On some parasitic Flagellata

by

Dr. OLYMPIO OLIVEIRA RIBEIRO DA FONSECA.

(With Pl. 11 & 12).

The present paper contains all my observations on parasitical flagellates made after the publication of a former article on the species found in Brazilian mammals, which also appeared in these "Memorias". Many of them were already described in preliminary notes, in "Brazil-Medico", but some of them are quite new. Our first paper was published in portuguese only so we reproduce the descriptions of new species given in it.

We would also reply to the objections made by some authors, especially CHALMERS and PEKKOLA, to our views concerning the subject in discussion.

The literature, general study of the group, technic etc. have already been given in former papers, which were also illustrated; In the way of literature I refer the reader to the thesis published by me on the same subject in 1915, which also contains a general study of the flagellata.

1.—Reply to a paper by CHALMERS & PEKKOLA.

Chilomastix mesnili (WENYON, 1916).

I publish the following few lines as an answer to the paper by ALBERT J. CHALMERS and WAINO PEKKOLA, who state (in Annals of Trop. Med. & Paras., vol. XI, n. 3, January 1918,) that two genera established by me in 1915, are really synonymous. On receipt of that paper I forthwith replied by a short note published in Brazil Medico, vol. 32 n. 15, succinctly stating my reasons for the establishment of separate genera and showing the great differences between them. At the same time, I expressed my intention of going into all the details of the question in a later paper, so as to arrive at a definite conclusion. I now proceed to compare the two species of the genera Chilomitus and Tetrachilomastix and am convinced that this comparison will justify their separation.

I would also defend the establishing of the genus Waskia, by WENYON & O’CONNOR (J. of the R. A. M. C., vol. 28 n. 2 & 3), as I have observed representatives of this genus, even describing a new species, and
at the same time representants of Embadomonas MACKINNON of which CHALMERS PEKKOLA state that Waskia is only a species.

Having made a detailed study of Waskia WENYON and O’CONNOR and Embadomonas MACKINNON, in another paper, presented on the same occasion, I refrain from it here. Though not based on the type species, my studies on other species of the same genera fully confirmed the conclusions at which the above mentioned authors arrived. The protomonadinae of the genus Embadomonas have one flagellum, which starts from the blepharoplast, and a cytostome with chromophilous lip and delicate undulating membrane. Those of the genus Waskia are simple or double and have, accordingly, one or two cytostomes near which appears a thick undulating and a longer and more slender, not undulated flagellum.

Genus Tetrachilomastix FONSECA, 1915.

Diagnosis: Protomonadina with four equal anterior flagella, springing from the blepharoplast, which is also the starting point of a chromophilous lip, that borders the cytostome, which has an undulating membrane.

Type species:

Tetrachilomastix Gallinarum (MARTIN & ROBERTSON, 1911).


Chilomastix (Tetrachilomastix gallinarum MARTIN & ROBERTSON 1911) FONSECA 1915 & 1916.

Redescription: General appearance like that of any other Chilomastix; body pear-shaped, often twisted and flattened; anterior extremity much more dilated than the rest of the body; posterior end sharp pointed, with a tail like appendix; sometimes there is a large diagonal furrow resulting from the torsion of the organism. Near the anterior end a broad fissure which ends in a sac, the cytostome, crossed by an undulating membrane which though readily seen in fresh specimens is hardly visible after staining by HEIDENHAINS method. Cytostomatic margin followed by a very chromophilous thickening, that starts from the blepharoplast and follows its contours; this is the chromophilous lip which characterises this genus and its allied forms; blepharoplast anterior to the nucleus, almost at the anterior end of the body; it is only in stages approaching cell-division that several granules occur.

Nucleus vesicular with thick and very chromophilous membrane, round a central cavity, which may contain a central caryosome, a more or less well developed linin net and granules of external chromatin; sometimes, generally when there is no caryosome, there are chromatin granules of different sizes adhering to the nuclear membrane.

Protoplasm neatly differentiated in distinct but not resistant periplastic layer, showing slight changes of outline and endoplasm, with more marked, sometimes even coarsely aiveolar structure; it often contains bacteria or other foreign bodies.

Genus Chilomitus FONSECA 1915

Diagnosis: More or less elongate flagellates, with rigid outer coating and four anterior flagella which start from the blepharoplast; at anterior extremity of the body, a short cytostome, without undulating membrane or chromophilous lip.

Type species:

Chilomitus caviæ FONSECA, 1915.

Redescription: The general appearance of this flagellate is quite different from that of any other type of protomonadina. The body is perfectly rigid; this is particularly noticeable during life, as the flagella give it a pendulum like motion, a little similar to that observed in Selonomonas. The species here described shows a marked dimorphism, with two extremes and all the intermediate forms.
I shall first reproduce the description of its characteristics from my previous publications; after that I shall describe the structure of the species and try to show in what it resembles and how it differs from the type species of the genus *Tetrachilomastix*.

One form of *Ch. caviae* is elongate, from 12–17 micra long and about 4 wide; the body is longitudinally depressed; one of the margins is thicker and more convex than the other; the cytostome is oblique, or almost parallel with the body axis and ends at the limit of the less thick rim and the anterior extremity.

In another form, the body is short, from 8–10 μ long and from 4–5 wide.

The extremities are equally rounded and very broad; the body is very much hollowed out longitudinally; one of the margins is very thick, rounded and very convex, the other very narrow, almost blade-like and only slightly convex; the cytostome is perpendicular to the longitudinal axis and ends at the most anterior part of the narrow margin. The limit between the blade-like part and the thicker one forms a neat curve, concave towards the narrow side, and at times in apparent continuity with the cytostomastic margin on the concave side of the curve; the flagella often lie hidden in the shape of a bundle.

Both forms show endo- and ectoplasm; the later is a rigid, more translucent, periplastic layer without any special morphologic characteristics; it prevents all movements and consequent variations of outline. The endoplasm of some forms is slightly alveolar; in others it is quite hyaline and in perfect continuity with the periplast. It always contains either round or rod-shaped, bent, siderophilous granulations, which are not inclusions but form part of the cell. No other protomonadina known to me has a structure like that of *Chilomitus*; there is some resemblance between it and *Selenomonas*, which as yet has no definite place in the nomenclature; but *Selenomonas* has a membranelike cellular outline.

The cytostome is almost always sac-like, sometimes narrowed at the orifice; it is from 3 to 4 μ long, and at its widest about 2 μ across.

No inner details were visible either in fresh or in stained specimens, nor were there any movements denoting the presence of an undulating membrane perceived. I saw nothing that might be considered a chromophilous lip like that of *Tetrachilomastix*; the formation shown in one of our illustrations, which CHALMERS & PEKKOLA take for it, is only one of the many above-mentioned granules found in the plasm.

The nucleus may also be of great use in distinguishing *Chilomitus* from other genera, especially from *Tetrachilomastix* and *Chilomastix*.

The latter always has a vesicular, spheric nucleus, which is characterised by a thick, chromophilous nuclear membrane; inside this, there is a clear zone which may, or may not, contain a caryosome and other chromatin and linin bodies. There is nothing of the kind in *Chilomitus*, which shows a compact chromatic mass, that is sometimes visibly formed of roughly associated granules inside a clear zone. To reconcile this strange appearance with what is known about the cytology of flagellates, we may hazard the opinion that the clear zone is liquid, and the compact mass a caryosome; consequently the nucleus is of the protocaryon type, as I state in earlier publications. A sometimes very visible rhizoplast starts from the nucleus and connects it which the blepharoplast. This is often large, not near the anterior end, but at the level of the inner side of the cytostome, so that the flagella seem to emerge from the latter instead of starting from the former.

There are four, anterior, equal flagella; in the short forms, in quiescent state, they are sometimes united in a bundle, which doubles under the body, sheltering its free end in the hollow formed by the cell-margin.

From the above, careful study of the internal structure and the external morpho-
ology of *Tetrachilomastix* and *Chilomastix*, it will be easy to see what they have in common and how they differ. I see nothing that justifies the confusion of the two genera by CHAIMERS & PEKKOLA and feel confident that the present arguments will entirely dispel it.

**Table showing morphologic differences between:**

**Tetrachilomastix**

*Periplast*: narrow and flexible, allowing metamorphic movements.

*Endoplasm*: distinctly alveolar, like in the other genera of the Chilomastix group. No siderophilous granulations. Unimportant inclusions.

*Cystostome*: long, with distinct chromophilous lip of nuclear origin.

*Undulating membrane*: short, transversing the whole cystostome longitudinally; readily seen in fresh specimens, invisible after staining.

*Form of body*: slightly variable on account of metamorphic movements.

*Nucleus*: vesicular, like in other flagellates, hardly ever with central caryosome. Nuclear aspects the same as observed in the Chilomastix group.

*Flagella*: given the connection of undulating membrane and blepharoplast, there must exist a posterior flagellum, which may be difficult to see.

**Chilomitus**

*Periplast*: absolutely rigid, though not very much developed; its rigidity prevents any kind of metamorphic movement.

*Endoplasm*: alveolar, structure difficult to see and only rarely observed. Siderophilous granulations constantly present.

*Cystostome*: short, always without chromophilous lip.

*Undulating membrane*: always wanting. (This is a quite sure characteristic).

*Form of body*: Invariable for the same individual.

*Nucleus*: never vesicular, generally formed of contiguous chromatic granules.

*Flagella*: only four anterior ones, which do not differ from those of Tetrachilomastix.

II.—Cytology of Trichomonas.

Quite a good number of new contributions have been added lately to the cycology of the genus *Trichomonas*. Recent researches by KUCEINSKI, MARTINS and ROBERTSON, on species found in birds, and of WENYON, on *Trichomonas muris*, have thrown much light on the internal structure and the process of multiplication.

Even so, some of the microscopical aspects were not described and still less explained by those students. I found, for instance both in *Trichomonas muris* and *T. caviae* some particulars that had been overlooked or wrongly explained.

As already mentioned in a previous paper, one or more corpuscles are found in the plasm; they are often hexagonal, with regular outline and slightly rounded angles (fig. 2); more rarely they are round or ovoid (fig 3); When treated by HEIDENHAINS iron hematoxylin, they stain deep blue though less intensely than the chromatin and the siderophilous granulations common in flagellates. At first I took them for a chromotoid substance directly connected with the metabolism of the nuclear chromatin. Their generally chrystalline appearance suggests that they might be due to a secretion.

I also observed apparently real cystoid forms of *Trichomonas* (fig. 5—10); they may be the same as those described by BRUG as real kysts, but I could not make sure, being unable to consult the original
publication and knowing only the synopsis of it published in Bull. of Trop. Dis. Unlike kysts, these forms have no distinct membrane, but only a periplastic layer which is hardly more differentiated than that of the ordinary vegetative forms. The internal structure is the same as that of vegetative flagellates, but the undulating membrane is curled round the body; its rim touches the external limit while its basal line forms a more internal and very much bent band. In the central region we find the normal nucleus and round it, characteristically disposed siderophilous granules. In these, as in the vegetative forms, I often observed the above mentioned hexagonal corpuscles. I believe that the kysts described by BRUG were only found in tracts of the intestine below those which yielded the vegetative forms, whereas the ones I here describe were found in large numbers, together with equally numerous vegetative forms, in the same part of the gut.

I also saw vegetative forms which seemed to be evolving towards cystoid ones (fig. 3).

In the coecum of the domestic fowl, I found very minute cystoid forms but cannot decide whether they belong to T. eberthi or to T. gallinarum, as these species coexisted in the hosts examined.

III.—Some parasitic flagellates found in Brazil.

Genus Globomonas FONSECA, 1918.


Diagnosis: Spheric protomonadina, with two equal anterior flagella.

Type species: (and only known one): Globomonas parasitica FONSECA 1916.

Globomonas parasitica FONSECA 1918.

Brazil-Medico, vol. 32 n. 31, p.

I have been studying this flagellate for a long time, but it is only lately that I have come to know its morphology and the structure of its flagella, both of which are indispensable for the determination of not definitively fixed specimens. Among those stained by HEIDENHAINS method there were often very diminutive biflagellate forms, with a structure like that of any typical protomonadina. As they where very small it was very difficult, to come to any definite conclusions; the specimens did not fit into any of the existing genera. It was only in DÖFLEINS book that I found an illustration, which corresponds to Gl. parasitica.

Description: Body spheric, regular, without any trace of axostyle, cytostome or analogous structure; only plasm and nucleo-flagellar apparatus.

Plasm divided in endo and ectoplasm; the former composed of an apparently narrow, continuous periplastic layer, hardly distinguishable from the alveolar endoplasm; it must be rigid, since no metamorphic movements are perceived. There were a few stainable granulations, whose exact nature is difficult to tell, but they are probably inclusions.

Nucleus generally excentric, nearer to the flagellar pole, mostly composed of a large central mass of chromatin, surrounded by a halo: the mass is sometimes compact, but may be composed of several contiguous granules; in some specimens I saw four of these, with a tiny clear space in the center (fig. 3). From the nuclear chromatin starts a rhizoplast which runs towards the heliophoroplast which is sometimes double. From the latter spring the two flagella; they are slightly divergent, and anteriorly directed.

Live specimens are easy to know as this species has a rotatory motion.

Diameter: 3–5 μ.

Habitat: Caecum of Cavia porcellus L.

Genus ENTEROMONAS FONSECA, 1915.

Diagnosis: Protomonadina with a long recurrent and free flagellum and two shorter anterior and equal ones; body globular, without axostyle, cytostome and undulating membrane.
Enteromonas hominis FONSECA, 1915.

Redescription: Body almost always regularly spheric; posterior extremity sometimes sharpened into a very short tail.

Diameter: 5—6 micra.

Periplast making up the whole ectoplasm, narrow, but rigid enough to prevent metamorphic movements. Endoplasm alveolar, often containing inclusions, frequently bacteria; alveolae often regularly disposed; when this is the case, stained specimens have a central one, surrounded by a circle others. Neither axostyle nor cytostome.

Nucleus anterior, submarginal, sometimes central, often 1 µ in diameter. It is of the protokaryon type, that is with caryosome, empty clear zone and no membrane. Caryosome central, large and spheric, seldom irregular, or small. Clear zone very narrow, empty. No centriole was seen.

Three flagella, one recurrent and longer than the body, the others anterior and shorter. They start from the only blepharoplast which is very small, sub-marginal and anterior to the nucleus, to which it is attached by a rhizoplast. This species multiplies by longitudinal division. In the first phases there appear two chromatic plates, which seem to have distinct cromosomes; at this stage two blepharoplasts are seen; they give rise to two sets of flagella; often a centrodessmosis, which may be rather thick is seen between the plates; there are large forms with many irregularly disposed flagella. CHAGAS and HARTMANN theory on the degenerative dissociation of the fibrillae constituting the axial filament of the flagella may help to interpret them.

Habitat: Intestine of Homo sapiens.

I found this species in faeces, expelled less than five minutes before examination, by a patient from the "Hospital dos Aliena- dos", who had disentry of unknown origin. She had been treated, without any result, with sulfate of sodium, Dovers powders, calomel, electrargol and injections of camphorated oil. After 12 days illness, the patient died. Her chief symptoms were: prostration, painful evacuations, haemorrhagic faeces, coated tongue, tympanic and painful abdomen. On the first days there was a slight hyperthermia (maximum 37°, 6 C.); on the following days the temperature rose to 38° and 39° C. in the evening, being 37°, 6 C. in the morning; on the two last days it fell to 36° C., remaining stable. The first examination of faeces was made on the eve of the day of death; it was too late to make a bacteriologic examination so as to ascertain the etiologic role of the flagellate.

Enteromonas intestinalis FONSECA, 1918.


Description: Body sub-spheric, anteriorly truncate in most specimens; without any trace of a tail.

A very narrow rigid, periplastic layer prevents all metamorphic movements; there is no other ectoplasm; endoplasm alveolar with only a few inclusions; the alveolae are not regularly disposed as is so often the case with Enteromonas hominis. I saw no sign of axostyle or cytostome.

Nucleus more or less central, at times somewhat anterior; in well differentiated preparations it often shows a chromatic mass surrounded by a clear halo, that is, it looks something like a protokaryon. In other specimens it seems composed of small granules which adhere to one another.

There are three flagella, one of which is longer than the others and starts from the anterior pole, running backwards; the others are shorter and start from the same place, but are directed forwards. They all spring from a small blepharoplast, which is in front of the nucleus and sometimes seems attached to it by a rhizoplast. I saw no stages of division and no kysts.

Diameter: about 5 µ.

Habitat: coecum of Oryctolagus cunicu- lus L; (the tame rabbit.)

Chilomastix Bittencourt FONSECA 1915.

Redescription: Body elongate, oval, with less regular outline than in the other species
of the same genus. Length: 13-16 μ exceptionally 11; Width: 9-11 μ exceptionally 7. It is the largest *Chilomastix* living in Mammals.

Anterior extremity obtuse, round; posterior end sharpened or rounded, but always narrower than the anterior one. At the fore end, a cytostome with chromophilous lip, from 4–5 μ long; from 2–3 broad. In stained specimens it is often apparently wound round the nucleus. An undulating membrane runs backwards across the cytostome; it starts from a blepharoplast, placed in front and to one side of the nucleus; it also gives rise to the lip. Three slender anterior flagella of more or less the same length as the body start from this blepharoplast or from another beside it.

Protoplasm divided in ecto and endoplasm. Periplastic layer continuous, finely granular and so rigid as to prevent metamorphic movements. Endoplasm alveolar. On the walls limiting the alveolae fine granules are seen. It seems that when unstained, this species looks more granular than *Ch. intestinalis*.

Nucleus anterior, sometimes lateral 3–4 μ in diameter. One or two somewhat lenticular chromatin masses adhering to the thick nuclear membrane. When there are two, one is larger than the other. Clear zone almost empty. A large central caryosome is seldom seen; when it is found there are generally no large chromatin masses.

*Habitat*: Coecum of *Mus (Epimys) norwegicus*.

This species is dedicated to Dr. NASCIMENTO BITTENCOURT, professor of Medical History, who was the first to teach Parasitology, in the Faculty of Medicine of Rio de Janeiro.

**Chilomastix capræ FONSECA, 1915.**

*Description*: Body elongate, more or less pear-shaped, the two posterior thirds narrowed, sometimes suddenly. Not metamorphic, seldom changing in outline. Length 9–12 μ, Width: 5–6 μ.

Anterior extremity round, with a lateral hollow, almost parallel with the side margin of the body. Posterior end sharp to a generally short tail. Seldom rounded.

Protoplasm divided in ecto and endoplasm. Periplast rigid, making metamorphic movements impossible. Endoplasm alveolar with a few inclusions; in the two anterior thirds the vesicles are large and coarse, in the posterior one small and delicate.

At the anterior end there is a cytostome, which is easily seen in unstained specimens, the chromophilus lip shows well after staining; generally only slightly bent, 3–4 μ long, 1–2 wide; the cytostome is crossed by an undulating membrane with a not chromophilous rim formed by an adherent flagellum, coming from the blepharoplast. This is anterior to the nucleus, sub-marginal and the starting point of the cytostomic lip.

The nucleus is anterior, sub-marginal, spheric and poor in chromatin; sometimes it is apparently below the cytostome at others above it. It is often lateral; caryosome often seen connected with the blepharoplast by a rhizoplast; nuclear chromatin in bent rods adhering to the nuclear membrane; there are mostly more than two and they are often joined to the caryosome by linin strands radiating from the center to the periphery of the nucleus. Three anterior flagella of equal length starting from the blepharoplast.

*Habitat*: Rumen of *Capra hircus*.

*Note*: Braune describes two flagellates found in the stomach of ruminants but gives a wrong classification of them. One of them is a *Trichomastix*, which I have not had the opportunity to study, and which the author considers as a *Trichomonas*. The other has three anterior flagella only, and no undulating membrane and cytostome. It can not be *Ch. caprae*, from which it differs considerably. Braune takes it for a *Trichomastix*.

**Chilomastix cuniculi FONSECA, 1915.**

*Description*: Body pear-shaped, elongate and narrow, seldom broad, rounded and short. Length: 7–9 μ Width: 4–7,
Anterior extremity broad and rounded; more or less indented near the cytostome. Posterior end drawn out in a tail which may be half as long as the body; it is rarely wanting, in which case the posterior end is rounded.

Plasm generally finely alveolate. Ectoplasm forming a rigid periplasm, which makes all movement impossible. Outer margin distinct. A cytostome with chromophilous lip is found at the anterior extremity. Length 3–5 μ. Width 1–2. It is often curved.

Nucleus spheric, anterior, sometimes lateral, generally sub-marginal, 1–5 μ in diameter. Nuclear membrane thick; caryosome small when present, in which case there are generally three achromatic filaments, in the clear zone they attach the caryosome to the nuclear membrane; often there are three or four irregular and long chromatic granulations adhering to the inner side.

Three anterior, equal flagella, start from the blepharoplast, which is in front of the nucleus; they are shorter than the body. Another flagellum which runs backwards, adhering to the undulating membrane also starts from it. In fresh specimens the undulating membrane can be seen crossing the cytostome.

Habitat: Coecum of Oryctolagus cuniculus.

Note: I have found no references to the flagellates inhabiting the coecum of the rabbit. Ch. cuniculi is not rare nor is it the only one found.

Chilomastix rosenbuschii FONSECA, 1916.


Anterior extremity rounded, much larger than the posterior one and the rest of the body; posterior extremity forming a pointed, but rather short tail. At the fore end a long cytostome which may attain the middle of the body; its margin is formed by a chromophilous streak which begins at the blepharoplast, in front of the nucleus. In fresh specimens an undulating membrane is visible inside the cytostome, but it does not show after staining. The blepharoplast emits three anterior slender and equal flagella which are somewhat shorter than the body; in fresh specimens they seem to emerge from the cytomatic opening.

Plasma differentiated in coarsely alveolar endoplasm and narrow periplastic layer of ectoplasm; the latter stains more intensely than the rest of the plasm and is so rigid as to prevent metamorphic movements.

Nucleus near the end, rounded, sometimes with a caryosome from 2 to 4 μ in diameter. The chromatins generally takes the shape of elongate masses which adhere to the inside of the nuclear membrane, they are generally narrow and rarely found together with the small caryosome, which is sometimes seen. The nuclear membrane is thick and stains deeply; when there is a caryosome, it may be connected by a more or less slender linin filament which stains but lightly. At the fore end, near to the nucleus and cytostome, I often saw a depression or narrowing of the body as in Chilomastix capræ, FONSECA. It is dimple shaped; it begins at the anterior end and continues obliquely backwards. This depression, combined with poverty in nuclear chromatins and smaller dimensions seem to me the features which best distinguish Ch. rosenbuschi from Ch. intestinalis KUCZYNSKI found in the guinea pig, for which it might be mistaken.

I considering these characters sufficient to establish a new species for this flagellate of the "Viscacha" which is named after Dr. F. ROSENBUSCH, the argentinnian protozoologist, who kindly helped me to obtain and study the material.

Chilomitus cevae FONSECA 1915.

Description: This flagellate shows a very marked dimorphism; but all the intermediary stage between the two extremes are found. In one form, the body is elongate, from 12 to 17 μ long and about 4 wide, with a
clear longitudinal depression. Anterior end broad and rounded; posterior end pointed, but not tail like; one of the two margins of the body thicker and more convex than the other; cystostome oblique or almost parallel with the longitudinal axis, ending at the limit between the narrower margin and the anterior end.

In another form, _Ch. caviæ_ is short, from 8 to 10 \( \mu \) long and from 4 to 5 wide. Extremities equally rounded and very broad; it shows a longitudinal depression; one of the margins is thick, rounded and very convex; the other is much narrower, almost blade-like and only very slightly convex. The cystostome is perpendicular to the longitudinal axis and ends at the most anterior part of the narrow margin. There is a clear curve at the limit of the narrow margin and the thick part of the body; it is concave towards the margin and sometimes seems continuous with the edge of the cystostome; the flagella are often hidden near the concave side, in a bundle; cystostome generally like a sac and often narrower at its opening; it is about 1.5 or 2 \( \mu \) wide at its broadest and 3 or 4 \( \mu \) long.

Plasm divided in endo and ectoplasm. The latter forms a thick capsule-like periplastic layer, preventing any movements; the rest of the ectoplasm is hyaline and continuous with the endoplasm, which contains many irregular, siderophilous granulations, especially in the center.

Nucleus difficult to see because of the large number of siderophilous granulations; with large caryosome and empty clear zone. Blepharoplast, also difficult to distinguish, near the cystostome and connected with the nucleus by a rhizoplast. From it and passing through the cystostome start four anterior flagella, which are more or less as long as the body; in the broad forms they sometimes form a bundle, the free end of which is hidden in the concavity limiting the narrow body margin.

**Habitat:** Coecum of _Cavia aperea_ and _Cavia porcellus._

**Chilomitus lagostomi** FONSECA, 1916.

**Redescription:** Body elongate, more or less pear-shaped, flat, rigid, not metamorphic. Length 11–15 \( \mu \), width 7 \( \mu \). Anterior end rounded, blunt; posterior end slightly sharpened, but not in the shape of a real tail. At the fore end a short cystostome running backwards obliquely; it is like a short sac and, though easily seen in fresh specimens, it is difficult to discern after staining, when it sometimes appears as a hyalin space in the granular cell; as it has no chromophilous lip, it has no distinct outline in the stained body; from it four equal flagella run forwards; they emerge from the only, blepharoplast, which is not always easily seen and lies at the anterior end of the body; the flagella are slender, and of equal length, generally inferior to that of the cell. Protoplasm hyaline, rarely alveolar, mostly devoid of any structure; it is divided in a thin layer of so slightly chromophilous periplast that at times it is almost imperceptible and so rigid, as to prevent any movement, and an endoplasm full of chromophilous granulations, which are either rounded or sometimes elongated; some of them are seen at the inner border of the periplastic layer forming a discontinuous or regular lining. These granulations are a little less chromophilous than the nuclear masses, but not always easy to distinguish from them.

The nucleus is an anterior, rounded or sometimes a little elongate mass which at times seems clearly formed of contiguous large masses of chromatin; it is surrounded by a clear zone, which may be considered fluid, the chromatic mass being a caryosome.

The smaller size, the more rounded form of the siderophilous granulations in the endoplasm, the apparently greater richness in nuclear chromatin, making the nucleus more visible, which characterise this species, distinguish it from the only other known one, which is the type species: _Chilomitus caviæ_ FONSECA 1915. The latter also has a marked dimorphism and deep lateral depresions
which are never found in *Chilomitus lagostomi*.

**Eurichomastix saurii** FONSECA, 1917.

Brazil-Medico, vol. 31 n. 36 pp. 304-5.
*Synonym:* Trichomastix saurii FONSECA 1917 1. c.

This flagellate, which I described as a parasite of a species of *Amphisbaena*, was first put in the genus *Trichomastix* BLOCHMANN 1884. When it was found that this name already belonged to a group of Hymenoptera, it was changed to *Eurichomastix KOFOID* et SWEZY, obliging me to follow the change.

**Redescription:** Body elongate, generally pear-shaped; anterior extremity rounded, blunt, much broader than the posterior end; the latter sharpened so as to end in a fine point which generally coincides with the pointed end of the axostyle.

Protoplasm not clearly divided in endo and ectoplasm, the latter like in the other species of this genus, is only formed of a narrow periplastic layer, which is flexible and allows free metamorphic movements; endoplasm finely alveolar, generally devoid of inclusions.

Axostyle very visible, hollow, and tube like; it begins at the anterior extremity of the body and traverses it entirely, its last fourth emerges at the posterior end and forms a slender and sharp needle outside the body. I saw no siderophilous granulations inside it. It is generally as long as the flagellate to which it belongs and about 1 μ wide. Cytostome difficult to distinguish as the body is very small.

Nucleus round, anterior, sub marginal, about 4 μ in diameter. It has a generally small caryosome, which often looks like a sidrophilous granulation surrounded by a clear halo. Often it is connected with the blepharoplast by a slender chromophilous filament, the rhizoplast. The blepharoplast is anterior, almost marginal and from it start three anterior and one recurrent flagella. The posterior one is much longer than the body, the others are shorter; they are all free.

Length 6—12 μ; Width 3—6.

**Trichomonas Chagasii** HASSELMANN & FONSECA, 1918.


The study of this flagellate was first undertaken by Dr. CARLOS CHAGAS; as however he had no leisure to carry it out, he presented Dr. HASSELMANN and me with the material, requesting us to finish it. We published the results in Brazil-Medico.

**Redescription:** Body very metamorphic, generally oval or round; protoplasm not clearly divided in ecto and endoplasm; the former composed of a narrow periplastic layer, enabling the body to undergo great changes of outline. At the anterior end of most stained specimens, the cytostome is clearly seen; it has no chromophilous lip and looks like a wedge-shaped bent fissure, as it is very long it crosses the anterior third, sometimes even half of the cell.

When unstained, the axostyle is readily seen; after staining it is less easily noticed; it has the shape of a long slender, bent rod that crosses more than the two posterior thirds of the body and stands out at the hind end; it is hollow and contains no siderophilous granulations, like those seen in other species, but there are always two rows of these granulations, on either side; sometimes they look like chromophilous lines limiting the axostyle.

The oval nucleus is generally clearly separated from the rest of the cell, though the presence of a nuclear membrane can not be discerned. Sometimes there is a larger granulation in the center of the nucleus, but as a rule, they are all more or less of the same size and irregularly distributed in the nuclear area. The nucleus is anterior, in front of the cytostome, between this, the anterior end of the axostyle and the chromophilous rib of the undulating membrane.

In front of the nucleus, there is a some-
times double chromatic granulation, the blepharoplast, from which start three anterior, slender, equal and free flagella; the recurrent flagellum also emerges from it, or from its posterior corpuscle when there is one; the recurrent flagellum is attached to an undulating membrane and a rib forming the base of the latter. The undulating membrane generally has from 5 to 7 undulations and the much bent rib which follows the surface of the body accompanies it in two thirds of its circumference.


Habitat: Coecum of Cerodon rupestris.

**Trichomonas tatusi** FONSECA 1915.

**Description**: Body ovoid or rounded, Length about 10 μ. Width 6. Very metamorphic.

Protoplasm finely alveolar, difficult to separate, in an extremely narrow periplastic layer and endoplasm containing few inclusions.

Cytostome anterior, contiguous with the nucleus, narrow, cleft-like. Axostyle prominent outside and seen in fresh specimens. In the nuclear area, there are only more or less irregular chromatic granulations, between the cytostome and the undulating membrane.

Three anterior, free, equal, and extremely slender flagella start from the blepharoplast; they are longer than the body; there is also a recurrent flagellum beginning at the blepharoplast, which is attached to a very delicate undulating membrane with broad and shallow undulations; it covers about half the outline of the body and ends in the form of a long free flagellum. The rib on which the membrane rests also comes from the blepharoplast; it is a narrow chromatic streak following the surface of the body, where it is covered by the undulating membrane.

I have been able to watch the transversal division of *Tr. tatusi*.

---

**Waskia Wenyoni** FONSECA, 1917.


In 1915, while already studying parasitic protomonadinae, I came across several species of *Entamoeba, Chilomastix, Trichomonas, Giardia* etc, in a large brazilian monkey, *Cebus caraya* HUMBOLDT. Among them I found an interesting diplozoon, of which I studied many specimens, following some of them for a long time. As I wished to obtain sufficient material so as to be able to observe the nucleo-flagellar apparatus after staining, I put of publishing the description. The recent publication of a paper by Wenyony & O'Connor in the Journ. of the R. A. M. C., in which they describe a new flagellate of man, has induced me to change my mind.

To my great surprise, the descriptions and illustrations given, correspond to the general organisation of a simple form of the above mentioned diplozoon; there were also double forms described by Wenyony & O'Connor, who consider them as phases of division. All the morphologic elements of their single forms are quite like those of the single form found in the monkey. I am consequently sure that the double forms can not belong to another genus; I found no double forms of the species I now describe, but they may be found later on. The morphologic differences between my, species and that described by Wenyony & O'Connor, are however enough to prove that it is not the same. Consequently I considered mine as new and described it under the name of *Waskia Wenyoni*.

Recently CHALMERS & PEKKOLA affirmed that this genus is only a synonym of *Embadomonas* Mackinson. I feel able to deny this as I have observed both genera.

**Redescription**: The studied material was fresh; it was found in the coecum of *Cebus caraya*; we do not deal with the nucleo-flagellar apparatus, but only give the external morphology and the position of the flagella.

The body is not elongate as in *W. intestinalis*, but heart-shaped or round. The ante-
rior extremity is very broad and shows a slight convexity, extending to the antero-lateral blunt angles; the posterior end is also blunt; there is only a narrow periplastic layer of ectoplasm maintaining a more or less unchanging outline; endoplasm alveolar. At the two latero-anterior angles two cytostomes; these are larger and set wider apart than in Waskia intestinalis, they open outwards and in front and are as broad as they are long, about a fourth of the greatest width of the cell. From each cytostome emerge two flagella which are not quite half as long as the body. One of the flagella is thick, undulating and behind the other, which is slender and not undulated; the thick one is perpendicular to the axis.

The cytostomes open and shut in synchronous and alternating movements when; the prehensile apparatus is at rest they are both equally open, whereas when one of them is wide open, the other is correspondingly shut. These variations give one the impression that the plasm between them has a pendular oscillatory motion which controls the alternative opening and shutting.

Dimensions Length about 14 μ Width about 12.

Habitat: Coecum of Cebus caraya HUMBOLDT.