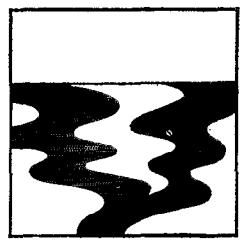

Study of the Euglenophyta from Camaleão lake (Manaus-Brazil)

I. *Trachelomonas* Ehr.

Visitación Conforti (1)

Abstract

A total of 90 taxa belonging to the genus Trachelomonas *Ehr. (Euglenophyta) from Camaleão lake (Marchantaria Island, near Manaus, Brazil) have been studied. On the basis of these observations we propose one new species :* T. amazonensis, *seven new varieties :* T. allorgei *var.* sparsispina, T. amphoriformis *var.* spinosa, T. angustispina *var.* unicoronata, T. charkoviensis *var.* spinicollis, T. hirta *var.* obesa, T. horrida *var.* spinicollis, T. selecta *var.* megaspina *and five new formae :* T. abrupta *var.* obesa *fo.* minor, T. curta *var.* punctata *fo.* minor, T. kelloggii *var.* effigurata *fo.* acuminata, T. similis *var.* spinosa *fo.* obesa, T. volvocina *var.* derephora *fo.* punctata. *Twenty one taxa have been examined by scanning electron microscopy.*

Key words : Morphology — Taxonomy — Ultrastructure — *Trachelomonas* — Euglenophyta — Brazil.

Resumen

Estudio de las euglenofitas del Lago Camaleão (Manaus-Brasil) I. *Trachelomonas* Ehr.

En este trabajo hemos estudiado un total de 90 taxones pertenecientes al género Trachelomonas *Ehr. (Euglenophyta) provenientes del lago Camaleão (Isla Marchantaria, próximo a Manaus, Brasil). Como resultado de nuestras observaciones decidimos describir una especie* T. amazonensis; *siete variedades* T. allorgei *var.* sparsispina, T. amphoriformis *var.* spinosa, T. angustispina *var.* unicoronata, T. charkoviensis *var.* spinicollis, T. hirta *var.* obesa, T. horrida *var.* spinicollis, T. selecta *var.* megaspina *y cinco formas* T. abrupta *var.* obesa *fo.* minor, T. curta *var.* punctata *fo.* minor, T. kelloggii *var.* effigurata *fo.* acuminata, T. similis *var.* spinosa *fo.* obesa, T. volvocina *var.* derephora *fo.* punctata *como nuevos taxones. Con la ayuda del microscopio electrónico de barrido hemos examinado en detalle 21 taxones.*

Palabras claves : Morfología — Taxonomía — Ultraestructura — *Trachelomonas* — Euglenophyta — Brasil.

Résumé

Les Euglénophytes du lac Camaleão (Manaus-Brésil) I. *Trachelomonas* Ehr.

Dans le présent travail, 90 taxons appartenant au genre Trachelomonas *Ehr. (Euglenophyta) provenant du lac Camaleão (île Marchantaria, près de Manaus au Brésil) sont étudiés. Nous proposons une nouvelle espèce :* T. ama-

(1) *Dpto. Cs. Biológicas, Fac. Cs. Exactas y Naturales, 1428, Buenos Aires, Argentina*

zonensis, *et 7 nouvelles variétés :* T. allorgei *var.* sparsispina, T. amphoriformis *var.* spinosa, T. angustispina *var.* unicoronata, T. charkoviensis *var.* spinicollis, T. hirta *var.* obesa, T. horrida *var.* spinicollis, T. selecta *var.* megaspina *et 5 nouvelles formes :* T. abrupta *var.* obesa *fo.* minor, T. curta *var.* punctata *fo.* minor, T. kelloggii *var.* effigurata *fo.* acuminata, T. similis *var.* spinosa *fo.* obesa, T. volvocina *var.* derephora *fo.* punctata. *vingt et un taxons ont été examinés au microscope électronique à balayage.*

MOTS CLÉS : Morphologie — Taxonomie — Ultrastructure — *Trachelomonas* — Euglénophytes — Brésil.

INTRODUCTION

Camaleão Lake, an Amazonian flood-plain lake, is located in the Marchantaria Island, near Manaus, Brazil. This shallow lake is regularly filled by the Solimões river during high water periods, while during low water periods, only the central part of the lake retains water. Under dry season conditions macrophytes die off, thus strongly increasing the contents of organic matter in the water consequently favoring growth of euglenoid flagellates, both in numbers and in diversity. The rich assemblage surveyed included the genera *Euglena, Lepocinclis, Phacus, Trachelomonas* and *Strombomonas*. Due to the high diversity of the euglenoid flagellates of this water body, we only deal in this paper with the genus *Trachelomonas* Ehr. We have recorded 90 *Trachelomonas* taxa, some of which are established as new species, new varieties and new formae. In addition, data on the ultrastructure of the lorica of 21 taxa of *Trachelomonas* are included in this report.

STUDY AREA

As a result of the periodic change in the water level, Camaleão lake does not exhibit a precise coast line. It has an extension of 7 km and its breadth varies from 100-150 m (FURCH *et al.* 1983), to 300-350 m (PIEDADE 1988); and even during high river discharge the whole Marchantaria Island can be flooded.

Samples were collected at three stations (Pl. I);

1 — Lake region close to the Solimoes river.
2 — Central region, always filled.
3 — Inner lake region.

The water body is highly vegetated with *Echinochloa polystachia, Paspalum repens* and *Eichhornia* sp.

MATERIAL AND METHODS

The materials analyzed and related environmental data (Tab. I), have been provided by Maria RODRIGUES (Inpa). Samples were selected from collections carried out between September 1987 and April 1990 on the basis of high abundance of euglenophyta, and were identified by a code number (Tab. II). Water was sieved with a 20 µm mesh net, and fixed with Transeau solution. Identifications were performed under a Leitz binocular microscope. For SEM observations organisms were isolated under a dissecting microscope with the aid of micropipettes, dehydrated in a series of ethanol solutions (50 to 100 %), and air dried on a cover glass to be subsequently coated with gold palladium. Specimens were examined and photographed by means of a SEM (Phillips 505) at the Electron Microscopy Service of Citefa, Argentina.

TABLE I

List of the dates, stations and number of the samples
Numérotation des échantillons, dates et stations correspondantes

Sample number	Date	Station
19	September 87	2
22	October 87	2
24	November 87	2
27	Dec. 87/Jan. 88	2
31	Jan./March 88	2 & 3
45	April 88	2 & 3
58	July/August 88	1 & 2
67	Sept./Oct. 88	2 & 3
70	Nov.-Dec. 88/ Feb.-March 89	1, 2 & 3
89	April 90	2

TABLE II

List of the environmental data of the station 2
Conditions de milieu à la station 2

Environmental data (station 2)	Period of low water Oct./Nov. 87	Period of high water May/June 88
Depth (m)	0.35	9.35
Temperature (°c)	30.1	27.6
Transparency (m)	0.10	0.35
Conductivity (µs/cm)	762	70.2
pH	7.6	7.0
Dissolved oxygen (mg/l)	10.2	5.7
Suspended solids (mg/l)	105	28.75

We have recorded 90 *Trachelomonas* taxa (Tab. III), only new taxa and those whose ultrastructure was observed are described in the text.

Samples were deposited at Inpa and in the collection of the Limnology Laboratory of the Department of Biological Sciences, University of Buenos Aires.

TAXONOMICAL DESCRIPTIONS

Family Euglenaceae

Trachelomonas Ehr.

T. abrupta var. *obesa* fo. *minor* n. fo. Pl. II, fig. 25

A typo minoribus dimensionibus differt. Lorica 18-19 *µm long.*, 13-14 *µm lat. In* Camaleão *lacu*, Manaus, Brasil. IX-X/88. *Holotypus tab.* II, *fig.* 25.

This forma presented the same characteristics as the variety type, the only difference being the smaller dimensions of the lorica.

T. acanthophora var. *speciosa* (Defl.) Balech
Pl. IV, fig. 18; Pl. VII, fig. 8

Lorica 40-42 µm long, 21-24 µm broad, spindle-shaped with regularly arched sides. Anterior end narrowed into a cylindrical neck (4-5 × 4-5 µm). Posterior end gradually tapering towards a subconical tail (4.5-7 × 3-6 µm). Membrane yellowish to clear-

Table III

Trachelomonas taxa of the Camaleão lake (Manaus-Brazil)
Les espèces du genre Trachelomonas *du lac Camaleão (Manaus-Brésil)*

	Sample number	Illustration
T. abrupta var. *arcuata* (Playf.) Defl.	70	II/27
fo. *angustata* Defl.	70	II/26
var. *obesa* fo. *minor* n. fo.	67	II/25
T. acanthophora Stokes	45-58-70	IV/13
var. *speciosa* (Defl.) Balech	19-67	IV/18; VII/8
T. allia Drez. emend. Defl.	19-45-58-67-89	II/40; V/6,7
T. allorgei var. *sparsispina* n. var.	31	IV/12
T. amazonensis n. sp.	45	II/20 a,b
T. amphoriformis Osorio Tafall	45-58	IV/14
var. *spinosa* n. var.	19-31-58-89	IV/15;VIII/10-12
T. angustispina Defl.	58	II/38
var. *unicoronata* n. var.	58	II/39
T. armata (Ehr.) Stein	19-31-45-58-67	III/1; VI/3-6
var. *steinii* Lemm. emend. Defl.	31-45-58-67	III/2
T. bacillifera var. *minima* Playf.	58/67	IV/2
var. *collifera* Hub.-Pest.	58	IV/3
T. bernardii Wolosz.	19	II/18
T. bernardinensis Visch. emend. Defl.	19-27-45-89	IV/10
T. caudata (Ehr.) Stein	19-45-70-89	IV/16a,b VII/9-13
T. cervicula Stokes	19-22-31-45-58-67	II/11
T. conica fo. *punctata* Defl.	67-70	II/29
T. curta Da Cunha	19-22-27-31-45-58-70-89	II/6
var. *minima* Tell & Zaloc.	31-45-58-70	II/8
var. *punctata* Skv.	19	II/9
fo. *minor* n. fo.	19	II/10a,b
T. charkoviensis var. *spinicollis* n. var.	31-45	III/22
T. dastuguei Balech	19-45-58	IV/17
T. dybowskii Drez.	67	II/14
T. globularis Lemm.	45-58-67	II/33
fo. *punctata* (Skv.) Popova	31	II/34
T. gracilis (Playf.) Defl.	27	IV/9
T. granulata Swir. emend. Defl.	19-31	IV/8a,b;VII/6,7
T. hirta Da Cunha	19-27-45-58-67	II/41
var. *duplex* Defl.	27-89	II/43
var. *obesa* n. var.	45-89	II/42
T. hispida (Perty) Stein emend. Defl.	19-22-31-45-58-67-70	III/3;V/8,9
var. *acuminata* Defl.	31	III/5
var. *crenulatocollis* Tell & Conf.	31-58	III/7
fo. *patula* Defl.	31	III/6
var. *duplex* Defl.	31	III/4
T. horrida var. *spinicollis* n. var.	31	III/23;VI/10,11
T. intermedia Dang.	67-70	II/19
T. janczewskii var. *minor* Drez.	89	II/35
T. kelloggii Skv. emend. Defl.	19-31-45-58-67	III/17
var. *effigurata* Skv.	19-45-58-67-89	III/19
fo. *acuminata* n. fo.	89	III/14
var. *nana* Balech	45	III/18
T. klebsii Defl.	19-31	II/47
T. magdaleniana Defl.	19-31-45-58-89	IV/11;VIII/6-9
T. megalacantha var. *crenulatocollis* Bourr.	19-58	IV/1
T. nexilis Palmer	31-45-58-67-89	II/22;V/5
T. oblonga Lemm.	31-58	II/15
var. *truncata* Lemm.	22-67	II/16
T. obtusa Palmer	31	II/46
T. parvicollis Defl.	67	II/31
T. planctonica var. *flexicollis* Balech	19-70	IV/5
T. pulcherrima var. *ovalis* Playf.	45	II/28
T. pulchra Swir.	58-70	II/37;V/13-14
T. pusilla Playf.	19-22-27-31-58-67-70-89	II/12
var. *punctata* Playf.	67	II/13
T. pyramidata Couté & Théréz.	19-45-58-67-70	III/9a,b;VIII/3-5
T. raciborskii Wolosz.	45-58-70	III/10;VIII/1-2
var. *incerta* Drez.	58-67-70	III/11
var. *nova* Drez.	67	III/12
fo. *minor* Hort.	67	III/16
T. recticollis Defl.	58	II/30
T. robusta Swir. emend. Defl.	19-27-31-45-58-67-70-89	III/8;V/10-11
T. rotunda Swir. emend. Defl.	31-45-58-67	II/24
T. rugulosa fo. *parallela* Telt & Zaloc.	19	II/23
T. sculpta Balech	19-31-45-58-67	II/21;V/3,4
T. selecta Defl.	58	II/44
var. *megaspina* n. var.	58	II/45
T. similis Stokes	19-22-27-58-70-89	IV/4a,b;VI/12; VII/1-3
var. *spinosa* Hub.- Pest.	19-31-45-58-89	IV/6;VII/4,5
fo. *obesa* n. fo.	45	IV/7
T. spinosa var. *hirsuta* Couté & Théréz.	45-58	VI/7-9
T. spirogyra Balech	67-70	II/17
T. superba Swir. emend. Defl.	45-58-67-70	III/13
var. *inevoluta* Defl.	45-58	III/15
T. sydneyensis Playf.	19-58-67-70	III/21;V/12
var. *minima* Playf.	27-31-67-70	III/20
T. volvocina Ehr.	22-27-31-45-58-67-70-89	II/1
var. *compressa* fo. *tubigera* Defl.	19	II/7
var. *derephora* Conr.	19-27-45-58	II/2;V/1,2
fo. *punctata* n. fo.	19	II/3
T. volvocinopsis Swir.	45-67-70-89	II/4
fo. *punctata* Popova	67	II/5
T. wermelii Skv.	67	II/36
T. woycickii var. *pusilla* Drez.	45-67-70	II/32

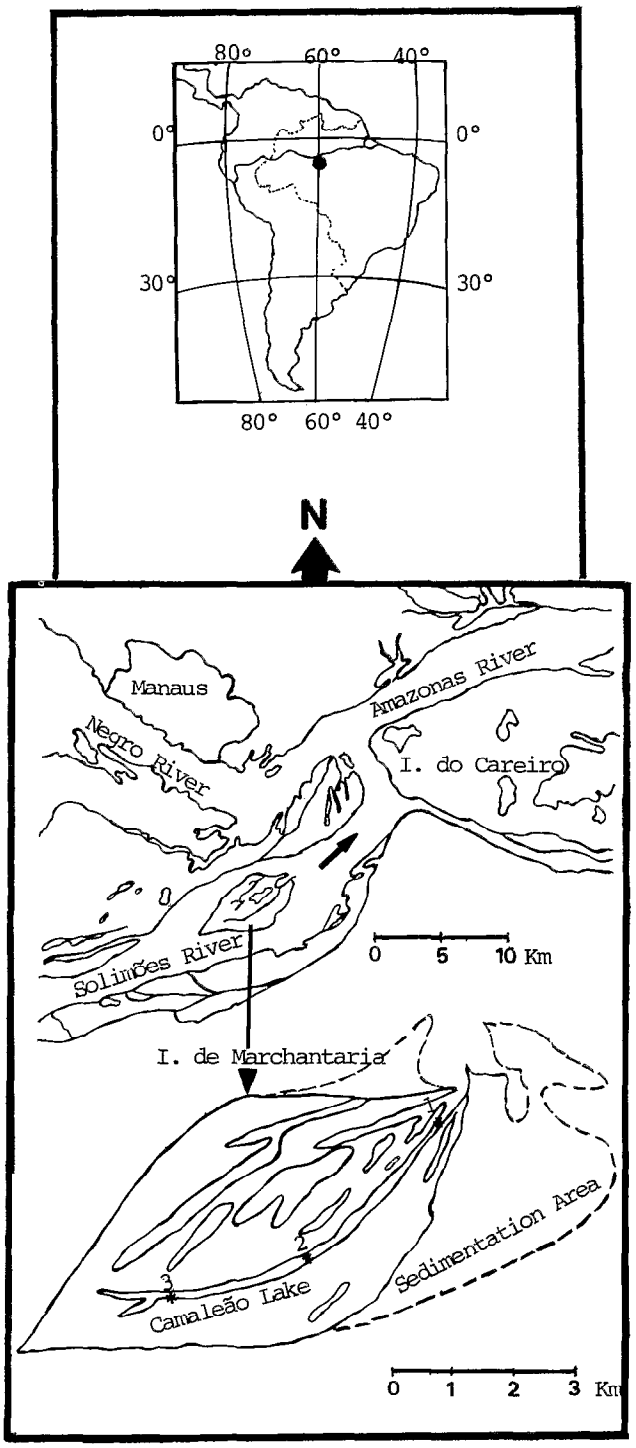

PLATE I. — Map of the study area.
Carte de la région échantillonnée.

brown, punctuate (150-180/100 μm²), and ornamented with conical spines arranged in definite areas. Around the distal edge of the neck there is a crown of 5 robust spines (5-6 μm long). The envelope body presented two rings of spines, one anterior and other posterior of similar characteristics to those found in the collar, and smaller spines (3.5-5 μm long) scattered on the centre of the body. Distal end of the tail with 3 spines (4-5 μm long). Argentina, Venezuela.

T. allia Drez. emend. Defl. Pl. II, fig. 40; Pl. V, fig. 6, 7

The organisms recorded from Camaleão lake are thinner than the cells described by DEFLANDRE (1926), lorica 22-30 μm long, 15-20 μm broad, cylindrical-ellipsoid with the sides parallel and poles broadly rounded. Pore 3-4 μm diam., provided with an annular thickening, surrounded by a crown of 8-9 conical spines. Membrane with punctuations, closely distributed (300-350/100 μm²), and scattered (150-200/100 μm²) conical spines (0.45-0.70 × 0.30-0.45 μm). Widespread.

T. allorgei Defl. var. *sparsispina* n. var. Pl. IV, fig. 12

A typo minoribus dimensionibus spinisque collum et loricae extremum ornantibus differt. Lorica 50-55 *μm long.*, 15-17 *μm lat. In* Camaleão *lacu*, Manaus, Brasil. I-III/88. *Holotypus tab.* IV, *fig.* 12.

This variety presented the same characteristics as the type, the differences being the smaller dimensions of the envelope, 50-55 μm long, 15-17 μm broad, and the conical spines on the neck and the posterior end of the lorica.

T. amazonensis n. sp. Pl. II, fig. 20 a, b

Lorica hemisphaerica, 24-25 μm *long.*, 30-31 μm *lat.; extremo posteriore rotundato praedito; extremo anteriore plana. Porus cum collo cylindrico interiore, circumdatus, spatio interposito, per proiectionem divergentem. Membrana fulva, in obscurum castaneum colorem, aequalitate praedita. In* Camaleão *lacu*, Manaus, Brasil. IV/88. *Holotypus tab.* II, *fig.* 20 a,b.

Lorica 24-25 μm long, 30-31 μm broad, flattened spherical, posterior end uniformly arched, anterior end plane. Pore with an inner cylindrical tube (3-3.5 × 3.5-4 μm), surrounded at a certain distance by a divergent membranous projection (7-7.5 μm). Membrane yellowish to deep brown, smooth.

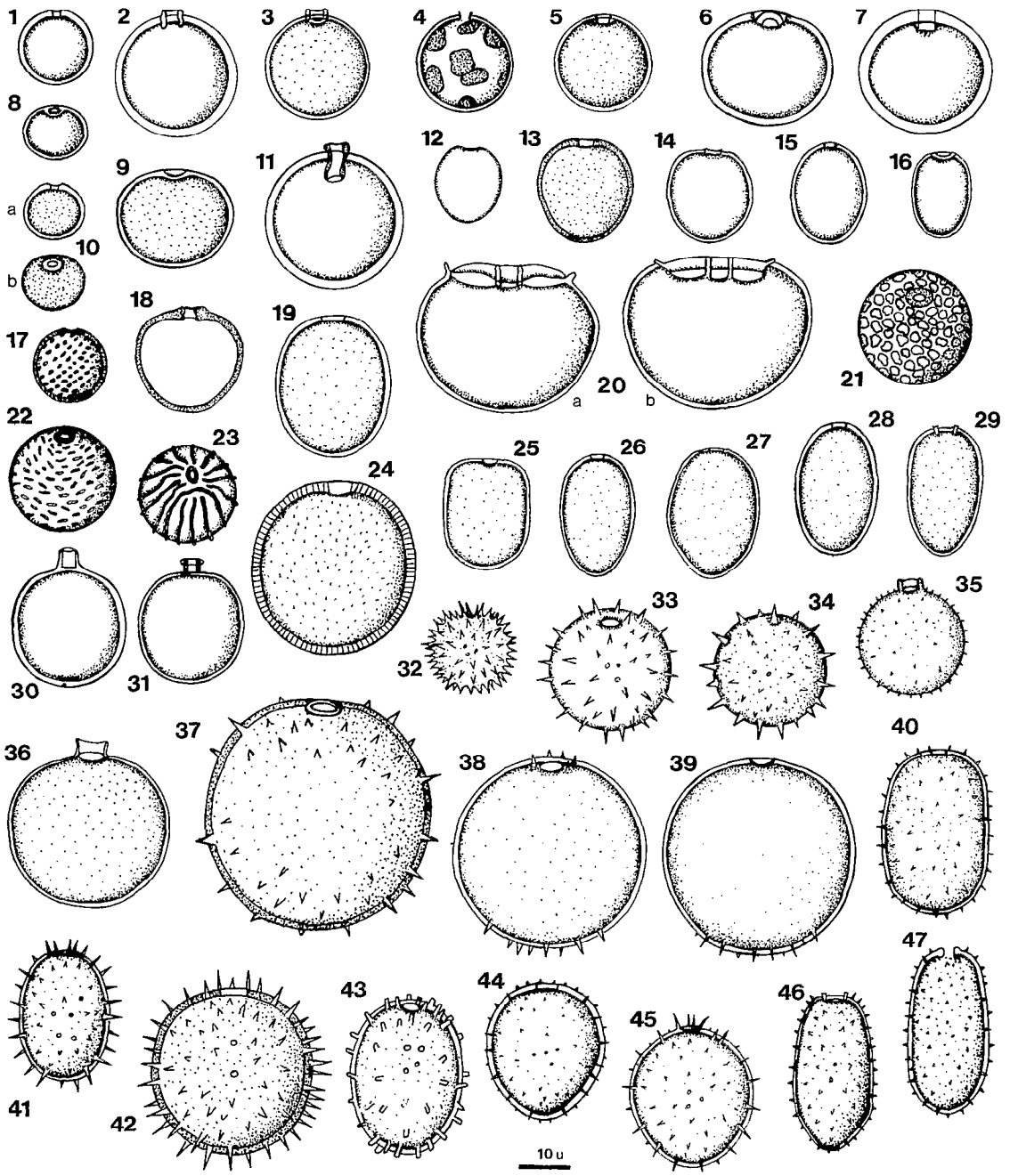

PLATE II

FIG. 1. — *T. volvocina*, 2. *T. volvocina* var. *derephora*, 3. *T. volvocina* var. *derephora* fo. *punctata*, 4. *T. volvocinopsis*, 5. *T. volvocinopsis* fo. *punctata*, 6. *T. curta*, 7. *T. volvocina* var. *compressa* fo. *tubigera*, 8. *T. curta* var. *minima*, 9. *T. curta* var. *punctata*, 10 a, b. *T. curta* var. *punctata* fo. *minor*, 11. *T. cervicula*, 12. *T. pusilla*, 13. *T. pusilla* var. *punctata*, 14. *T. dybowskii*, 15. *T. oblonga*, 16. *T. oblonga* var. *truncata*, 17. *T. spirogyra*, 18. *T. bernardii*, 19. *T. intermedia*, 20 a, b. *T. amazonensis*, 21. *T. sculpta*, 22. *T. nexilis*, 23. *T. rugulosa* fo. *parallela*, 24. *T. rotunda*, 25. *T. abrupta* var. *obesa* fo. *minor*, 26. *T. abrupta* var. *arcuata* fo. *angustata*, 27. *T. abrupta* var. *arcuata*, 28. *T. pulcherrima* var. *ovalis*, 29. *T. conica* fo. *punctata*, 30. *T. recticollis*, 31. *T. parvicollis*, 32. *T. woycickii* var. *pusilla*, 33. *T. globularis*, 34. *T. globularis* fo. *punctata*, 35. *T. janczewskii* var. *minor*, 36. *T. wermelii*, 37. *T. pulchra*, 38. *T. angustispina*, 39. *T. angustispina* var. *unicoronata*, 40. *T. allia*, 41. *T. hirta*, 42. *T. hirta* var. *obesa*, 43. *T. hirta* var. *duplex*, 44. *T. selecta*, 45. *T. selecta* var. *megaspina*, 46. *T. obtusa*, 47. *T. klebsii*.

This newly established species resembles *T. zuberi* Koczw., but it differs mainly in the contour of its lorica and the inner collar.

T. amphoriphormis var. *spinosa* n. var. Pl. IV, fig. 15; Pl. VIII, fig. 10-12

A typo spinis conicis praesentibus super collum differt; aliis spinis bacillaribus, dispositis super regione media et cauda, etiam differt. Lorica 64-81 µm *long.*, 31-32 µm *lat. In* Camaleão *lacu,* Manaus, Brasil. IX/87, I-III/88, VII- VIII/88, IV/90. *Holotypus tab.* IV, *fig.* 15.

Lorica 64-81 µm long, 15-19 µm broad, neck 8.5-10 × 5-6.5 µm, tail 13-15 µm. This new variety differs from the type described by OSORIO-TAFALL (1942) by the presence of spines on the lorica. We observed two types of spines scattered on the envelope : conical spines (1.75-2 µm long) along the neck ; and rod-shaped spines (0.8-1 × 0.5 µm) disposed on the body and the tail. In some specimens a few conical spines were present among the rod-shaped ones.

COUTÉ and ILTIS (1981) described *T. amphoriformis* var. *granulosa* whose lorica is ornamented by very depressed conical grains.

T. angustispina var. *unicoronata* n. var. Pl. II, fig. 39

A typo spinarum corona dumtaxat in posteriore extremo differt. Lorica 32-33 µm *long.*, 31-32 µm *lat.* In Camaleão *lacu,* Manaus, Brasil. VII-VIII/88. *Holotypus tab. II, fig.* 39.

Lorica 32-33 µm long, 31-32 µm broad. This variety is only ornamented with a crown of conical spines at the posterior end of the envelope.

T. armata (Ehr.) Stein Pl. III, fig. 1 ; Pl. VI, fig. 3-6

Lorica 38-45 µm long, 30-34.5 µm broad, ellipsoid or slightly ovoid with rounded ends, anterior end frequently narrower than the posterior one. Pore surrounded by a crown of 8-12 conical spines (2.5-4 µm long). Membrane yellowish to deep-brown with closely distributed punctuations (210-230/100 µm²) and scattered conical spines (6-10/100 µm²) of variable length (4.5-8 µm). Posterior end ornamented with a crown of well developed spines (5-17 µm), which are curved and more or less convergent. Cosmopolitan.

T. caudata (Ehr.) Stein Pl. IV, figs. 16 a,b; Pl. VII, figs. 9-13

Lorica 37-51 µm long, 17-23 µm broad, elongate-ellipsoid, pore surrounded by a cylindrical or subcylindrical collar (5.5-7.5 × 4.5-6.5 µm) which is widened, straight or oblique. with or without spines at the distal end. Posterior end gradually tapering to a conical cauda (3.5-4.5 × 4-5 µm). Membrane reddish-brown to deep brown, punctuated (70-100 / 100 µm²), with scattered (12-15 /100 µm²) rod-like obtuse spines (1.5-2 × 0.8-1 µm), among these some conical spines similar to those on the neck are present. Cosmopolitan.

T. curta var. *punctata* fo. *minor* n. fo. Pl. II, fig. 10a,b

A typo minoribus dimensionibus differt. Lorica 8-8.5 µm *long.*, 10-11 µm *lat. In* Camaleão *lacu,* Manaus, Brasil. IX/87. *Holotypus tab.* II, *fig.* 10.

This forma presented the same characteristics as the variety type, the only difference being the smaller dimensions of the lorica, 8-8.5 µm long, 10-11 µm broad.

T. charkoviensis Swir. var. *spinicollis* n. var. Pl. III, fig. 22

A typo conicis spinis, ornantibus colliapicem differt. Lorica 44-46 µm *long.*, 27-30 µm *lat. In* Camaleão *lacu,* Manaus, Brasil. I-III/88, IV/88. *Holotypus tab.* III, *fig.* 22.

Lorica 44-46 µm long, 27-30 µm broad. This variety presented the same characteristics as the type, the only difference being the collar (4.5-5 × 5-5.5 µm), which is ornamented by conical spines at the tip.

TELL and ZALOCAR DE DOMITROVIC (1985) recorded from Chaco (Argentina) specimens very similar to this new variety, yet the spines appear shorter than the ones observed in our organisms. We disagree with their identification of these specimens as *T. sydneyensis* var. *oblonga* because the long cylindrical collar is not characteristic of this taxon.

T. granulata Swir. emend. Defl. Pl. IV, fig. 8 a, b; Pl. VII, fig. 6, 7

The cells observed in our materials are smaller than the specimens described by DEFLANDRE (1926), 18.5-21 µm long, 12.5-15.5 µm broad. Lorica ellipsoid. Pore surrounded by an annular ring and sometimes by different types of envelope projections.

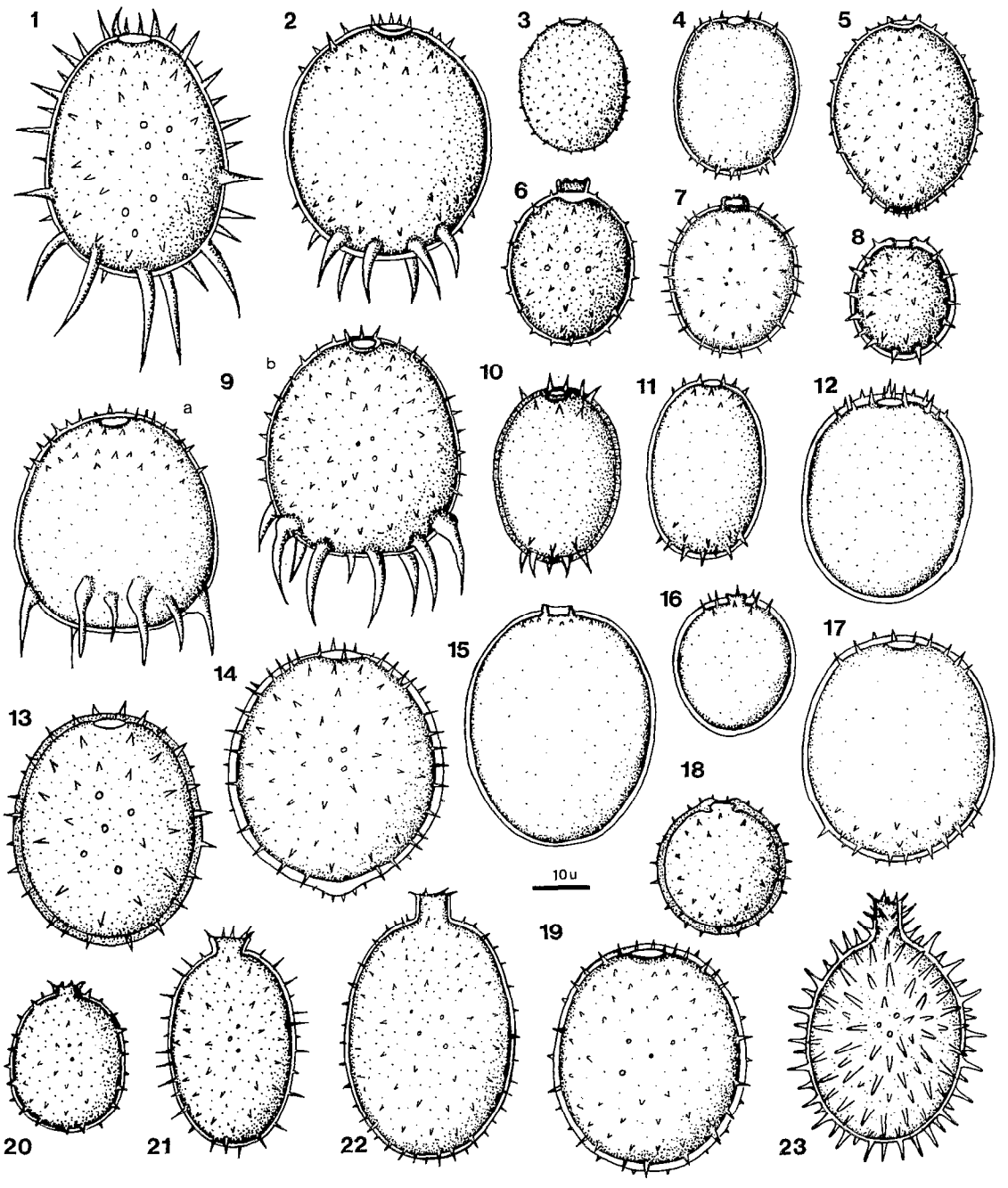

PLATE III

FIG. 1. — *T. armata*, 2. *T. armata* var. *steinii*, 3. *T. hispida*, 4. *T. hispida* var. *duplex*, 5. *T. hispida* var. *acuminata*, 6. *T. hispida* var. *crenulatocollis* fo. *patula*, 7. *T. hispida* var. *crenulatocollis*, 8. *T. robusta*, 9 a, b. *T. pyramidata*, 10. *T. raciborskii*, 11. *T. raciborskii* var. *incerta*, 12. *T. raciborskii* var. *nova*, 13. *T. superba*, 14. *T. kelloggii* var. *effigurata* fo. *acuminata*, 15. *T. superba* var. *inevoluta*, 16. *T. raciborskii* var. *nova* fo. *minor*, 17. *T. kelloggii*, 18. *T. kelloggii* var. *nana*, 19. *T. kelloggii* var. *effigurata*, 20. *T. sydneyensis* var. *minima*, 21. *T. sydneyensis*, 22. *T. charkoviensis* var. *spinicollis*, 23. *T. horrida* var. *spinicollis*.

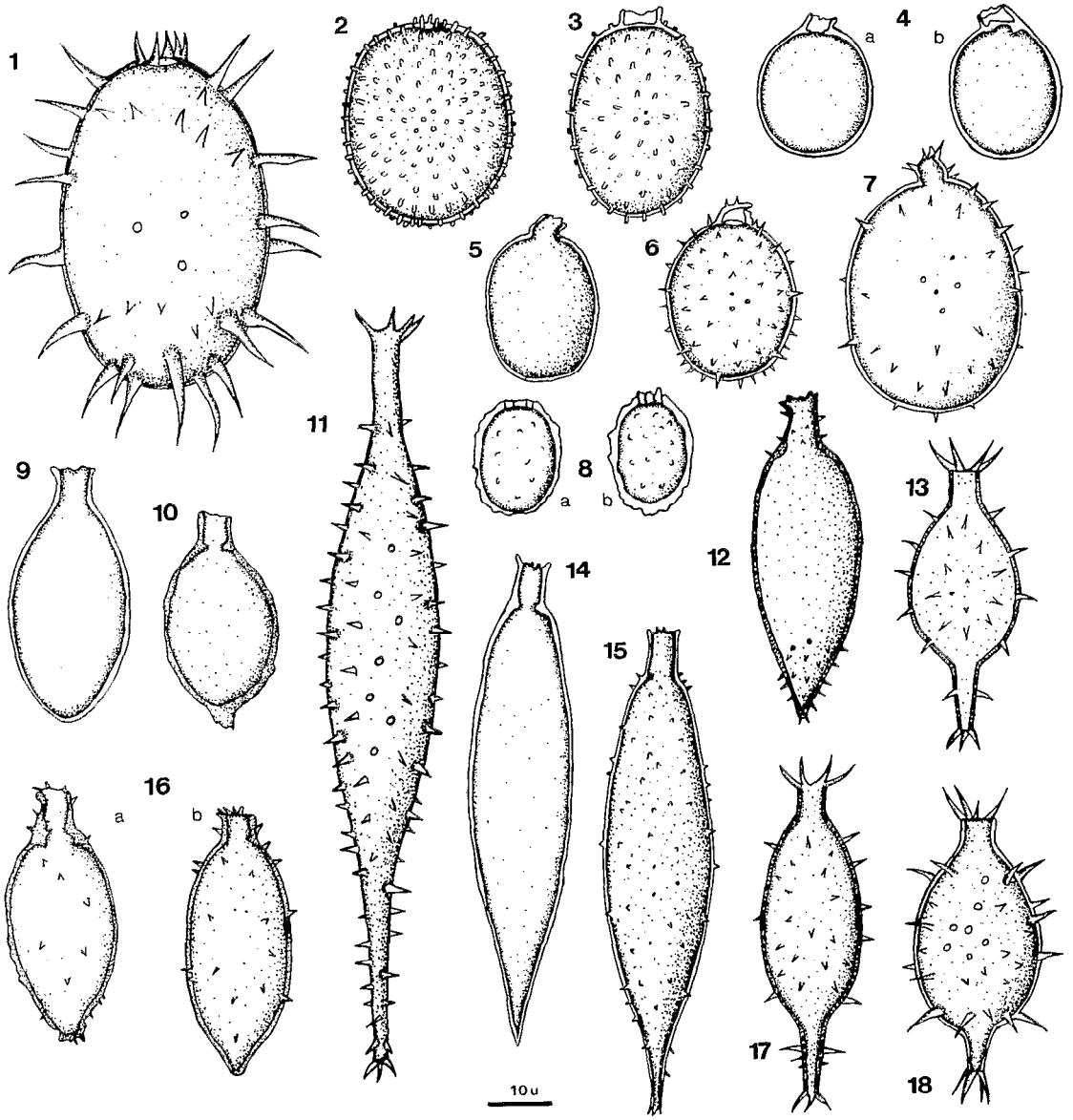

PLATE IV

FIG. 1. — *T. megalacantha* var. *crenulatocollis*, 2. *T. bacillifera* var. *minima*, 3. *T. bacillifera* var. *collifera*, 4 a, b. *T. similis*, 5. *T. planctonica* var. *flexicollis*, 6. *T. similis* var. *spinosa*, 7. *T. similis* var. *spinosa* fo. *obesa*, 8 a, b. *T. granulata*, 9. *T. gracilis*, 10. *T. bernardinensis*, 11. *T. magdaleniana*, 12. *T. allorgei* var. *sparsispina*, 13. *T. acanthophora*, 14. *T. amphoriformis*, 15. *T. amphoriformis* var. *spinosa*, 16 a, b. *T. caudata*, 17. *T. dastuguei*, 18. *T. acanthophora* var. *speciosa*.

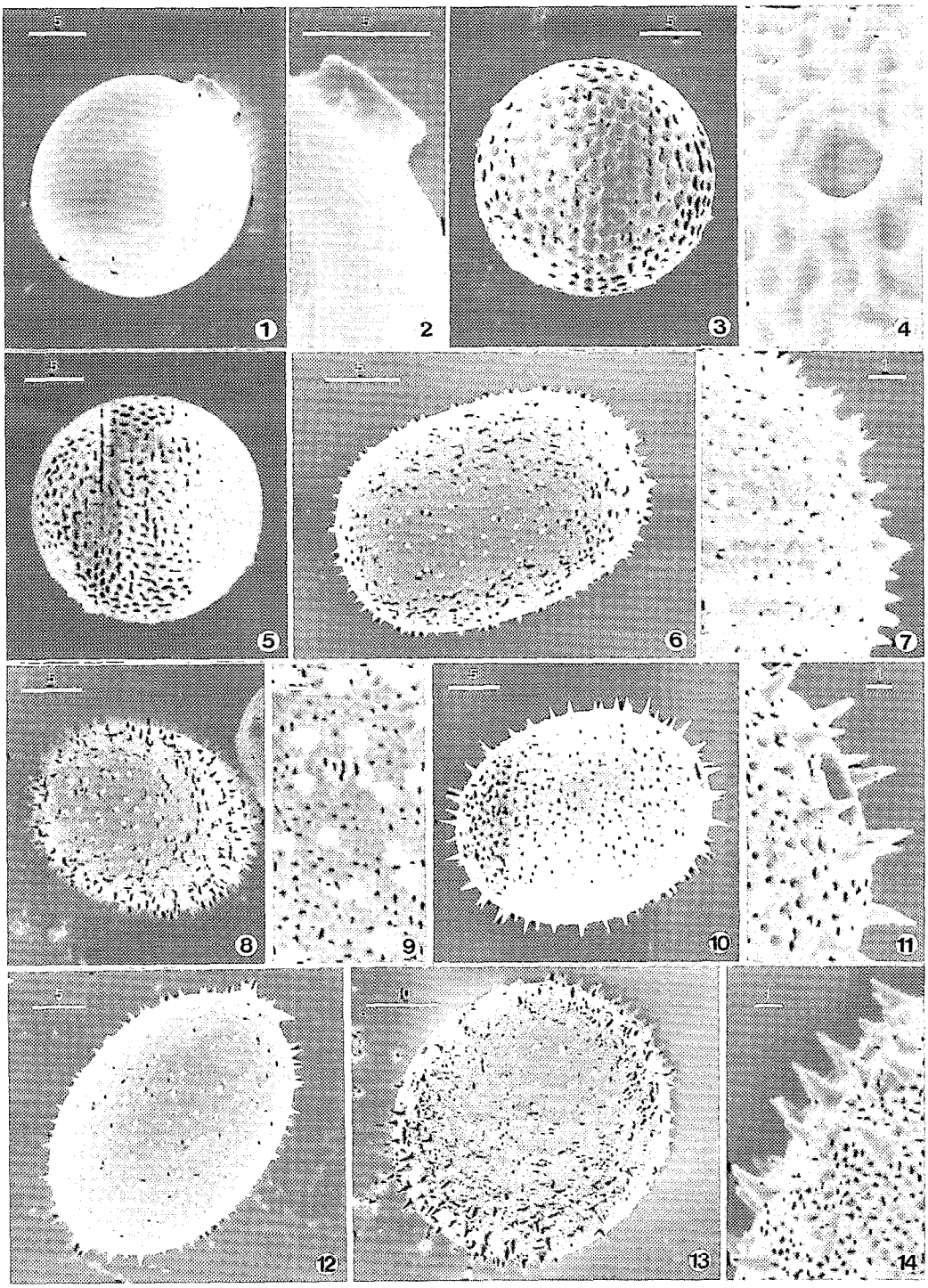

PLATE V

FIG. 1, 2. — *T. volvocina* var. *derephora*, general view and detail of the collar ; 3, 4. *T. sculpta*, general view and detail of the pore and the lorica surface ; 5. *T. nexilis* ; 6, 7. *T. allia*, general view and detail of the lorica surface ; 8, 9. *T. hispida*, general view and detail of the lorica surface ; 10, 11. *T. robusta*, general view and detail of the pore and the lorica surface ; 12. *T. sydneyensis* ; 13, 14. *T. pulchra*, general view and detail of the lorica surface.

T. volvocina *var.* derephora, *vue générale et détail du col ; 3, 4.* T. sculpta, *vue générale et détail du col et de la thèque ; 5.* T. nexilis*; 6, 7.* T. allia, *vue générale et détail de la thèque ; 8, 9.* T. hispida, *vue générale et détail de la thèque ; 10, 11.* T. robusta, *vue générale et détail du col et de la thèque ; 12.* T. sydneyensis*; 13, 14.* T. pulchra, *vue générale et détail de la thèque.*

Membrane deep-brown, more or less regularly punctuate (52-60 / 100 μm²), surface with conical obtuse spines irregularly scattered (16-20 / 100 μm²) and irregular tubercles, which confer the contour of the lorica an undulate appearance. Cosmopolitan.

T. hirta var. *duplex* Defl. Pl. II, fig. 43; Pl. VI, fig. 1, 2

Lorica 25-26.5 μm, 20-21 μm broad, broadly ellipsoid, with rounded ends. Pore with or without a depressed collar. Membrane reddish-brown to deep brown, notoriously punctuate (115-125/100 μm²), ornamented with obtuse conical spines (2.5-3 × 0.7-0.8 μm) distributed mainly around the ends, some also scattered on the middle surface. Madagascar, Poland. Recorded in America for the first time.

T. hirta var. *obesa* n. var. Pl. II, fig. 42

A typo subsphaerica lorica maioribus dimensionibus differt. Lorica 24-28 μm *long*, 22-26 μm *lat. In* Camaleão *lacu*, Manaus, Brasil. IV/88, IV/90. *Holotypus tab.* II, *fig.* 42.

These specimens were considered as a variety of *T. hirta* var. *hirta* because they presented the same peculiar type of spines (CONFORTI and TELL, 1989). They differ from the type in the subspherical form and in the bigger dimensions of the lorica, 24-28 μm long, 22-26 μm broad.

T. hispida (Perty) Stein emend. Defl. Pl. III, fig. 3; Pl. V, fig. 8, 9

Lorica 20-23 μm long, 13-18.5 μm broad, ellipsoid, finely punctuate (175-200 / 100 μm²), with short conical pointed spines (1-1.5 × 0.7-0.8 μm), irregularly distributed (20-25/100 μm²). Pore with or without annular thickening, normally surrounded by spines of similar length to those on the rest of the lorica. Membrane reddish to deep-brown. Cosmopolitan.

T. horrida var. *spinicollis* n. var. Pl. III, fig. 23; Pl. VI, figs. 10, 11

A typo conicis spinis ornantibus collum differt. Lorica 38-40 μm *long.*, 24-25 μm *lat. In* Camaleão *lacu*, Manaus, Brasil. I-III/88. *Holotypus tab.* III, *fig.* 23.

This variety differs from the typical species in the spines on the collar. Lorica ellipsoid, without spines, 38-40 μm long, 24-25 μm broad. Membrane reddish-brown, punctuate, with robust long conical spines (2.5-3 × 0.9-1 μm) irregularly distributed (35-40 / 100 μm²). Pore surrounded by a cylindrical neck (4.5-5 × 4 μm) ornamented with spines whose length is equal to that of the ones on the body of the envelope, divergent distally.

T. kelloggii var. *effigurata* fo. *acuminata* n. fo. Pl. III, fig. 14

A typo polo posteriore sensim acuminata differt. Lorica 40-42 μm *long.*, 33-35 μm *lat. In* Camaleão *lacu*, Manaus, Brasil. IV/90. *Holotypus tab.* III, *fig.* 14.

This new forma presented the same characteristics as the type, the difference being the lorica with a posterior acuminate end.

T. magdaleniana Defl. Pl. IV, fig. 11; Pl. VIII, figs. 6-9

Lorica spindle-shaped with regularly arched sides; anterior end narrowed into a long broad neck (11-12 × 4-4.5 μm), with five spines only at the tip; posterior end narrowed into a long tail (20-21 × 4-4.5 μm) stumpy and with 3-4 spines at the end. Membrane reddish to deep-brown, punctuate and ornamented with conical spines (2-4 μm long) irregularly distributed along the body and the tail. These specimens are longer than those described by Deflandre (1926), 82-111 μm long, 16-18.5 μm broad, neck 12-13 μm × 3.5-4 μm, tail 26-27 μm. This species was recorded only in tropical and south- tropical regions of South America : Argentina, Bolivia, Venezuela.

T. nexilis Palmer Pl. II, fig. 22; Pl. V, fig. 5

Lorica 19-20 μm diam., pore 2 μm diam., surrounded by an annular thickening. Membrane reddish-brown ornamented with depressions of different shapes, predominantly vermicular. The crests, which divide one depression from the other, are 0.5-0.6 μm in width. Argentina, USA, Portugal, Spain.

T. pulchra Swir. Pl. II, fig. 37; Pl. V, fig. 13, 14

Lorica 38-40.5 μm long, 37-38 μm broad, spherical. Pore surrounded by conical spines. Membrane deep brown, closely punctuated (350-370 / 100 μm²) and ornamented with short conical spines, distributed mainly around the ends (32-40 / 100 μm²). In a few specimens we could also observe some spines scattered on the middle surface. Asia, Europe. In America : Brazil and Venezuela.

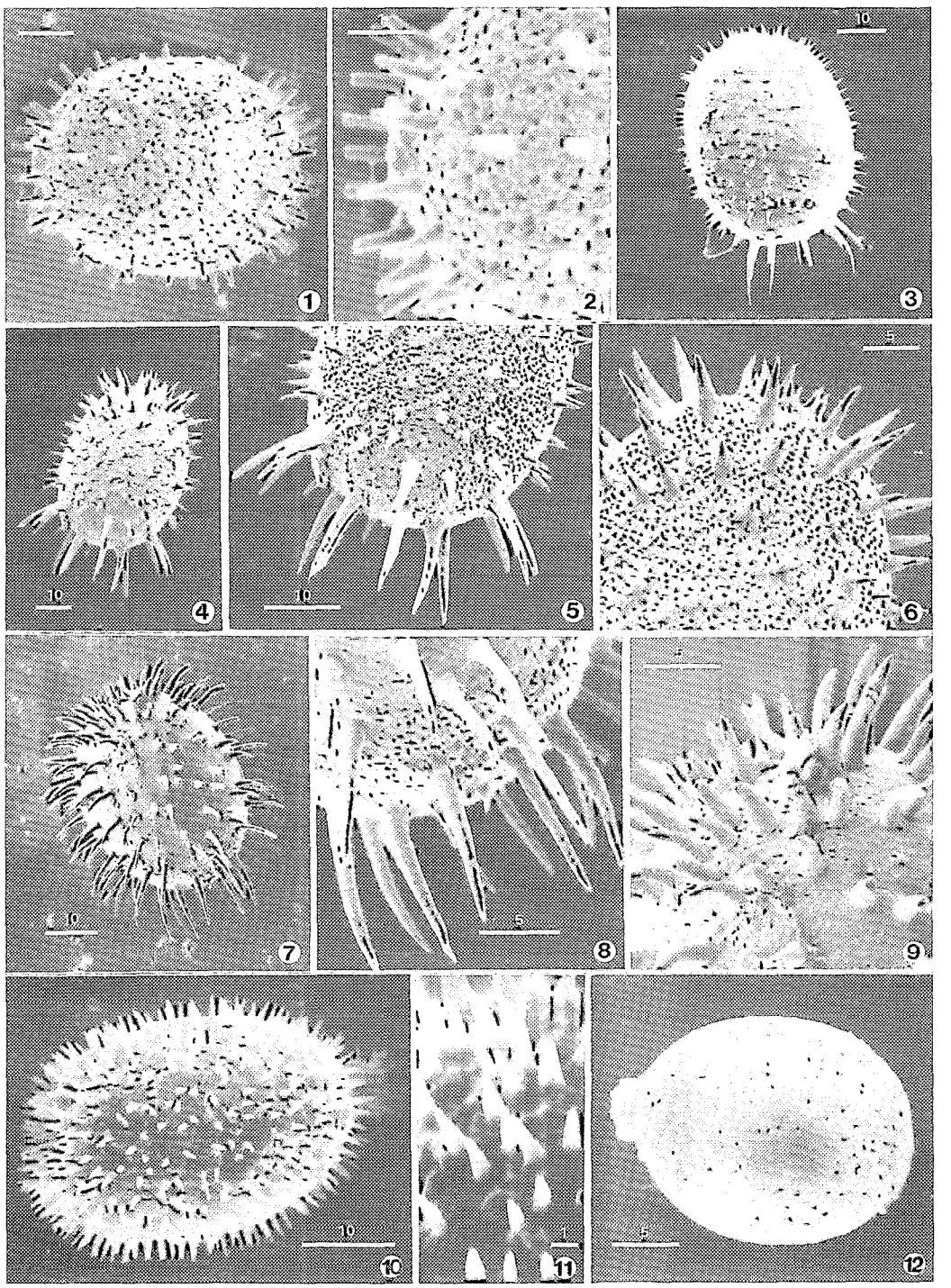

PLATE VI

FIG. 1, 2. — *T. hirta* var. *duplex*, general view and detail of the pore and the lorica surface; 3-6. *T. armata*, 3, 4. general view, 5. detail of the posterior end, 6. detail of the anterior end; 7-9. *T. spinosa* var. *hirsuta*, 7. general view, 8. detail of the posterior end, 9. detail of the anterior end; 10, 11. *T. horrida* var. *spinicollis*, general view and detail of the lorica surface; 12. *T. similis*.
T. hirta *var.* duplex, *vue générale et détail du col et de la thèque; 3-6.* T. armata, *3, 4. vue générale, 5. détail de l'extrémité postérieure, 6. détail de l'extrémité antérieure, 7-9.* T. spinosa *var.* hirsuta, *7. vue générale, 8. détail de l'extrémité postérieure, 9. détail de l'extrémité antérieure, 10, 11.* T. horrida *var.* spinicollis, *vue générale et détail de la thèque; 12.* T. similis.

T. pyramidata Couté and Théréz. Pl. III, fig. 9 a,b; Pl. VIII, fig. 3-5

Lorica without spines 36-37 µm long, 32-33 µm broad, trunk conic. Membrane deep-brown, finely punctuate, ornamented with short conical spines at the anterior end (2-3 µm long), and with a crown of very long spines at the posterior end (12-15 µm).

This species was only found in tropical and south-tropical regions of South-America : Argentina, Brazil, Bolivia and Venezuela.

Couté and Tell (1990) included as synonyms of this species *T. pyramidata* var. *ornata* Couté and Thérezién (1985), *T. armata* var. *liloralensis* Tell and Zalocar de Demitrovic (1985) and *T. armata* var. *trapeziformis* Yacubson (1984/85).

T. raciborskii Wolosz. Pl. III, fig. 10; Pl. VIII, fig. 1-2

Lorica 23-29 µm long, b. 21-23 µm broad, ellipsoid. Pore without collar (2.5-3 µm diam.), surrounded by a ring-like thickening. Membrane yellowish or reddish-brown, strongly and regularly punctuate (120-130/100 µm²) ornamented with conical short spines (1.5-2 µm) distributed mainly around the ends, some also scattered on the middle surface. Cosmopolitan.

T. robusta Swir. emend. Defl. Pl. III, fig. 8; Pl. V, fig. 10, 11

Lorica 20-30 µm long, 17-27 µm broad, ellipsoid strongly and irregularly punctuate (100-120/100 µm²), with robust scattered (12-16 × 100 µm²) conical spines (2-3 µm long). Pore without collar, normally surrounded by some spines whose length is equal to or greater than that of the ones on the body of the lorica, divergent or not. Membrane deep or reddish-brown. Cosmopolitan.

T. sculpta Balech Pl. II, fig. 21; Pl. V, fig. 3, 4

Lorica 20-21 µm diam., spherical. Pore (2-2.5 µm) surrounded by an annular thickening. Membrane reddish-brown ornamented with polygonal depressions, closely distributed. The crests, which divide one depression from the other, are 0.4-0.5 µm in width. Argentina.

Popova (1966) reported that this species could be synonym of *T. alisoviana* Skv. We disagree with this author because this taxon is ellipsoid (23-24 × 20-21 µm), with a clear brown membrane, ornamented with depressions smaller and distributed less closely one to the other than those found in *T. sculpta*.

T. selecta var. *megaspina* n. var. Pl. II, fig. 45

A typo maioribus dimensionibus spinarum (2-4 µm *long.) differt. Lorica* 24-25 µm *long.*, 19-20 µm *lat. In* Camaleão *lacu,* Manaus, Brasil, VII-VIII/88. *Holotypus tab.* II, *fig.* 45.

Lorica 24-25 µm long, 19-20 µm broad. This variety is ornamented by spines longer than the type (2-4 µm long).

T. similis Stokes Pl. IV, fig. 4 a,b; Pl. VI, fig. 12; Pl. VII, fig.1-3

Lorica 24-26 µm long, 16-17 µm broad, ellipsoid. Pore with a collar (1.2-2.5 µm long), which is always bent and irregularly dentate at the tip (2-4.5 µm diam.). Membrane yellowish to reddish-brown, (37-45 / 100 µm²) with scattered punctuations. Cosmopolitan.

var. *spinosa* Hub.-Pest. Pl. IV, fig. 6; Pl. VII, figs. 4, 5

Lorica 26-32 µm long, 20-25 µm broad; ellipsoid with both poles evenly rounded or the posterior end acuminate. Pore with a collar (3.5-4.5 × 5-5.5 µm) oblique or sometimes curved, with spines (1.2-1.5) irregularly distributed at the free end. Membrane reddish-brown, more or less regularly punctuate (75-85 / 100 µm²) and with conical pointed spines (1-2 µm long) scattered distributed (12-15 / 100 µm²).

Africa, Europa. In America : Argentina, Venezuela.

fo. *obesa* n. fo. Pl. IV, fig. 7

A typo maioribus dimensionibus differt. Lorica 40-41 µm *long.*, 25-26 µm *lat. In* Camaleão *lacu,* Manaus, Brasil, IX/88. *Holotypus tab.* IV, *fig.* 7.

This new forma presented the same characteristics as the type, the only difference being the bigger dimensions of the lorica 40-41 µm long, 25-26 µm broad.

T. spinosa var. *hirsuta* Couté and Thér. Pl. VI, figs. 7-9

Lorica (excluding spines) 38-40 µm long, 30-31 µm broad, ellipsoidal. Pore surrounded by a crown of strong conical spines (2.5 µm long). Membrane deep-

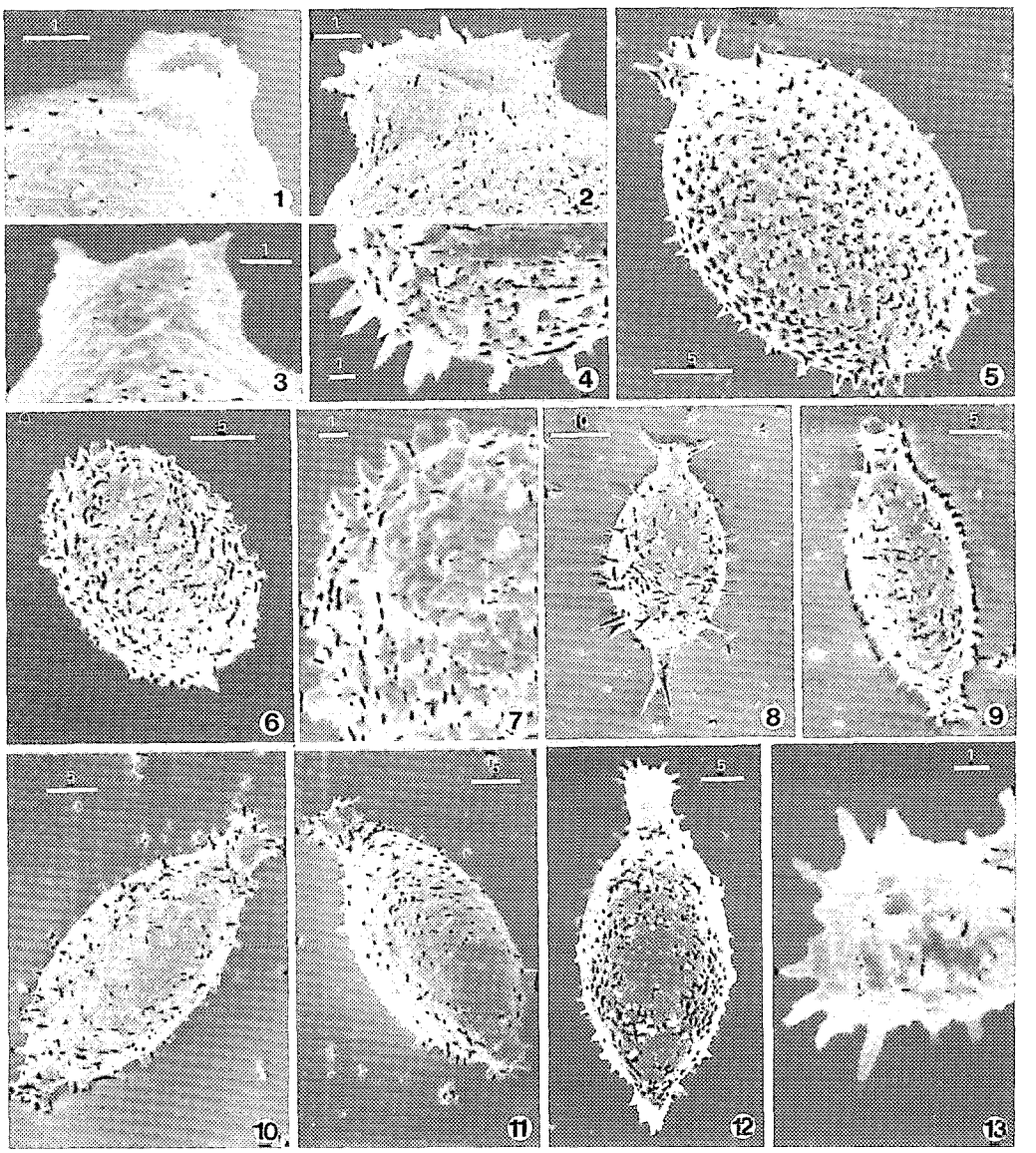

PLATE VII

FIG. 1-3. — *T. similis*, details of the collar; 4, 5. *T. similis* var. *spinosa*, posterior end showing detail of the lorica surface and general view; 6, 7. *T. granulata*, general view and detail of the lorica surface; 8. *T. acanthophora* var. *speciosa;* 9-13. *T. caudata*, 9-12. general view, 13. detail of the collar and lorica surface.

T. similis, *détail du col; 4, 5.* T. similis *var.* spinosa, *extrémité postérieure montrant le détail de la thèque et vue générale; 6, 7.* T. granulata, *vue générale et détail de la thèque ; 8.* T. acanthophora *var.* speciosa ; *9-13.* T. caudata, *9-12. vue générale, 13. détail du col et de la thèque.*

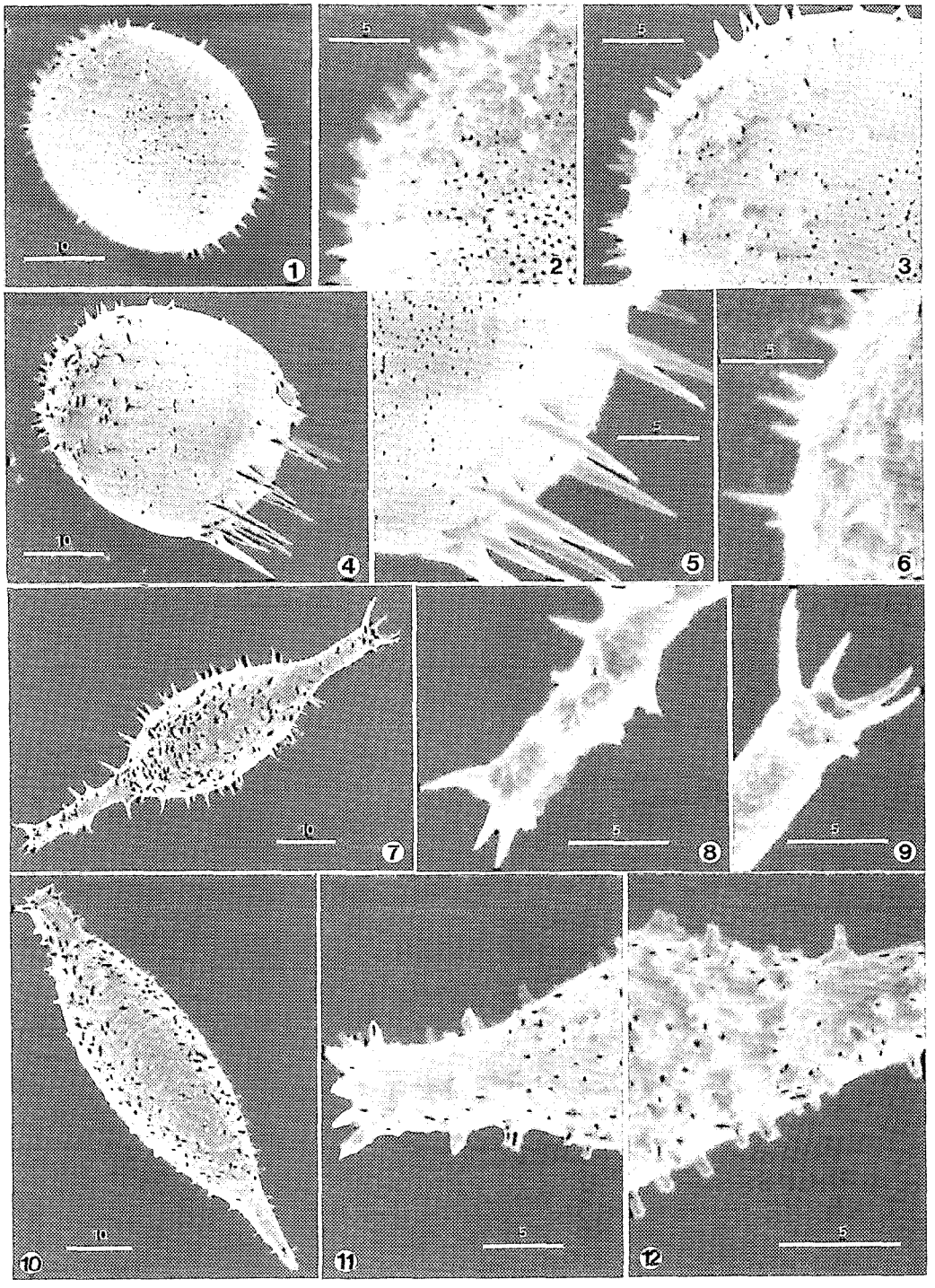

PLATE VIII

FIG. 1, 2. — *T. raciborskii*, general view and detail of the pore and lorica surface; 3-5. *T. pyramidata*, general view and details of the anterior and posterior end showing the lorica surface; 6-9, *T. magdaleniana*, 6. detail of the lorica surface, 7. general view, 8. detail of the tail, 9. detail of the distal end of the collar; 10-12. *T. amphoriformis* var. *spinosa*, 10. general view, 11. detail of the collar and lorica surface, 12. detail of the lorica surface.

T. raciborskii, *vue générale et détail du col et de la thèque; 3-5.* T. pyramidata, *vue générale et détail des extrémités antérieure et postérieure avec détail de la thèque; 6-9,* T. magdaleniana, *6. détail de la thèque, 7. vue générale, 8. détail du flagelle, 9. détail de l'extrémité du col; 10-12.* T. amphoriformis *var.* spinosa, *10. vue générale, 11. détail du col et de la thèque, 12. détail de la thèque.*

brown, finely punctuate and ornamented with robust conical spines regularly disposed (5-7 / 100 μm²), which increase its length towards the posterior end (5-12 × 1-2 μm).

This species was originally reported from the Bolivian Amazonian. This is the first record outside of this country.

T. sydneyensis Playf. Pl. III, fig. 21 ; Pl. V, fig. 12

Lorica 30-37 μm long, 21-25 μm broad ; ellipsoid with the posterior end sometimes slightly narrowed. Pore surrounded by a depressed collar (0.8-1 × 5.5-6 μm) with conical divergent spines at the free end. Membrane reddish to deep-brown, more or less regularly punctuate (95-100 / 100 μm²) and ornamented with scattered (18-25/100 μm²) conical spines (1-1.5 μm long). Widespread.

T. volvocina var. *derephora* Conr. Pl. II, fig. 2 ; Pl. V, fig. 1, 2

Lorica 14-24.5 μm diam., spherical ; pore surrounded by a depressed collar (1.5-2 × 4.5-5 μm). Membrane smooth, hyaline yellowish, clear to deep reddish-brown. Europe, Indonesia. In America : Argentina, Brazil and Venezuela.

fo. *punctata* n. fo. Pl. II, fig. 3

A typo membrana punctata differt. Lorica 15-20 *μm long.*, 16-21 *μm lat. In* Camaleão *lacu*, Manaus, Brasil. IX/87. *Holotypus tab.* II, *fig.* 3.

This forma differs from the typical variety in the membrane finely punctuated.

CONCLUSIONS

Among the 90 taxa of *Trachelomonas* found in the Camaleão lake, 13 were considered as new taxa : *T. abrupta* var. *obesa* fo. *minor* n. fo., *T. amazonensis* n. sp., *T. allorgei* var. *sparsispina* n. var., *T. amphoriformis* var. *spinosa* n. var., *T. angustispina* var. *unicoronata* n. var., *T. curta* var. *punctata* fo. *minor* n. fo., *T. charkoviensis* var. *spinicollis* n. var., *T. hirta* var. *obesa* n. var., *T. horrida* var. *spinicollis* n. var., *T. kelloggii* var. *effigurata* fo. *acuminata*, n. fo., *T. selecta* var. *megaspina* n. var, *T. similis* var. *spinosa* fo. *obesa* n. fo. and *T. volvocina* var. *derephora* fo. *punctata* n. fo.

Twelve taxa were only recorded for America : *T. acanthophora* var. *speciosa*, *T. curta* var. *minima*, *T. dastuguei*, *T. kelloggii* var. *nana*, *T. magdaleniana*, *T. parvicollis*, *T. pyramidata*, *T. rugulosa* fo. *parallela*, *T. sculpta*, *T. spinosa* var. *hirsuta*, *T. spirogyra* and *T. volvocina* var. *compressa* fo. *tubigera*.

Eight were only found in warm regions of Africa, Central and South America : *T. conica* fo. *punctata*, *T. kelloggii* var. *nana*, *T. magdaleniana*, *T. megalacantha* var. *crenulatocollis*, *T. parvicollis*, *T. pyramidata*, *T. spinosa* var. *hirsuta* and *T. volvocina* var. *compressa* fo. *tubigera*.

Five were recorded for the first time for America : *T. bacillifera* var. *collifera*, *T. curta* var. *punctata*, *T. gracilis*, *T. hirta* var. *duplex* and *T. janczewskii* var. *minor*.

Forty present a widespread or cosmopolitan distribution.

We have not found any *Trachelomonas* taxa in the sample N° 24, obtained in November 1987 when the water level of the lake was the lowest (0.35 m), presented high concentration of dissolved oxygen (10,2 μg/l) and dissolved solids (105 mg/l), high conductivity (762 μS/cm), low transparency (0.10 m) and pH slightly basic (7.6).

Samples N° 58, 45, 67 and 19 were the more diverse, presenting 42, 37, 36 and 31 taxa respectively.

AKNOWLEDGEMENTS

The author is indebted to authorities of Citefa, who put at her disposal the SEM facilities, and to Mr. Dante GIMENEZ for his assistance with scanning electron microscopy. She also whishes to extend her gratitude to Miss Maria RODRIGUES who provided the materials analyzed and to Dr. Demetrio Boltovskoy for his assistance in the English translation.

Manuscrit accepté par le Comité de rédaction le 15 mai 1993

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