belenophorus*
184 *Goniochloris mutica*
185 *Isthmochloron gracile*
186 *Tetraedriella jovetii*
187 *Tetraplektron deniseae*

CHRYSOPHYCEAE

188 *Bitrichia* sp.
189 *Chrysodydimus synuroide*
190 *Chromulina* cf. *gyrans*
191 *C. mikroplankton*
192 *Chromulina* sp.
193 *Chrysococcus punctiformis*
194 *Chrysococcus* sp.
195 *Dinobryon bavaricum*

196	*D. sertularia*	197	*D. divergens*
198	*D. crenulatum*	199	*D. petiolatum*
200	*Lagynyon* sp.	201	*Mallomonas* sp. 6
202	*Mallomonas* sp. 7	203	*Mallomonas* sp. 1
204	*Mallomonas* sp. 2	205	*Mallomonas* sp. 3
206	*Mallomonas* sp. 4	207	*Mallomonas* sp. 5
208	*Pseudokephyrion* sp.	209	*Synura* cf. *uvella*
210	Chrysophyceae 1	211	Chrysophyceae 2
212	Chrysophyceae 3	213	Chrysophyceae 4
	CRYPTOPHYCEAE		
214	*Chroomonas acuta*	215	*Cryptomonas curvata*
216	*C.* cf. *marsonii*	217	*Cryptomonas* sp. 2
218	*Cryptomonas* sp. 1	219	*C. obovata*
220	*C. phaseolus*	221	*C.* cf. *pyrenoidifera*
	DINOPHYCEAE		
222	*Glenodinium* sp.	223	*Gymnodinium* cf. *cnecoides*
224	*Peridinium umbonatum* var. 1	225	*Peridinium umbonatum* var. 2
226	*Peridinium umbonatum* var. 3	227	Dinophyceae 1
228	Dinophyceae 2		

Tab. 1: Mean values of some abiotic variables of the systems studied.

	Mean	**Nr. of samples**
Water transparency (m)	1,3	57
Electrical conductivity ($\mu S \cdot cm^{-2}$)	12,9	201
Water temperature (°C)	29,7	201
pH	5,9	201
Alkalinity ($mEq \cdot l^{-1}$)	0,07	201
Soluble reactive phosphorus ($\mu g \cdot l^{-1}$)	4,8	201
Nitrate ($\mu g \cdot l^{-1}$)	40,1	201

Table 2: Total number of infrageneric taxa (Sp.) and genera (Gen.) by taxonomic class, recorded from Lake Batata, Lake Mussurá and Trombetas River during the period of study.

	L. Batata		L. Mussurá		Trombetas R.		Total	
	Sp.	Gen.	Sp.	Gen.	Sp.	Gen.	Sp.	Gen.
Cyanophyceae	18	10	13	09	11	09	19	10
Chlorophyceae	68	38	40	24	45	26	90	42
Zygnemaphyceae	43	11	22	09	24	08	50	12
Euglenophyceae	05	03	01	01	0	0	05	03
Chloromonadophyceae	02	01	02	01	0	0	02	01
Bacillariophyceae	14	08	11	06	12	07	16	08
Xanthophyceae	03	03	01	01	03	31	05	04
Chrysophyceae	20	09	13	05	13	07	26	09
Cryptophyceae	08	02	06	02	05	02	08	02
Dinophyceae	07	03	07	03	07	03	07	03
Total	188	88	116	61	120	65	228	94

Table 3: Number of taxa by taxonomic class and total number of taxa recorded in the weekly (We.) and trimonthly (Tr.) collections in the three systems studied; in the trimonthly collections in the three systems; in each system, in the trimonthly collections; in the weekly collections, only at Station 8 (St. 8); only at Station 10 (St. 10); and at Stations 8 and 10 combined in Lake Batata. (Bat. = Lake Batata; Mus. = Lake Mussurá; Tromb. = Trombetas River).

Classes	We.+Tr. Bat.+Mus. +Tromb.	Tr. Bat.+Mus. +Tromb.	We. L. Batata Bat.	Mus.	Tromb.	St.8	St.10	St.8+ 10
Cyanophyceae	19	17	18	16	13	17	17	17
Chlorophyceae	90	81	68	44	40	56	52	58
Zygnemaphyceae	50	47	43	36	22	37	36	41
Euglenophyceae	05	05	05	03	01	03	03	04
Raphidophyceae	02	02	02	02	02	02	02	02
Bacillariophycae	16	16	14	11	11	12	12	13
Xanthophyceae	05	04	03	0	01	03	0	03
Chrysophyceae	26	23	20	14	13	17	14	19
Cryptophyceae	08	08	08	06	06	08	06	08
Dinophyceae	07	07	07	07	07	07	07	07
Total	228	240	188	139	116	162	149	172

Table 4: Variation in number of taxa present in the trimonthly collections in Lake Batata, Lake Musurá and Trombetas River, in each stage of the hydrological cycle.

	Lake Batata	Lake Musurá	Trombetas River
Drowdown	94	69	83
Low water	129	75	75
Filling	122	58	67
High water	58	40	22

Table 5: Percentage of the taxa recorded in the study area by taxonomic class, compared with the size ranges recorded in literature (L.L. = lower limit; U.L. = upper limit; R. = range; Cyan. = Cyanophyceae; Chlor. = Chlorophyceae; Zygnem. = Zygnemaphyceae; Eugl. = Euglenophyceae; Bacill. = Bacillariophyceae; Chrys. = Chrysophyceae; Xanth. = Xanthophyceae; Crypt. = Cryptophyceae).

	Cyan.	Chlor.	Zygnem.	Eugl.	Bacill.	Chrys.	Xanth.	Crypt.	Total
< L.L.	13	25	35	50	0	0	50	29	24
= L.L.	40	37	29	0	60	44	0	42	36
> L.L.	47	36	32	50	40	56	50	20	38
> U.L.	0	02	04	0	0	0	0	0	01
< R. >	0	0	0	0	0	0	0	07	01

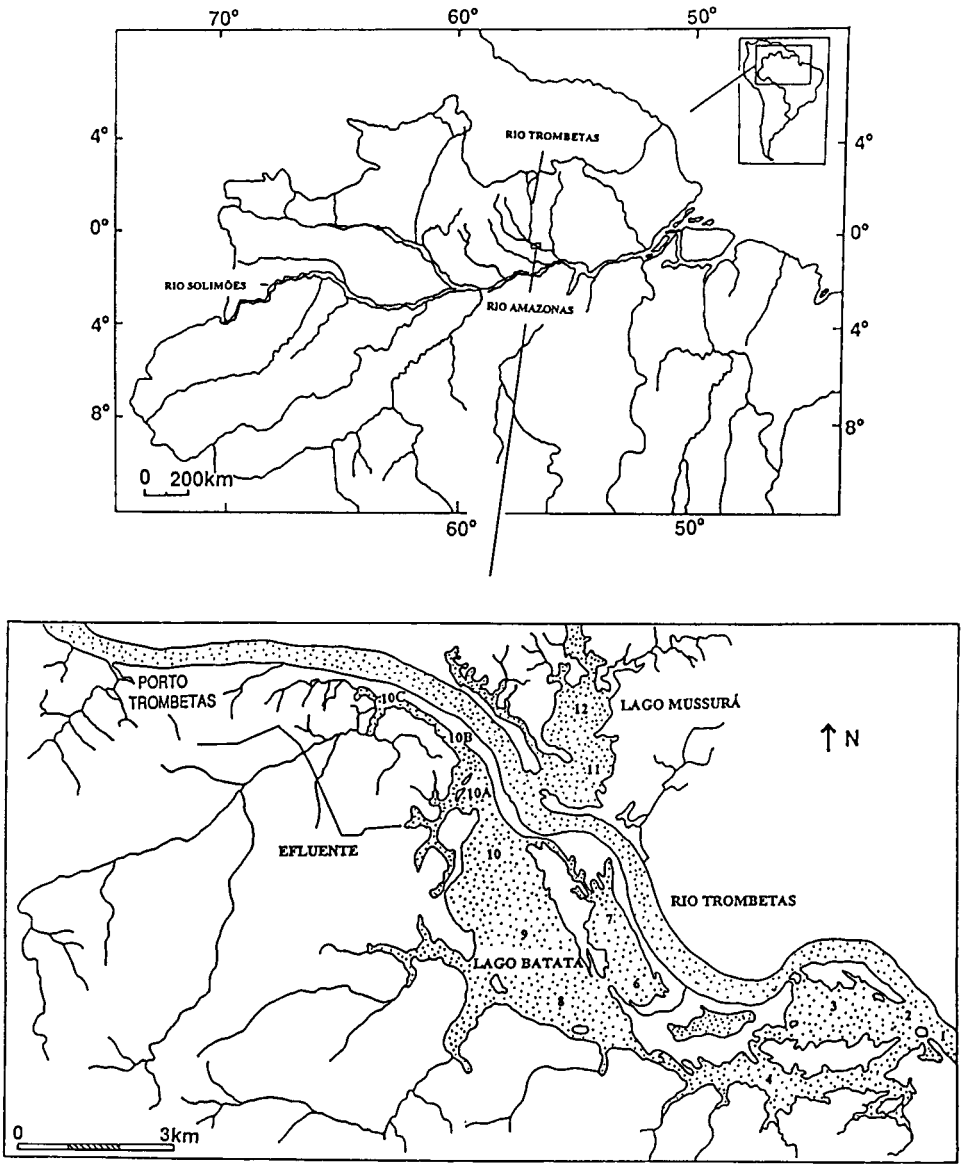

Fig. 1:
Location of study area and map of Lake Batata and Lake Mussurá, showing the sampling stations.

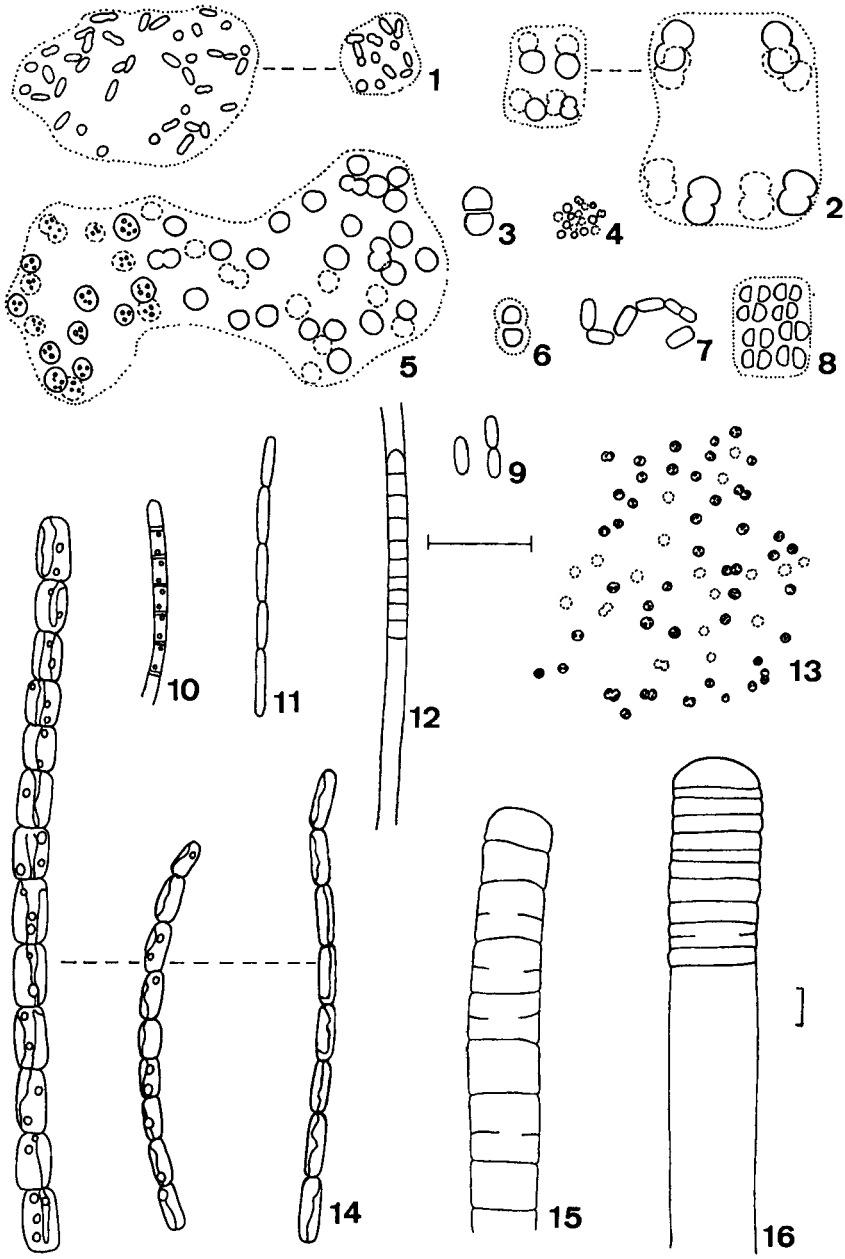

Plate I:

1: *Aphanothece clathrata*; **2**: *Eucapsis alpina* var. *minor*; **3**: *Synechocystis aquatilis*; **4**: *Microcystis aeruginosa* f. *flos-aquae*; **6**: *Chroococcus minor*, **7**: *Synechococcus elegans*; **8**: *Merismopedia tenuissima*; **9**: *Synechococcus elongatus*; **10**: *Oscillatoria quadripunctulata*; **11**: *Oscillatoria limnetica*; **12**: *Lyngbya cebennensis*; **13**: *Microcystis aeruginosa* f. *protocystis*; **14**: *Oscillatoria geminata*; **15**: *Oscillatoria chalybea* var. *insularis*; **16**: *Oscillatoria* cf. *tranvaalensis*. (Scales - 10 μm).

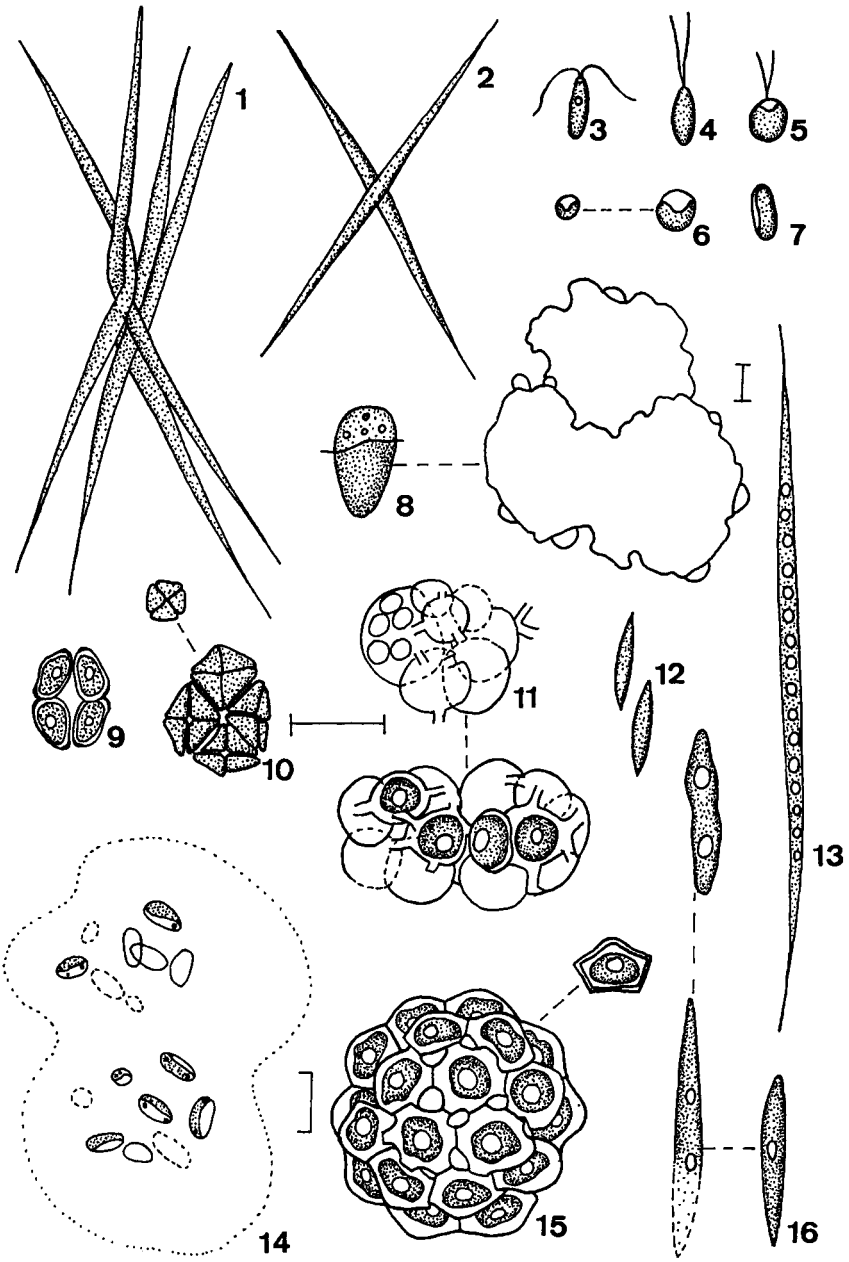

Plate II:

1: *Ankistrodesmus bernardii*; 2: *Ankistrodesmus falcatus*; 3: *Chlamydomonas* cf. *microscopica*; 4: *Chloromonas* cf. *flos-aque*; 5: *Chloromonas* cf. *grovei*; 6: *Chlorella homosphaera*; 7: *Choricystis cylindracea*; 8: *Botryococcus fernandoi*; 9: *Crucigeniella apiculata*; 10: *Crucigenia tetrapedia*; 11: *Coleastrum reticulatum*; 12: *Elakatothrix genevensis*; 13: *Closteriopsis longissima*; 14: *Coccomyxa lacustris*; 15: *Coelastrum indicum*; 16: *Elakatothrix gelifacta*. (Scales - 10 μm).

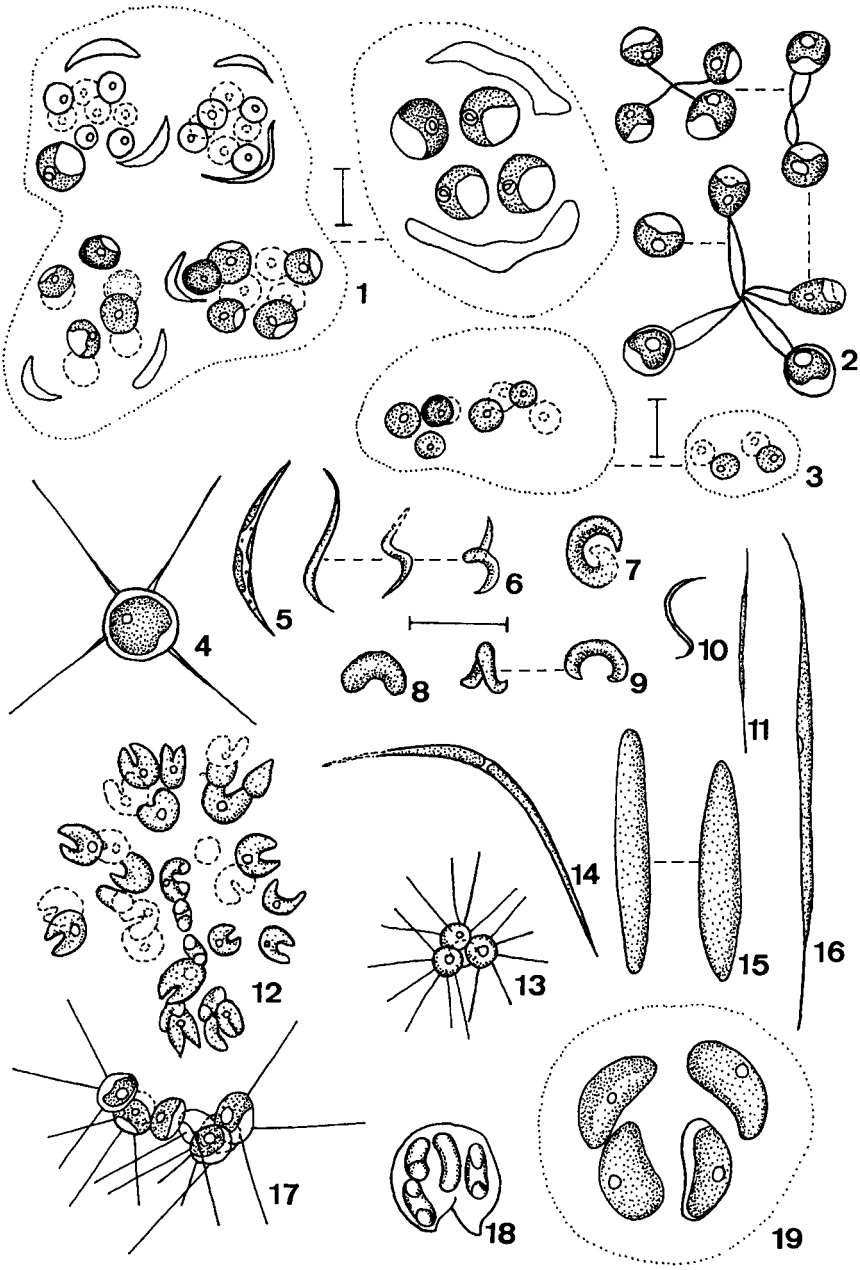

Plate III:

1: *Coenochloris piscinalis*; **2**: *Dictyosphaerium pulchellum*; **3**: *Eutetramorus planctonicus*; **4**: *Lagerheimia chodati*; **5**: *Monoraphidium fontinale*; **6**: *Monoraphidium contortum*; **7**: *Monoraphidium circinale*; **8**: *Monoraphidium nanum*; **9**: *Monoraphidium convolutum*; **10**: *Koliella longiseta* f. *variabilis*; **11**: *Koliella longiseta* f. *tenuis*; **12**: *Kirchneriella dianae*; **13**: *Micractinium pusillum*; **14**: *Monoraphidium longiusculum*; **15**: *Monoraphidium* cf. *dybowskii*; **16**: *Monoraphidium komarkovae*; **17**: *Micractinium appendiculatum*; **18**: *Nephrochlamys willeana*; **19**: *Nephrocytium shillerii*. (Scales - 10 μm).

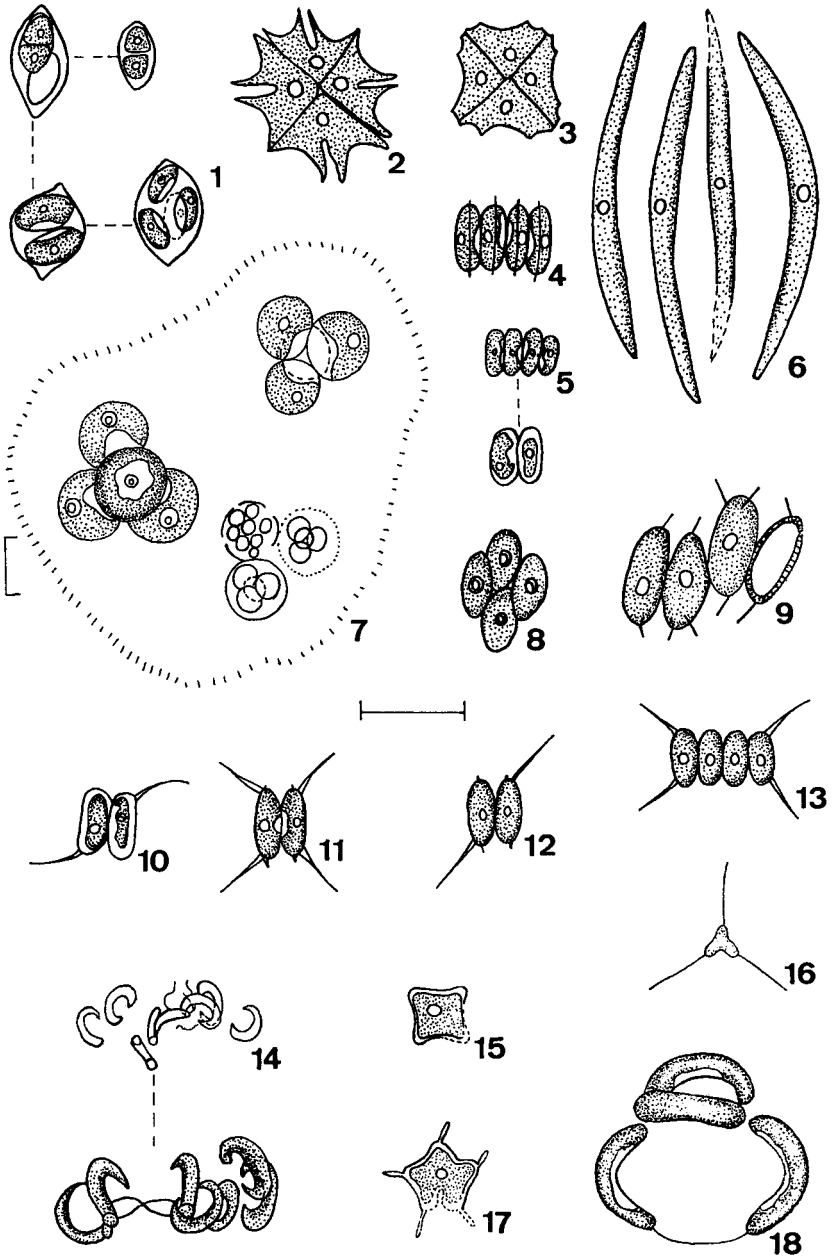

Plate IV:

1: *Oocystis lacustris*; **2**: *Pediastrum tetras*; **3**: *Pediastrum privum*; **4**: *Scenedesmus acutiformis*; **5**: *Scenedesmus ellipticus*; **6**: *Quadrigula closterioides*; **7**: *Radiococcus nimbatus*; **8**: *Scenedesmus arcuatus* var. *platydiscus*; **9**: *Scenedesmus denticulatus*; **10**: *Scenedesmus bicaudatus*; **11**: *Scenedesmus quadricauda* var. *longispina*; **12**: *Scenedesmus quadricauda* var. *longispina* f. *asymmetricus*; **13**: *Scenedesmus quadricauda* var. *quadricauda*; **14**: *Kirchneriella roselata*; **15**: *Tetraedron minimum*; **16**: *Treubaria setigera*; **17**: *Tetraedron caudatum*; **18**: *Tetrallantos lagerheimii*. (Scales - 10 μm).

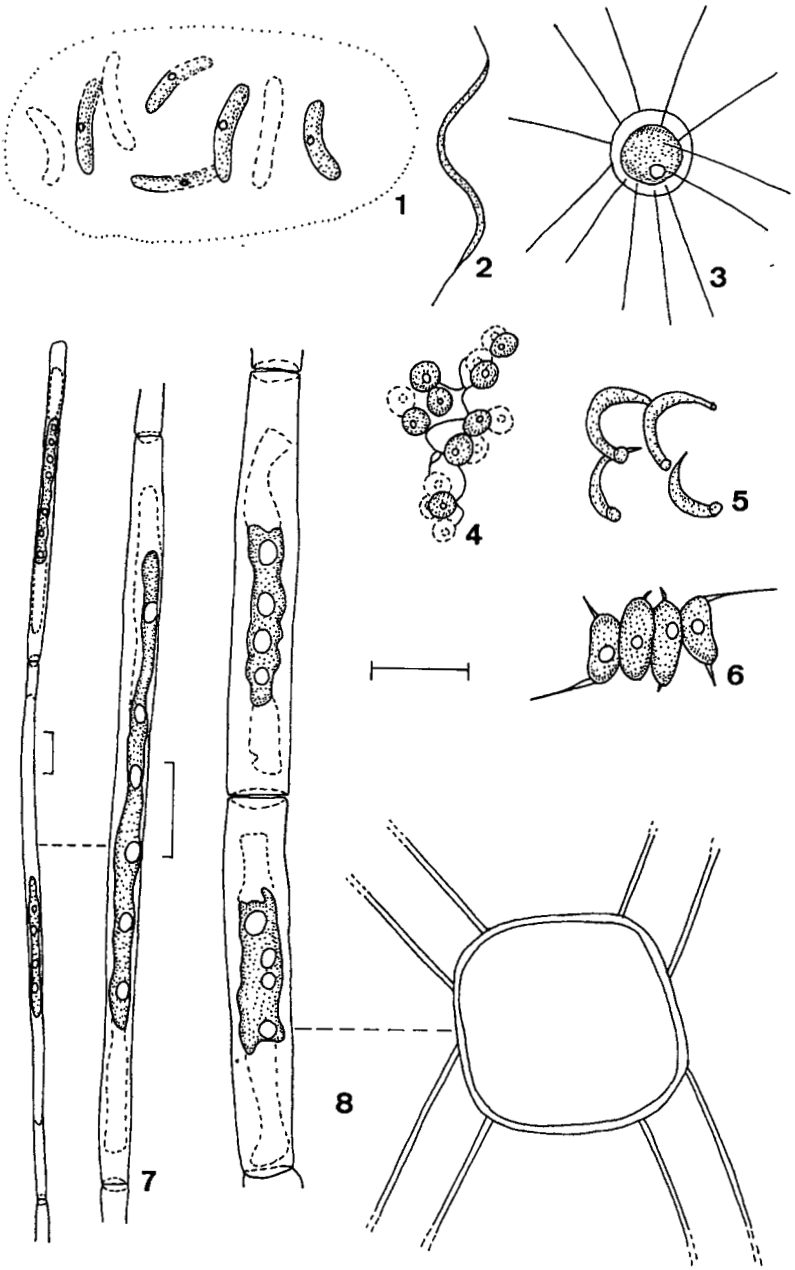

Plate V:

1: *Nephrocytium agardhianum*; **2**: *Monoraphidium irregulare*; **3**: *Golenkiniopsis parvula*; **4**: *Westella botryoides*; **5**: *Kirchneriella* sp.; **6**: *Scenedesmus* cf. *heteracanthus*; **7**: *Mougeotia* cf. *delicata*; **8**: *Mougeotia* cf. *viridis*. (Scales - 10 μm).

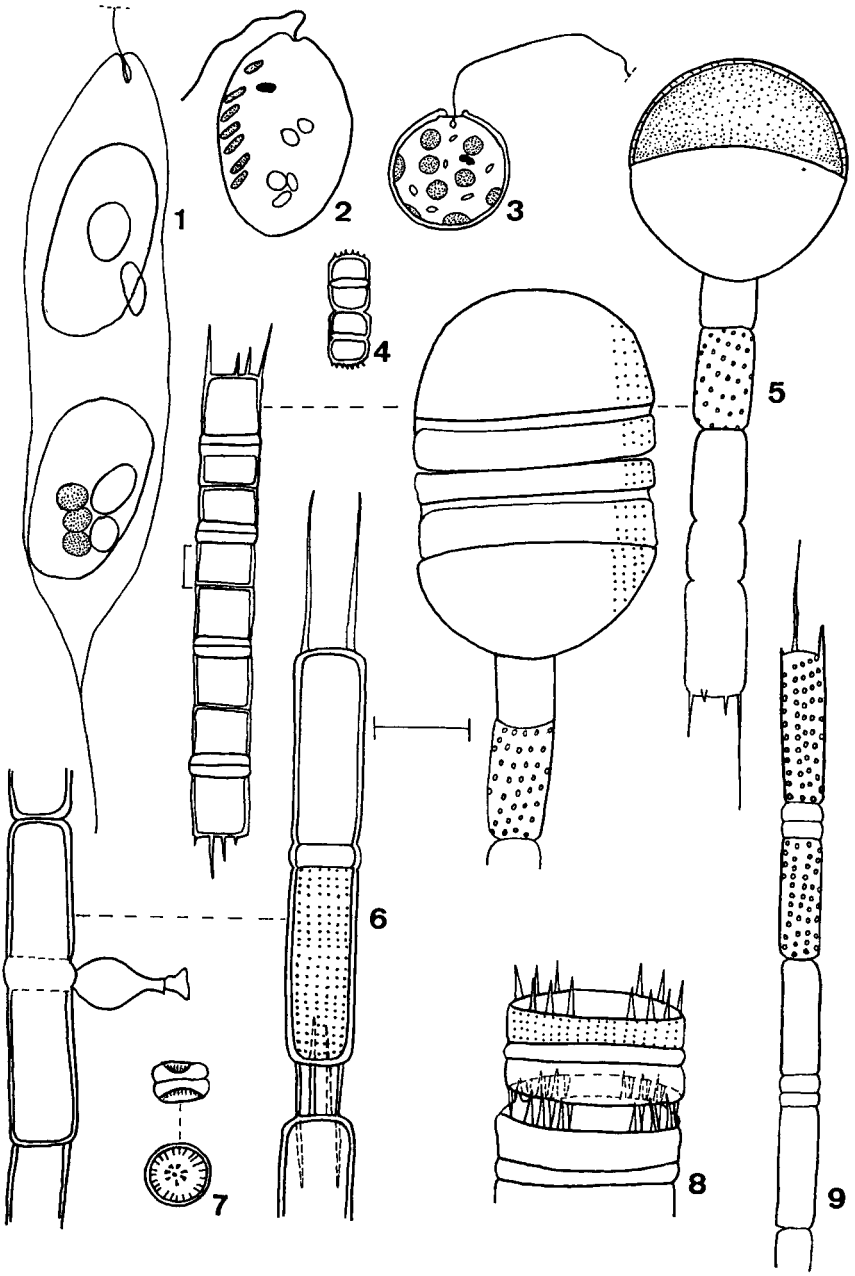

Plate VI:

1: *Euglena oxyuris* var. *minima*; **2**: *Euglena* cf. *splendens*; **3**: *Trachelomonas volvocinopsis* var. *volvocinopsis*; **4**: *Aulacoseira distans*; **5**: *Aulacoseira granulata* var. *granulata*; **6**: *Aulacoseira pseudogranulata*; **7**: *Cyclotella stelligera*; **8**: *Aulacoseira agassizii* var. *malayensis*; **9**: *Aulacoseira granulata* var. *angustissima*. (Scales - 10 μm).

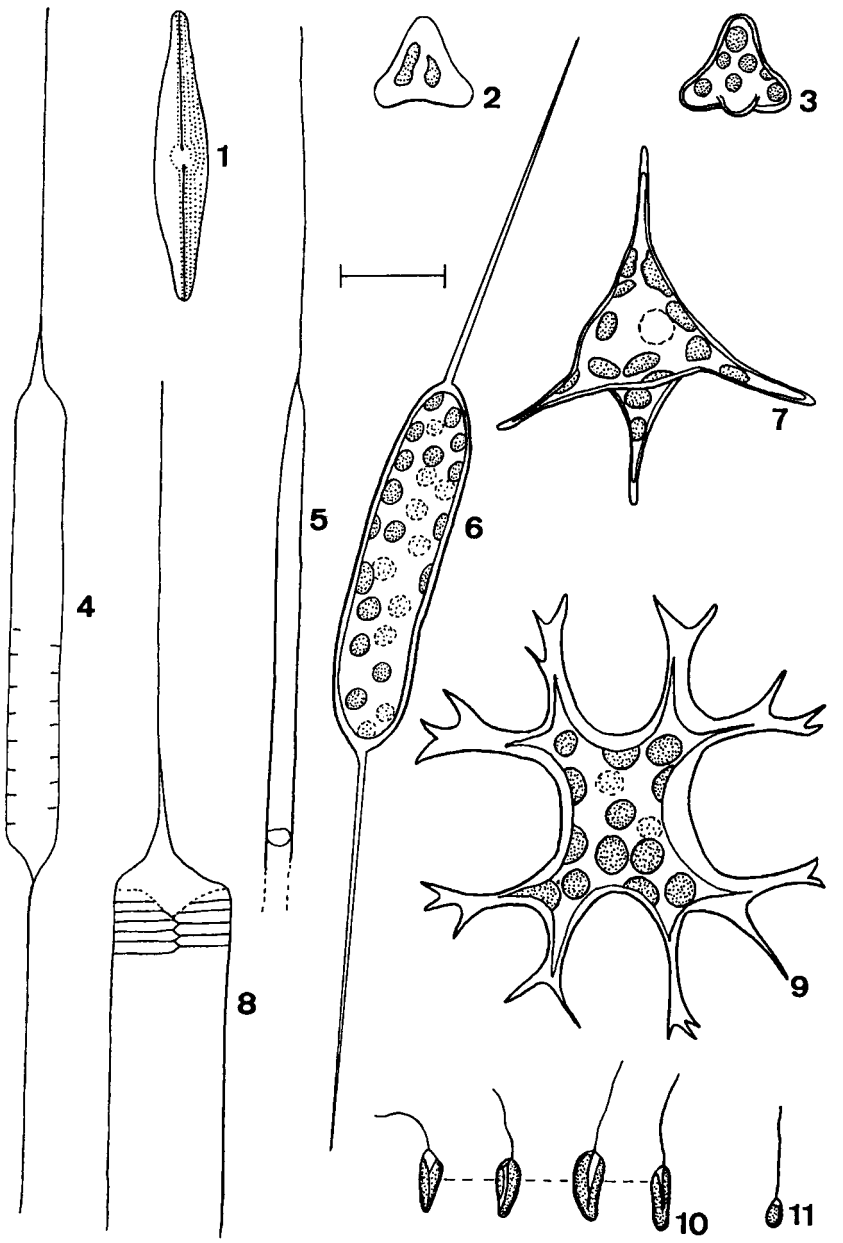

Plate VII:

1: *Brachysira vitrea*; **2**: *Goniochloris mutica*; **3**: *Tetraedriella jovetii*; **4**: *Rhizosolenia eriensis* var. *eriensis*; **5**: *Rhizosolenia longiseta*; **6**: *Centritractus belenophorus*; **7**: *Tetraplektron denisae*; **8**: *Rhizosolenia eriensis* var. *morsa*; **9**: *Isthmochloron gracile*; **10**: *Chromulina* cf. *gyrans*; **11**: *Chromulina mikroplankton*. (Scales - 10 μm).

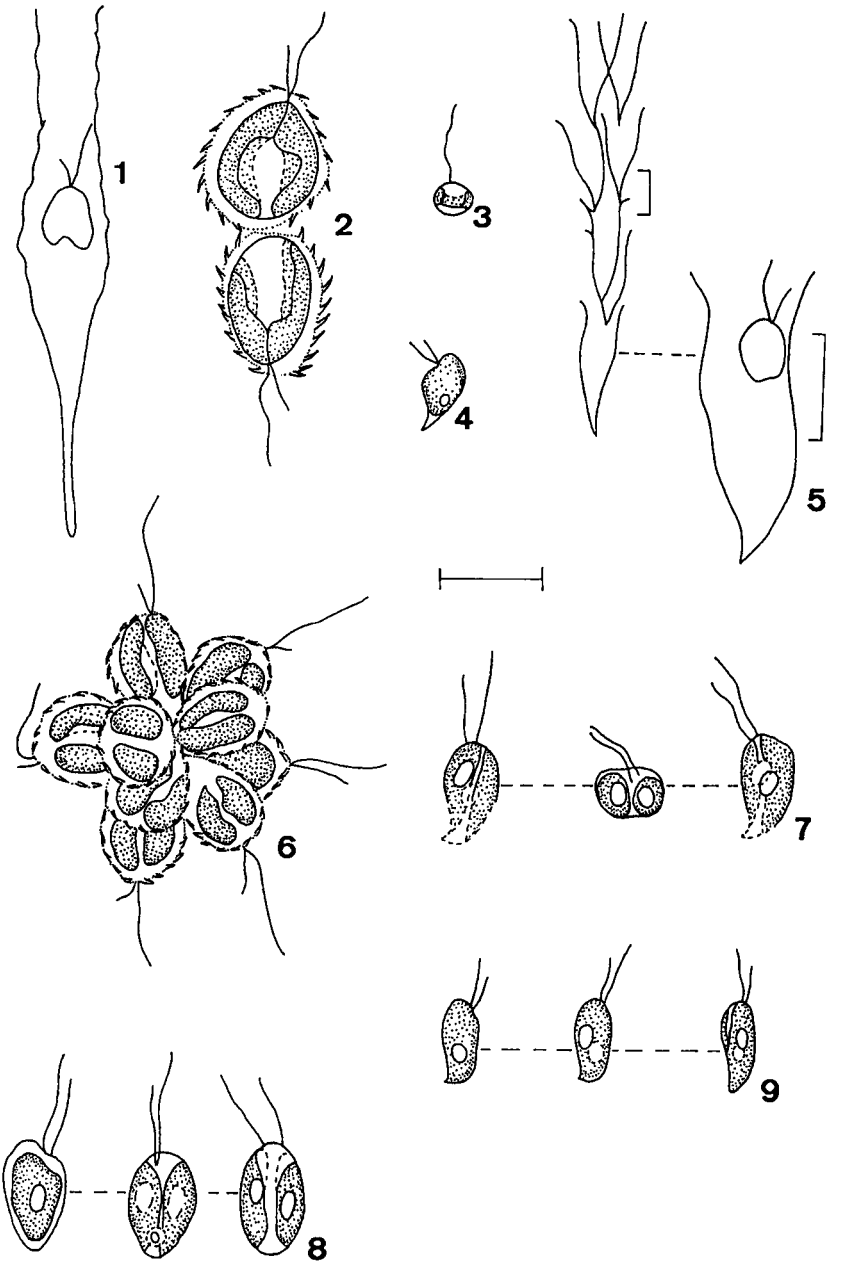

Plate VIII:

1: *Dinobryon bavaricum*; **2**: *Chrysodidymus synuroides*; **3**: *Chrysococcus punctiformis*; **4**: *Chroomonas acuta*; **5**: *Dinobryon sertularia*; **6**: *Synura* cf. *uvella*; **7-9**: *Cryptomonas* cf. *pyrenoidifera*. (Scales - 10 μm).

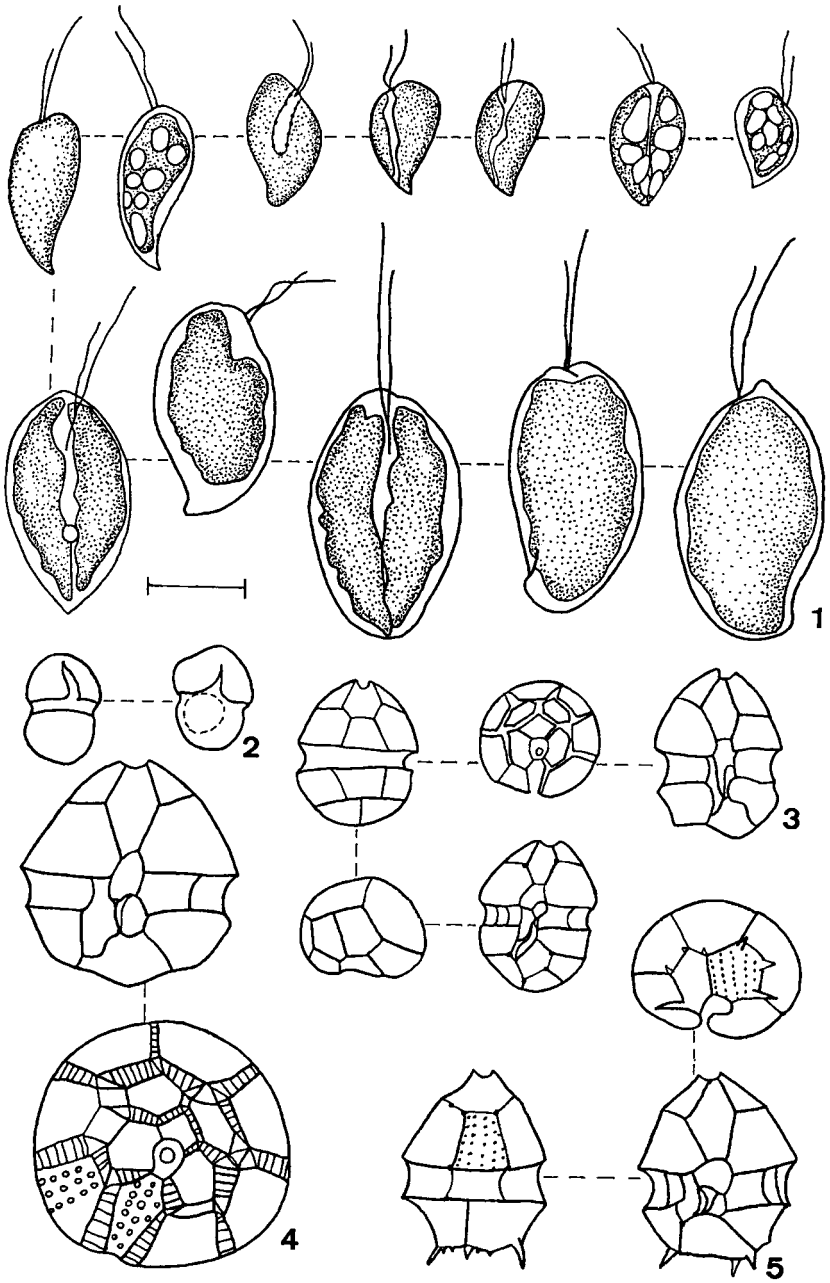

Plate IX:

1: *Cryptomonas* cf. *marsonii*; **2**: *Gymnodinium* cf. *cnecoides*; **3**: *Peridinium umbonatum* var. 1. *Peridinium umbonatum* var. 2. *Peridinium umbonatum* var. 3. (Scales - 10 μm).