

*Ultrastructure of the lorica
of Trachelomonas Ehr.
from the Colombian Amazonia*

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ABSTRACT

The ultrastructure of 37 taxa belonging to the genus Trachelomonas Ehr. (Euglenophyta) from the Colombian Amazonia have been studied by scanning electron microscopy. On the basis of these observations we propose one new species T. duquei and two new forms T. armata var. gordeievii fo. minor and T. armata var. nana fo. spinosa n. fo.

KEYWORDS : Ultrastructure — Taxonomy — *Trachelomonas* — Euglenophyta — Colombian Amazonia.

RESUMEN

ULTRAESTRUCTURA DE LA LORIGA DE *TRACHELOMONAS* EHR. DE LA AMAZONIA COLOMBIANA

En este trabajo se analiza la ultraestructura de 37 taxones pertenecientes al género Trachelomonas Ehr. (Euglenophyta) provenientes de la Amazonia Colombiana. Como resultados de nuestras observaciones decidimos describir una especie T. duquei y dos formas T. armata var. gordeievii fo. minor y T. armata var. nana fo. spinosa como nuevos taxones.

PALABRAS CLAVES : Ultraestructura — Taxonomía — *Trachelomonas* — Euglenophyta — Amazonia Colombiana.

RÉSUMÉ

ULTRASTRUCTURE DE LA LOGETTE DE *TRACHELOMONAS* EHR. DE L'AMAZONIE COLOMBIENNE

Dans le présent travail, 37 taxons appartenant au genre Trachelomonas Ehr. (Euglenophyta) provenant d'Amazonie Colombienne sont étudiés au microscope électronique à balayage. Nous proposons une nouvelle espèce : T. duquei et deux nouvelles formes : T. armata var. gordeievii fo. minor et T. armata var. nana fo. minor.

MOTS CLÉS : Ultrastructure — Taxonomie — *Trachelomonas* — Euglenophyta — Amazonie Colombienne.

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INTRODUCTION

The water bodies of the Amazonian floodplain offer excellent conditions to the development of Euglenophyta. This is mainly due to the great content of organic matter that strongly favours growth of these flagellates, both in diversity and number. In spite of a high species richness, the studies in Amazonian algae are precarious; many investigations have been carried out in the Brazilian sector (THOMASSON, 1971; UHERKOVICH, 1976 and 1981; UHERKOVICH and FRANKEN, 1980; UHERKOVICH and RAI, 1979; UHERKOVICH and SCHMIDT, 1974), the most exhaustive being those from Camaleão lake near Manaus (CONFORTI, 1993 and 1994; RODRIGUES, 1992). Recently, COUTÉ and THÉRÉZIEN (1985, 1994) studied the ultrastructure of numerous Euglenophyta from the Bolivian Amazonia. DUQUE (1995) described Euglenophyta from the Colombian region, observed with optical microscope. In this paper we analyse the ultrastructure of 37 taxa belonging to the genus *Trachelomonas* Ehr. (Euglenophyta) from the floodplain lakes and river of the Colombian Amazonas, between Cotuhe River and the Amazonas.

As a result of our observations, we propose one new species *T. duquei*, and two new forma *T. armata* var. *gordeievii* fo. *minor* and *T. armata* var. *nana* fo. *spinosa*.

MATERIALS AND METHODS

The materials analysed in this work were provided by Prof. Santiago Duque, Instituto de Ciencias Naturales (Estación Científica de Leticia) Universidad de Colombia.

The samples were collected from several water bodies of the Trapecio Amazónico Colombiano during the period 1991-93, and were identified by a code number:

- 0042 — Lago Buutaá, Río Cotuhé, 26/6/91
- 0066 — Cano Pacatua, Río Amazonas, 3/12/91
- 0104 — Lago Tarapoto, Río Amazonas, 23/4/92
- 0110 — Lago Pozo Hondo, Río Amazonas, 29/4/92
- 0117 — Lago Tarapoto, Río Amazonas, 21/5/92

The qualitative samples of phytoplankton were taken superficially, sieved through a 40 μm mesh net, and fixed with a Transeau solution, 1:1 dilution. Identifications were carried out by means of a Leitz binocular microscope. For SEM observations the 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 aluminium foil, to be subsequently coated with

gold palladium. Specimens were examined and photographed by means of a SEM (Philips 505) at the Electron Microscopy Service of CITEFA, Argentina.

Samples were deposited at Ficoteca Amazónica of Estación Científica de Leticia, in the Colombian National Herbarium (COL) and in the collection of the Limnology Laboratory of the Department of Biological Sciences, University of Buenos Aires.

TAXONOMICAL DESCRIPTIONS

FAMILY EUGLENACEAE

Trachelomonas Defl.

T. abrupta var. *obesa* (Playf.) Defl (pl. I, fig. 5)

Lorica 29-31 μm long, 25-27 μm broad, ellipsoid-cylindrical with slightly arched, sometimes parallel sides, poles broadly rounded. Pore without collar. Membrane yellowish to brownish, strongly punctuate (80-100/100 μm^2) scabrous, ornamented with granulations or protuberances. Europe, Australia. In America: Argentina.

Occurrence: 0104.

T. armata var. *armata* fo. *inevoluta* Defl. (pl. IV, fig. 9)

The organisms observed from Colombian Amazonia were smaller, 27-30 μm long, 24-27 μm diam., than those described by TELL and CONFORTI (1986), 38 \times 31 μm . Lorica widely cylindrical or quadrangular with broad poles and more or less parallel sides. Membrane fine and sparsely punctuate. It can be observed a group of areolae (1-2 μm diam.), resembling the bases of spines, around the posterior end. Pore with an annular thickening. Europe. In America: Argentina.

It is necessary to clarify that the areolae do not resemble broken spines, we observed this character many times and the cut is never so "clean" nor in all spines. In addition, we found many specimens in these conditions.

Occurrence: 0042.

var. *gordeievii* Skv. (pl. IV, figs. 1, 2)

Lorica 37-40 μm long, 28-31 μm diam., broadly ellipsoidal or ovoid with anterior end narrower than the posterior one. Membrane yellowish to brownish, apparently smooth, ornamented with conical spines (1-1.5 μm long) at the anterior end and a crown of very long spines at the posterior one (15-18 μm long). Pore surrounded by 10-12 conical spines (1.5-2.5 μm

long). This variety has been originally described with S.E.M. by COUTÉ and THÉRÉZIEN (1985). Manchuria. In America: Bolivia.

Occurrence: 0042.

var. gordeievii fo. minor n. fo. (pl. III, figs. 10-12)

A varietate minoribus dimensionibus differt. Lorica 31-34 µm long., 29-31 µm lat. In Buutaá lacu, Colombia. 26/VI/91. Holotypus tab. III, fig. 10.

This forma presents the same characteristics as the variety, the only difference being the minor dimensions of the lorica, 31-34 µm long, 29-31 µm broad.

Occurrence: 0042.

var. longispina Playf. em. Defl. (pl. IV, figs. 3, 4)

Lorica 39-41 µm long, 29-31 µm broad, ellipsoid. Membrane yellowish sometimes colourless, finely punctuate (120-150/100 µm²) and with conical spines (1.8-2 × 0.3-0.5 µm) regularly distributed (6-10/100 µm²). Posterior end ornamented with a crown of very long curved spines (12-14 × 2-3 µm). This variety was already described with S.E.M. by COUTÉ and ILTIS (1981) and COUTÉ and THÉRÉZIEN (1985). Widespread.

Occurrence: 0110.

var. nana Balech fo. spinosa n. fo. (pl. IV, fig. 8)

A varietate spinis conicis praesentibus circum flagellarem porum et in lorica pariete differt. Lorica 29-32 µm long., 25-27 µm lat. In Pozo Hondo lacu. 29/IV/92. Holotypus tab. IV, fig. 8.

Lorica 29-32 µm long, 25-27 µm broad, ellipsoid or slightly ovoid with rounded ends, anterior end narrower than the posterior one. Pore surrounded by a crown of 8-12 short conical spines (1-1.5 µm long). Membrane yellowish to deep brown, with closely distributed punctuations and very scattered (13-15/100 µm²) short conical spines (0.8-1 µm long). Posterior end ornamented with a crown of well developed (10-12 µm long), curved, more or less convergent conical spines.

Balech in his description of var. *nana*, reported "... ovoid with flattened poles, specially the posterior one ..." and this fact is shown in his photo 184, although in the fig. 65, the anterior pole is very much narrower than the posterior one. This forma presents the characteristics of the type variety, the only difference being the short conical spines that ornamented the pore and the body of the lorica.

Balech's variety shows only a posterior crown of long spines.

Occurrence: 0110.

***T. armata* var. *setosa* Drez. (pl. IV, fig. 7)**

Lorica 35-38 µm long, 27-29 µm broad, ellipsoid. Membrane finely punctuate (120-150/100 µm²) with scattered (10-20/100 µm²) conical spines (0.3-0.5 µm long). Posterior end ornamented with a crown of long spines (6-8 µm), straight or slightly divergent. Pore without collar surrounded by short spines at the distal end. Europe, Asia. Recorded in America for the first time.

This variety could be considered *T. superba* var. *swirenkiana*, but in this taxon the spines are not regularly distributed on the body surface, as in the specimen shown. Moreover, the length/breath ratio in our specimens is closer to that in *T. armata* var. *setosa* than in *T. superba* var. *swirenkiana*.

Occurrence: 0042.

var. steinii Lemm. em. Defl. (pl. IV, figs. 5, 6)

Lorica 34-37 µm long, 29-32 µm broad, ellipsoid with both ends rounded. Membrane finely (100-150/100 µm²) punctuate. Anterior end ornamented with conical spines of variable length (0.5-1.5 µm long) and very long curved spines (8-12 µm long) at the posterior one. Pore surrounded by an annular thickening, ornamented with a crown of spines (1-2 µm long). This variety has been described with S.E.M. by COUTÉ and ILTIS (1981) and CONFORTI and TELL (1986). Widespread. In America: Argentina, Brazil.

Occurrence: 0110.

***T. australica* var. *granulata* (Playf.) Defl. (pl. I, figs. 7-9)**

Lorica 22-24 µm long, 17-21 µm broad, ellipsoid. Membrane finely punctuate (80-100/100 µm²), ornamented with short conical spines densely (30-50/100 µm²) distributed, sometimes the ornamentation includes granules or papillae loosely arranged. Pore surrounded by a double annular thickening dentate at the distal end. Widespread. In America: Bolivia.

Occurrence: 0110.

***T. bernardinensis* Vischer em. Defl. (pl. V, figs. 5, 6)**

Lorica 35-37 µm long, 18-20 µm broad, elongate-ellipsoid with the sides usually regularly arched, but sometimes slightly attenuated towards the anterior

end. Membrane deep brown sparsely punctuate with numerous adhered particles on its surface. Pore surrounded by a wide conical collar (3-4 × 5.5 μm) with spines or crenulate at the tip. Posterior end gradually tapering to a conical cauda. Europe, India. In America: Argentina.

Deflandre (1926) described this taxon as showing a strongly scrobiculated membrane. Within the material examined, we found a pool of specimens, with a punctuated membrane that presented variable quantities of agglutinated particles. Perhaps, this material could appear as scrobiculations in light microscope.

Occurrence: 0104.

***T. caudata* (Ehr.) Stein fo. (pl. V, fig. 7)**

The lorica observed in plate V, fig. 7 differs from the typical species in its elongate ellipsoidal contour, 46-48 μm long, 15-17 μm broad. Pore surrounded by a straight cylindrical collar (5-5.5 × 6-6.5 μm), ornamented with short spines. Posterior end gradually tapering to a conical cauda (6-6.5 × 5-5.5 μm). Membrane yellowish to reddish-brown, punctuate (75-80/100 μm²) with scattered (15-20/100 μm²) spines similar to those observed along the neck and the cauda.

Occurrence: 0066, 0117.

***T. dastuguei* Balech (pl. VI, figs. 1-4)**

Lorica 54-59 μm long, 16-20 μm broad, spindle-shaped, sides regularly arched. Anterior end narrowed into a cylindrical neck (8-9 × 5-6 μm). Posterior end gradually tapering towards a subconical tail (12-13 × 5-6 μm). Membrane yellowish to deep brown, punctuated and ornamented with conical spines arranged in definite areas. Around the distal end of the neck there is a crown of 5-6 robust spines (4-5 × 1.5-2 μm). The body presents conical spines of variable length: the longer ones are located on the ends and the smaller (1.5-2 × 0.5-1 μm) spines are distributed scattered (7-10/100 μm²) on the central part of the body. The tail is like a truncated cone with 4 robust spines (4-5 × 1-1.5 μm) on the free end. This species was only recorded in materials from South America: Argentina, Brazil.

From comparison with other descriptions of this species in S.E.M., we can conclude that the number of punctuations seems to be very variable: from 60-70/100 μm² (TELL and COUTÉ, 1980) or 80-85/100 μm² (CONFORTI and TELL, 1986), to very scattered, as we observed in our materials (20-40/100 μm²).

Occurrence: 0104.

***T. duquei* n. sp. (pl. III, figs. 1, 2)**

Lorica late ovoidea, 36-37 μm long., 31-33 μm lat.; anterior posteriorque poli obtuse rotundati usque complanati. Membrana fuscus fortitor puncteata et ornata spinis conicis irregularim distribuntis. Punctula tam magna ut forsan sint conjunctionis consequentiam. In Tarapoto lacu, Colombia. 21/V/92. Holotypus tab. III, fig. 1.

Lorica 36-37 μm long, 31-33 μm wide, broadly ovate with regularly arched sides. Anterior and posterior ends obtusely rounded to flattened. Membrane brown, strongly punctuated (82-90/100 μm²) and ornamented with conical spines (1.5-2.5 μm long), irregularly distributed (11-15/100 μm²). The punctuations are so large (0.4-2 μm diam.) and variable in shape, that this feature suggests that some of them might be the result of fusions.

This newly established species resembles *T. allia* var. *obesa* Balech (30-32 × 23-25 μm), but it differs mainly in its larger dimensions, the anterior and posterior end flattened, the clearly arched sides and the strongly punctuated membrane. The shape of our specimens does not resemble *T. bacillifera* Playf.: sides are more curved in the latter and the length/breadth ratio is also different.

Occurrence: 0117.

***T. dybowskii* Drez. (pl. I, fig. 4)**

Lorica 24-26 μm long, 21-23 μm wide, broadly ellipsoidal with slightly arched or parallel sides, uniformly rounded poles. Membrane smooth, yellowish-brown. Pore without collar, sometimes surrounded by an annular thickening. Widespread. In America: Argentina.

The organisms from Colombian Amazonia were bigger than those described by Drezepolski (1921/22); 18-22 × 15-19 μm.

Occurrence: 0104.

***T. globularis* fo. *crenulatocollis* (Szab.) Popova (pl. I, fig. 12)**

Lorica 20-22 μm long, 19-21 μm broad, subspherical. Pore surrounded by a very short collar (0.5-1 μm), irregularly dentate. Membrane brownish, closely punctuated (85-95/100 μm²), ornamented with short conical spines (1-1.5 μm long) very scattered distributed (12-15/100 μm²). Europa. Recorded in America for the first time.

Occurrence: 0110.

***T. granulosa* var. *subglobosa* Playf. (pl. III, fig. 7, 8)**

Lorica 26-28 μm long, 24-26 μm broad, subspherical. Membrane yellowish or reddish-brown, loosely punctuated (50-100 μm^2), ornamented with short obtuse spines (0.5 x 0.8 μm long) irregularly scattered (10-15/100 μm^2), which confers to the contour of the lorica an undulate appearance. Pore without collar. Poland, Australia. This is the first record of this variety in America.

Occurrence: 0117.

***T. hirta* da Cunha (pl. II, fig. 11)**

Lorica 21-24 μm long, 19-21 μm wide, broadly ellipsoidal with round ends to subspherical. Pore without collar. Membrane reddish-brown to deep brown, notoriously punctuated (80-100/100 μm^2) with long conical spines (2-3 μm long) irregularly distributed (8-10/100 μm^2). This species was already described with S.E.M. by CONFORTI and TELL (1986). It was only recorded in America: Argentina, Brazil.

Occurrence: 0042.

***T. hispida* (Perty) Stein em. Defl. var. *hispida* (pl. II, figs. 1, 2)**

Lorica 21-23 μm long, 18-20 μm broad, ellipsoid. Pore surrounded by an annular thickening (pl. II, fig. 2). Membrane deep to reddish-brown, finely punctuated (84-100 μm^2) with short conical pointed spines (0.7-1 μm long), scatterly distributed (50-70/100 μm^2), among these there are very little papillae irregularly located. Cosmopolitan.

Occurrence: 0104.

var. *hispida* fo. *minor* Bourr. (pl. II, fig. 3)

Lorica 21-23 μm long, 16-18 μm broad, ellipsoid, covered densely (15-20/100 μm^2) with short conical pointed spines (1-1.5 μm long). Pore with or without annular thickening surrounded by spines (1-2 μm long). Membrane yellowish or reddish-brown finely (100-200/100 μm^2) punctuated. This species has been already described with S.E.M. by COUTÉ and ILTIS (1981). Guadeloupe, Africa.

Occurrence: 0042, 0104.

var. *crenulatocollis* (Maskell) Lemm. (pl. II, figs. 5, 6)

Lorica 26-32 μm long, 20-23 μm broad, ellipsoid, strongly and irregularly punctuate (80-100/100 μm^2) with scattered (9-15/100 μm^2) conical spines (0.5-1.5 μm long), distributed mainly around the ends. Pore surrounded by a cylindrical neck ornamented

with 10-12 spines at the tip, which are longer than those in the body, which diverge distally. France. In America: Argentina.

The observed specimens presented the neck almost cylindrical; notwithstanding, we shouldn't say our specimens belong to fo. *recta* because the spines are divergent from the edge of the neck.

Occurrence: 0104.

var. *duplex* Defl. (pl. II, fig. 4)

Lorica 28-30 μm long, 23-25 μm broad, ellipsoid. Membrane yellowish to reddish-brown, notoriously punctuate (80-100/100 μm^2), with short conical spines irregularly distributed mainly around the ends, some also scattered on the middle surface. Pore surrounded by a depressed annular thickening. This species was already described with S.E.M. by COUTÉ and THÉRÉZIEN (1985). Widespread. In America: Argentina, Bolivia.

Occurrence: 0042.

***T. horrida* var. *spinicollis* Conf. (pl. IV, figs. 10-12)**

Lorica 39-41 μm long, 25-27 μm broad, ellipsoid. Pore surrounded by a cylindrical collar (5.5-6 x 4.5-5 μm) with conical spines (1-1.5 μm long) at the distal end and some others placed on the lateral (pl. IV, fig. 11). Membrane reddish-brown, punctuated, ornamented with robust conical spines (3.5-4 μm long), irregularly distributed (32-38/100 μm^2), among these spines little granulations are present.

This variety was originally described by CONFORTI (1993) in materials from Camaleão Lake (Brazil). This is the first record outside this country.

Occurrence: 0110.

***T. intermedia* var. *papillata* (Skuja) Popova (pl. I, fig. 6)**

Lorica 24-27 μm long, 21-23 μm broad, ellipsoid. Membrane finely punctuated (100-200/100 μm^2) ornamented with short conical spines scatterly (10-20/100 μm^2) distributed. This variety was originally reported in materials from Lithuania, the present is the second record of it in the world.

Occurrence: 0104.

***T. irregularis* Swir. (pl. I, figs. 10, 11)**

Lorica 23-25 μm long, 18-20 μm broad, ellipsoid. Posterior end slightly flattened. Pore (4-4.5 μm diam.) surrounded by an annular thickening or a very short collar. Membrane scrobiculated, strongly

punctuated (85-100/100 μm^2) and with scattered (5-10/100 μm^2) obtuse spines (1-1.5 μm long). Dispersed warts are also observed sometimes. Russia. In America: Argentina.

Occurrence: 0104.

***T. kelloggii* Skv. (pl. II, fig. 12)**

Lorica 32-34 μm long, 30-32 μm broad, ellipsoid or ovoid with rounded ends. Pore surrounded by a crown of 8-10 conical spines (1.5-2 μm long). Membrane reddish-brown, finely punctuated (100-110/100 μm^2) ornamented with conical spines, distributed mainly around the ends (7-10/100 μm^2). In some specimens we could observe scattered spines on the middle surface. This species was already described with S.E.M. by CONFORTI and TELL (1986). Widespread.

Occurrence: 0104.

***T. magdaleniana* Defl. (pl. VI, figs. 5, 7)**

Lorica 104-106 μm long, 19-20 μm broad, spindle-shaped with regularly arched sides; anterior end narrowed into a long neck (15-17 \times 4-5 μm) ornamented with conical spines, usually 5, at the tip (they are broken in the photographed specimen). Posterior end narrowed into a long tail (27-29 \times 8-10 μm) with 3-4 spines at the end. Membrane reddish to deep brown, punctuated and ornamented with conical curved spines of variable length (1-5 μm long) irregularly distributed along the lorica, mainly on the middle part of the body. This taxon was observed with S.E.M. by CONFORTI (1993) in materials from Brazil. *T. magdaleniana* was only recorded in tropical and subtropical regions of South America: Argentina, Bolivia, Brazil and Venezuela.

Occurrence: 0117.

***T. megalacantha* var. *crenulatocollis* Bourr. et Manguin (pl. III, figs. 5, 6)**

Lorica 53-55 μm long, 29-31 μm broad, ellipsoid. Membrane strongly (100-200/100 μm^2) punctuated, with robust long and divergent conical spines (10-12 \times 2-4 μm) scatterly (3-4/100 μm^2) distributed. Pore with a depressed collar (6-7 μm diam.) bearing teeth on the distal end (13 μm long). Guadeloupe, Argentina.

Occurrence: 0117.

***T. planctonica* var. *flexicollis* Balech (pl. V, figs. 1, 2)**

Lorica 21-23 μm long, 17-19 μm broad, ellipsoid, with the posterior end slightly flattened. Pore with

an oblique or sometimes curved collar (3-4 μm long) and irregularly denticulated at the tip (1-1.2 μm long). Membrane with scattered punctuations (58-70/100 μm^2). France. In America: Argentina, Brazil.

Occurrence: 0104.

***T. pseudocaudata* Defl. (pl. V, figs. 8-11)**

Lorica 35-60 μm long, 17-23 μm broad, regularly ellipsoid. Membrane irregularly punctuate (50-100/100 μm^2), covered densely with robust obtuse spines mainly distributed at the posterior end and exogenous particles randomly distributed. Pore surrounded by an annular thickening and a distinct cylindrical (5.5 \times 5 μm) collar which may be denticulated or not. Posterior end with a short tail (3-4 μm long), sometimes truncated.

The lorica shown in plate V, figure 10 differs from the typical species because it presents a straight and cylindrical neck, without any ornamentation or spines. Europe. Recorded in America for the first time.

Occurrence: 0117.

***T. pseudocaudata* Defl. fo. (pl. V, fig. 12)**

The lorica observed in plate V, figure 12 differs from the typical species in the smaller dimensions of the lorica (40 μm long, 13.5 μm broad), slightly narrower and its neck (6 \times 6 μm) without teeth at the distal end. Membrane finely punctuated (100-200/100 μm^2) and covered with warts (10-20/100 μm^2).

Occurrence: 0117.

***T. raciborskii* var. *incerta* Drez. (pl. II, fig. 9)**

Lorica 21-23 μm long, 16-18 μm broad, ellipsoid. Membrane reddish to deep brown, finely (80-100/100 μm^2) punctuated, ornamented with irregular tubercles or obtuse spines in both ends. Pore without collar. Poland. In America: Argentina, Venezuela.

Occurrence: 0042.

var. *nova* Drez. (pl. II, fig. 10)

Lorica 30-34 μm long, 25-27 μm broad, ellipsoid. Membrane finely (60-70/100 μm^2) punctuated, with scattered (5/100 μm^2) conical spines of variable length distributed only in the anterior end. Pore with an annular thickening, without a collar. Hungary, Poland. In America: Argentina.

These organisms could be considered *T. acanthostoma* Stokes *em.* Defl., but this taxon bears just one or two crown of spines. In our specimens, the spines

are disposed irregularly at the anterior end, with no organization in concentric circles at all.

Occurrence: 0042.

***T. robusta* Swir. em. Defl. (pl. II, figs. 7, 8)**

Lorica 19-23 μm long, 17-20 μm broad, ellipsoid, strongly and irregularly punctuate (84-100/100 μm^2), with robust scattered (5-12/100 μm^2) conical spines (1.5-4 μm long). Pore without collar, normally surrounded by some spines the length of which is equal or greater than that of the ones on the body of the lorica, divergent or not. Membrane deep or reddish-brown. Europe. In America: Argentina, Bolivia, Brazil, Venezuela.

This species has been already described with S.E.M. by COUTÉ and ILTIS (1981), CONFORTI and TELL (1986), COUTÉ and THÉRÉZIEN (1985) and CONFORTI (1993).

Occurrence: 0104.

***T. rugulosa* fo. *steinii* Defl. (pl. I, figs. 2, 3)**

Lorica 22-24 μm diam, spherical; pore with an annular thickening (1.5-2 μm diam.); membrane thick, yellowish to reddish-brown, ornamented with a number of more or less regular, slightly anastomosing ribs that appear to radiate from the pore. Austria, France. This is the first record of it in America.

Occurrence: 0110.

***T. similis* var. *spinosa* Hub. — Pest. (pl. V, figs. 3, 4)**

Lorica 24-25 μm long, 16-17 μm broad, ellipsoid, with ends rounded or the posterior slightly acuminate. Pore surrounded by a collar oblique (3.5-4 \times 4-5 μm), ornamented with spines irregularly placed on the sides and the distal end (1-1.5 μm). Membrane reddish-brown, punctuated (50-100/100 μm^2) and with conical spines (1.5-2 μm long) sparsely distributed (10-15/100 μm^2). This variety was already described with S.E.M. by CONFORTI and TELL (1986), RINO and PEREIRA (1989-1990), CONFORTI (1993), COUTÉ and THÉRÉZIEN (1994). Widespread.

Occurrence: 0104.

***T. superba* var. *spinosa* Prescott (pl. III, fig. 9)**

Lorica 33-37 μm long, 27-30 μm broad, ellipsoid or slightly ovoid, with rounded ends. Membrane reddish-brown with punctuations closely distributed (200/100 μm^2) and scattered conical spines (10-15/

100 μm^2) of variable length (1.5-3 μm long). Posterior end ornamented with a crown of well developed spines (3-10 μm long) which are curved and more or less convergent. This variety has been already described with S.E.M. by RINO and PEREIRA (1989-1990). Portugal, U.S.A. Recorded in South America for the first time.

Occurrence: 0042.

***T. volvocina* Ehr. (pl. I, fig. 1)**

Lorica 23-26 μm diam., spherical, pore surrounded by a depressed collar (3-5 μm diam.). Membrane smooth, hyaline yellowish to deep reddish-brown. Two chloroplasts with one pyrenoid each (observed by light microscope). Cosmopolitan.

Occurrence: 0104, 0110.

***T. zingeri* Roll (pl. III, fig. 3, 4)**

Lorica 31-34 μm long, 21-23 μm broad, ellipsoid, with both ends rounded. Membrane yellowish or reddish-brown, strongly and regularly punctuated (100-150/100 μm^2), ornamented with robust (4-6 μm long) conical spines regularly (8-10/100 μm^2) distributed. Russia. In America: Argentina.

The determination of this taxon was specially uneasy. We included it in *T. zingeri*, though in the figure given by Roll (HUBER-PESTALOZZI, 1955), the sides are slightly straighter than in our specimens. In addition, though the anterior spines are not longer than posterior ones in the specimens shown, we observed this feature many times under light microscope. Finally, it differs from *T. spectabilis* Defl. by its larger dimensions (53-55 \times 32-35 μm).

Occurrence: 0110.

CONCLUSIONS

As result of our observations, besides of the *Trachelomonas* taxa recorded by DUQUE (1995) from these Colombian Amazonia samples, we described 26 additional taxa of this genus: *T. abrupta* var. *obesa*, *T. armata* var. *armata* fo. *inevoluta*, *T. armata* var. *gordeievii*, *T. armata* var. *gordeievii* fo. *minor*, *T. armata* var. *longispina*, *T. armata* var. *nana* fo. *spinosa*, *T. armata* var. *setosa*, *T. australica* var. *granulata*, *T. duquei*, *T. dybowskii*, *T. globularis* fo. *crenulatocollis*, *T. granulosa* var. *subglobosa*, *T. intermedia* var. *papillata*, *T. irregularis*, *T. hirta*, *T. hispida* fo. *minor*, *T. hispida* var. *crenulatocollis*, *T. hispida* var. *duplex*, *T. horrida* var. *spinicollis*, *T. megalacantha* var. *crenulatocollis*, *T. pseudocaudata*, *T. raciborskii* var. *incerta*, *T. rugulosa* fo. *steinii*, *T. planctonica*

var. *flexicollis*, *T. superba* var. *spinosa* and *T. zingeri*. Among these, 3 were considered as new taxa: *T. armata* var. *gordeievii* fo. *minor*, *T. armata* var. *nana* fo. *spinosa* and *T. duquei*.

Five taxa were recorded only in America: *T. das-tuguei*, *T. hirta*, *T. horrida* var. *spinicollis*, *T. magdaleniana* and *T. megalacantha* var. *crenulatocollis*.

Six taxa were recorded for the first time in South America: *T. armata* var. *setosa*, *T. globularis* fo. *crenulatocollis*, *T. granulosa* var. *subglobosa*, *T. intermedia* var. *papillata*, *T. rugulosa* fo. *steinii* and *T. superba* var. *spinosa*.

Twenty-three taxa present a widespread distribution.

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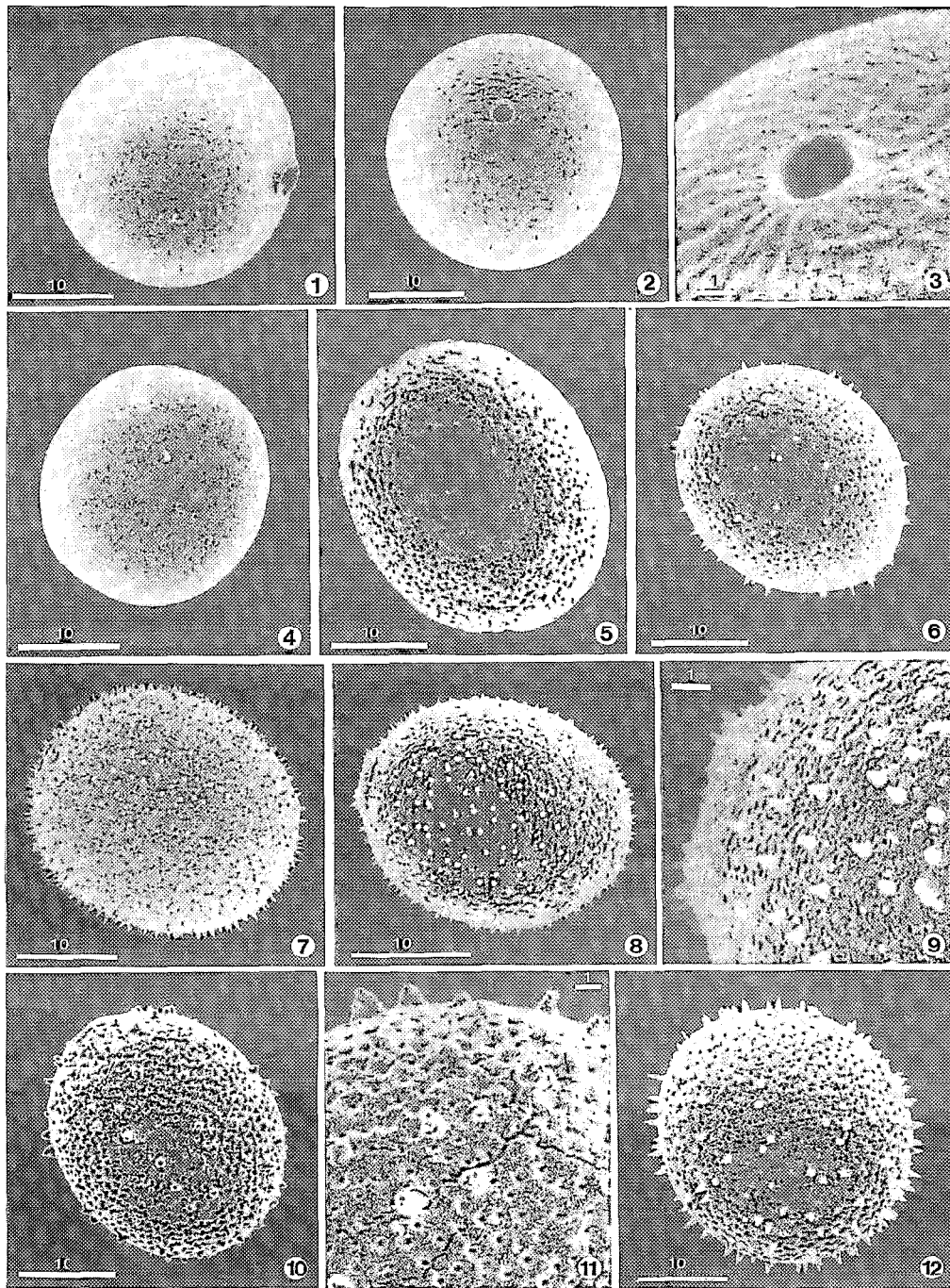


PLATE I

FIG. 1. — *T. volvocina*; 2, 3. *T. rugulosa* fo. *steinii*, 2. general view, 3. detail of the envelope surface; 4. *T. dybowskii*; 5. *T. abrupta* var. *obesa*; 6. *T. intermedia* var. *papillata*; 7-9. *T. australica* var. *granulata*, 7, 8. general view, 9. detail of the envelope surface; 10, 11. *T. irregularis*, 10. general view, 11. anterior end showing detail of the pore and the envelope surface; 12. *T. globularis* var. *crenulatocollis*.

1. *T. volvocina*; 2, 3. *T. rugulosa* fo. *steinii*, 2. vue générale, 3. détail de l'enveloppe; 4. *T. dybowskii*; 5. *T. abrupta* var. *obesa*; 6. *T. intermedia* var. *papillata*; 7-9. *T. australica* var. *granulata*, 7, 8. vue générale, 9. détail de l'enveloppe; 10, 11. *T. irregularis*, 10. vue générale, 11. extrémité antérieure avec détail du pore et de l'enveloppe; 12. *T. globularis* var. *crenulatocollis*.

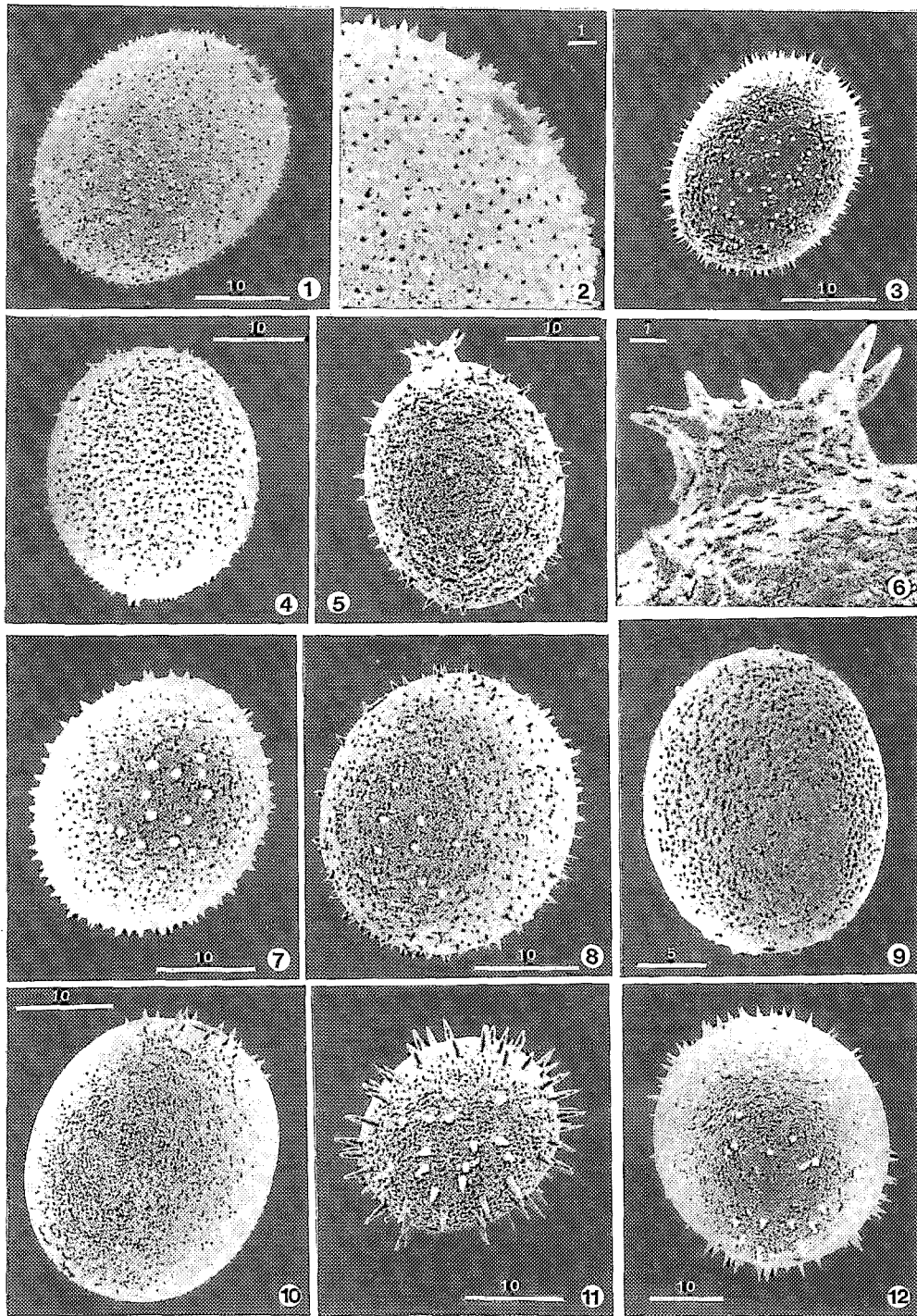


PLATE II

FIG. 1, 2. *T. hispida* var. *hispida*, 1. general view, 2. detail of the anterior end; 3. *T. hispida* fo. *minor*; 4. *T. hispida* var. *duplex*; 5, 6. *T. hispida* var. *crenulato-collis*, 5. general view, 6. detail of the neck ornamentation; 7, 8. *T. robusta*; 9. *T. raciborskii* var. *incerta*; 10. *T. raciborskii* var. *nova*; 11. *T. hirta*; 12. *T. kelloggii*.

1, 2. *T. hispida* var. *hispida*, 1. vue générale, 2. détail de l'extrémité antérieure; 3. *T. hispida* fo. *minor*; 4. *T. hispida* var. *duplex*; 5, 6. *T. hispida* var. *crenulato-collis*, 5. vue générale, 6. détail de l'ornementation du col; 7, 8. *T. robusta*; 9. *T. raciborskii* var. *incerta*; 10. *T. raciborskii* var. *nova*; 11. *T. hirta*; 12. *T. kelloggii*.

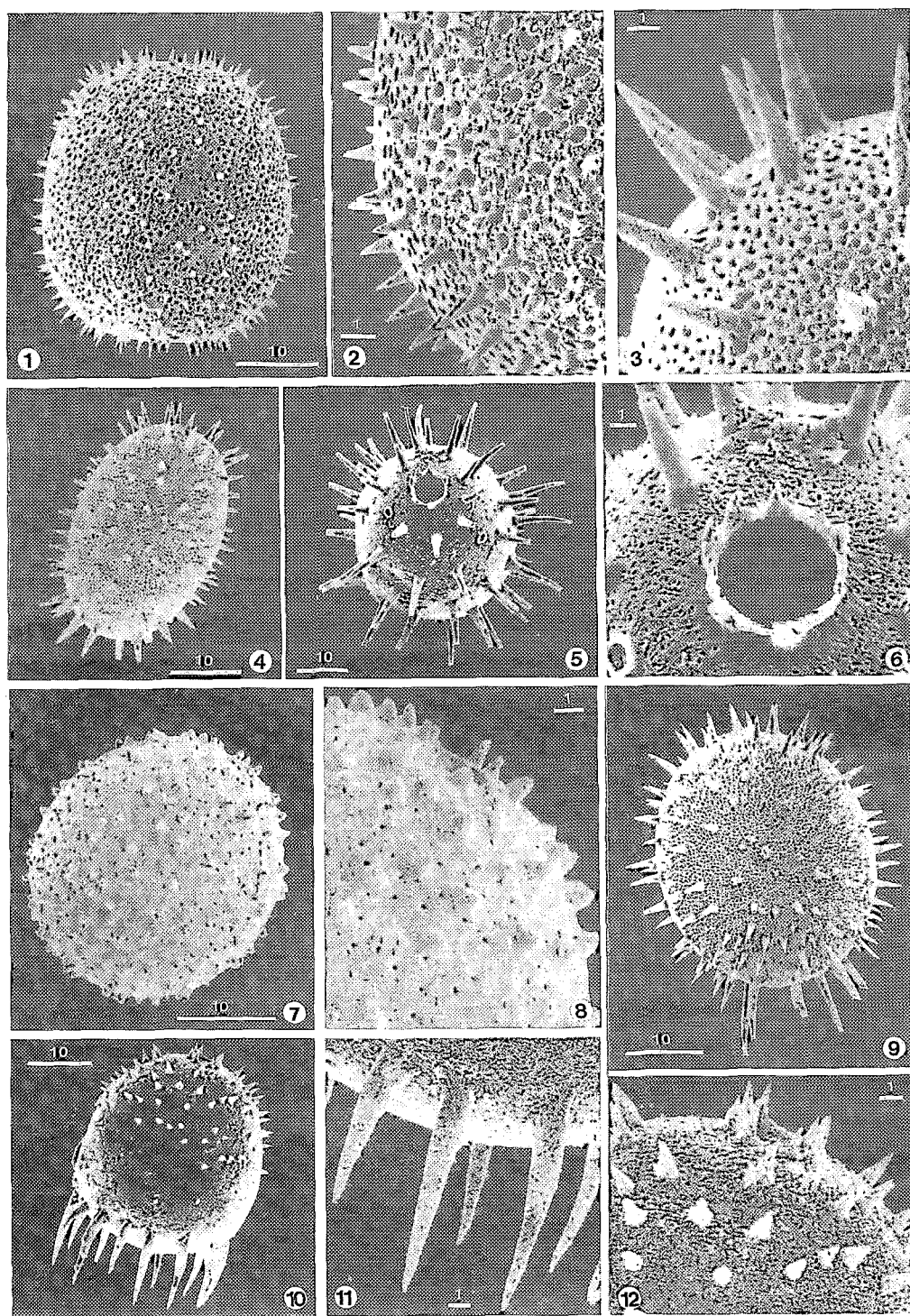


PLATE III

FIG. 1, 2. *T. duquei*, 1. general view, 2. detail of the envelope surface; 3, 4. *T. zingeri*, 3. detail of the envelope surface, 4. general view; 5, 6. *T. megalacantha* var. *crenulatocollis*, 5. general view, 6. detail of the flagellar pore; 7, 8. *T. granulosa* var. *subglobosa*, 7. general view, 8. detail of the envelope surface; 9. *T. superba* var. *spinosa*; 10-12. *T. armata* var. *gordeievii* fo. *minor*, 10. general view, 11. detail of the posterior end spines, 12. detail of the anterior end.

1, 2. *T. duquei*, 1. vue générale, 2. détail de l'enveloppe; 3, 4. *T. zingeri*, 3. détail de l'enveloppe, 4. vue générale; 5, 6. *T. megalacantha* var. *crenulatocollis*, 5. vue générale, 6. détail du pore du flagelle; 7, 8. *T. granulosa* var. *subglobosa*, 7. vue générale, 8. détail de l'enveloppe; 9. *T. superba* var. *spinosa*; 10-12. *T. armata* var. *gordeievii* fo. *minor*, 10. vue générale, 11. détail des épines postérieures, 12. détail de l'extrémité antérieure.

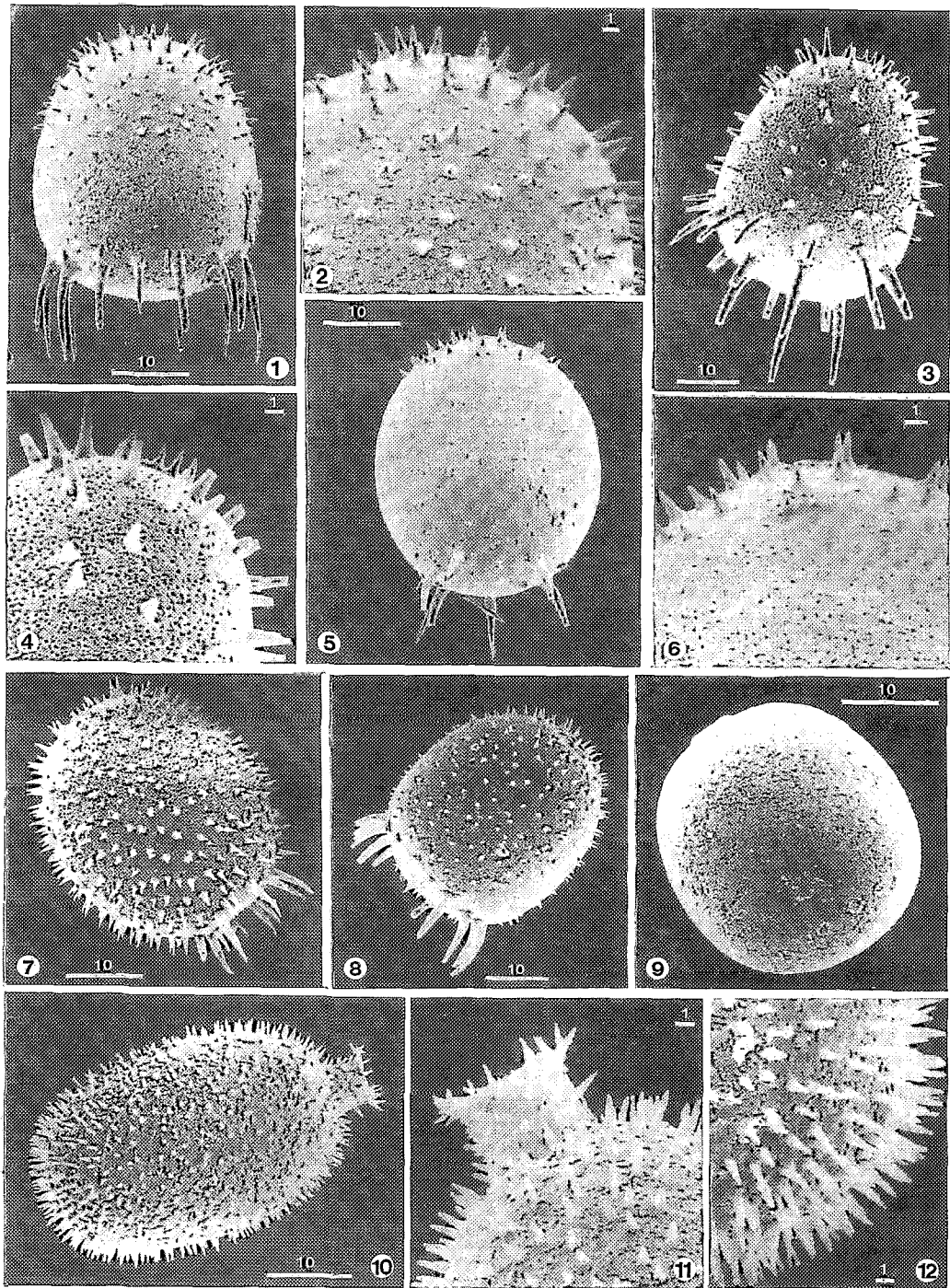


PLATE IV

FIG. 1, 2. *T. armata* var. *gordeievii*, 1. general view, 2. detail of the anterior end; 3, 4. *T. armata* var. *longispina*, 3. general view, 4. detail of the anterior end; 5, 6. *T. armata* var. *steinii*, 5. general view, 6. detail of the anterior end; 7. *T. armata* var. *setosa*; 8. *T. armata* var. *nana* fo. *spinosa*; 9. *T. armata* var. *armata* fo. *inevoluta*; 10-12. *T. horrida* var. *spinicollis*, 10. general view, 11. detail of the neck ornamentation, 12. detail of the envelope surface.

1, 2. *T. armata* var. *gordeievii*, 1. vue générale, 2. détail de l'extrémité antérieure; 3, 4. *T. armata* var. *longispina*, 3. vue générale, 4. détail de l'extrémité antérieure; 5, 6. *T. armata* var. *steinii*, 5. vue générale, 6. détail de l'extrémité antérieure; 7. *T. armata* var. *setosa*; 8. *T. armata* var. *nana* fo. *spinosa*; 9. *T. armata* var. *armata* fo. *inevoluta*; 10-12. *T. horrida* var. *spinicollis*, 10. vue générale, 11. détail de l'ornementation du col, 12. détail de l'enveloppe.

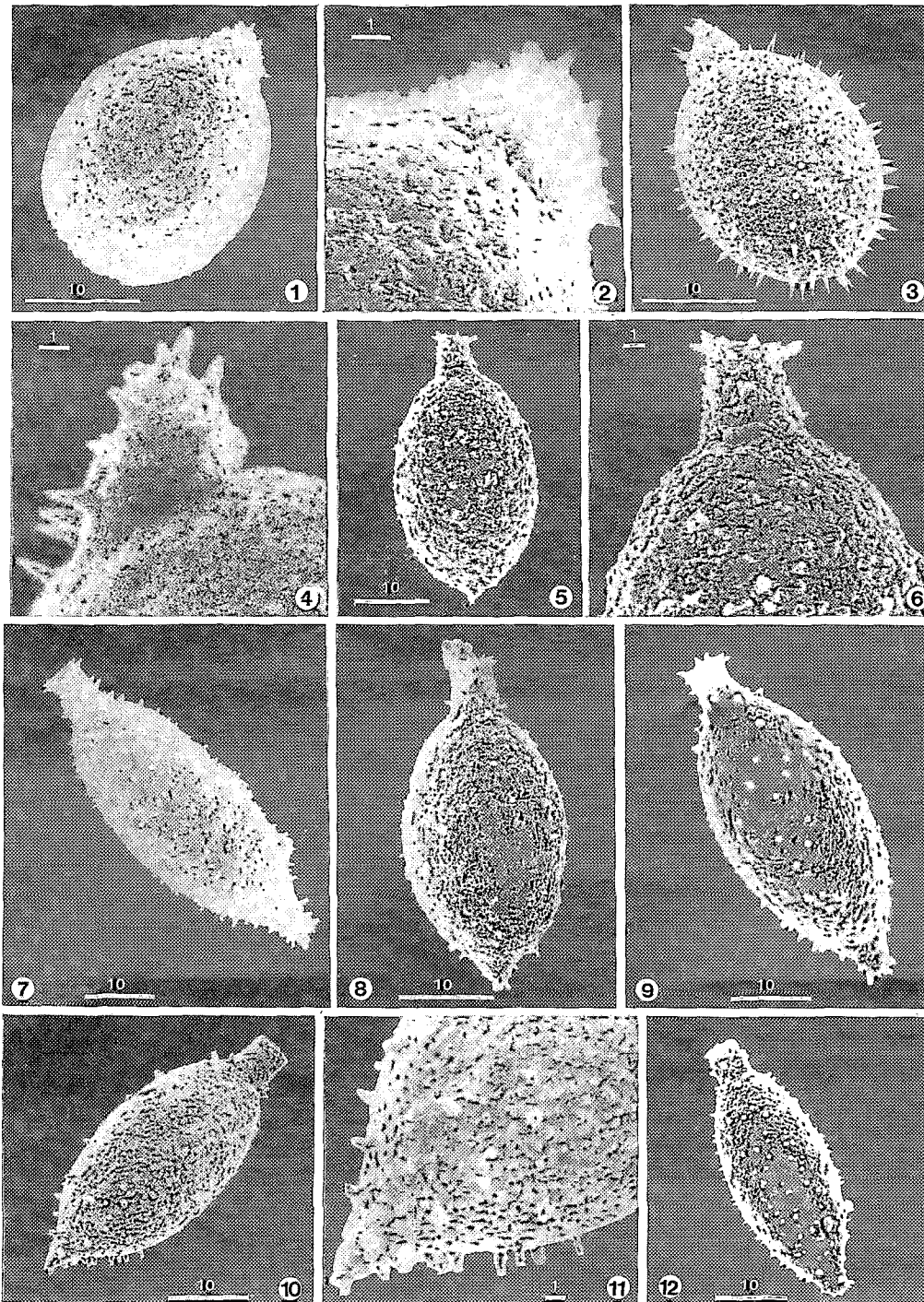


PLATE V

FIG. 1-2. *T. planctonica* var. *flexicollis*, 1. general view, 2. detail of the neck; 3-4. *T. similis* var. *spinosa*, 3. general view, 4. detail of the neck; 5-6. *T. bernardinensis*, 5. general view, 6. detail of the envelope surface; 7. *T. caudata* fo.; 8-11. *T. pseudocaudata*, 8-10. general views, 11. detail of the envelope surface; 12. *T. pseudocaudata* fo.
 1-2. *T. planctonica* var. *flexicollis*, 1. vue générale, 2. détail du col; 3-4. *T. similis* var. *spinosa*, 3. vue générale, 4. détail du col; 5-6. *T. bernardinensis*, 5. vue générale, 6. détail de l'enveloppe; 7. *T. caudata* fo.; 8-11. *T. pseudocaudata*, 8-10. vue générale, 11. détail de l'enveloppe; 12. *T. pseudocaudata* fo.

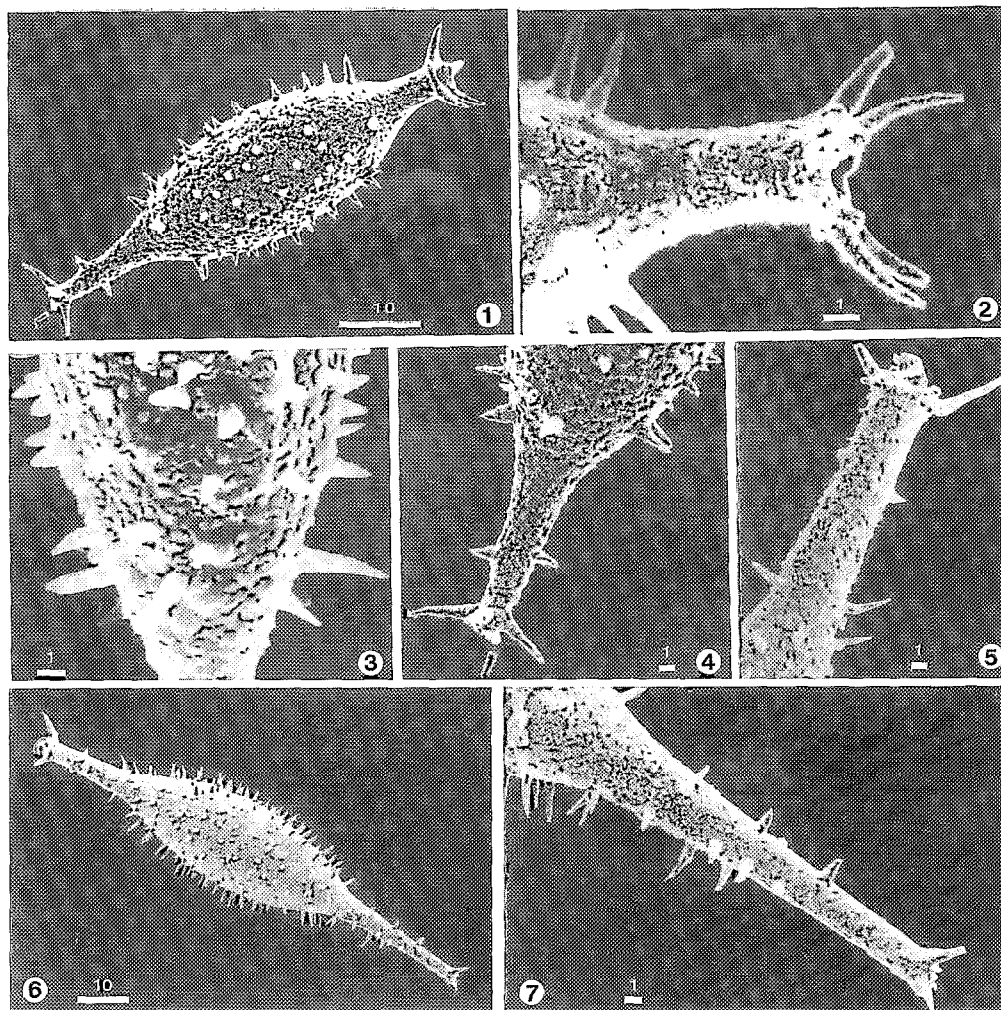


PLATE VI

FIG. 1-4. *T. dastuguei*, 1. general view, 2. detail of the neck ornamentation, 3. detail of the envelope surface, 4. detail of the cauda ornamentation; 5-7. *T. magdaleniana*, 5. detail of the neck ornamentation, 6. general view, 7. detail of the cauda ornamentation.
 1-4. *T. dastuguei*, 1. vue générale, 2. détail de l'ornementation du col, 3. détail de l'enveloppe, 4. détail de l'ornementation de l'extrémité postérieure; 5-7. *T. magdaleniana*, 5. détail de l'ornementation du col, 6. vue générale, 7. détail de l'ornementation de l'extrémité postérieure.