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TALIAFERRIA CLARKI, A NEW GENUS AND SPECIES OF CILIATE FROM THE CECUM OF THE RED SPIDER MONKEY, *ATELES GEOFFROYI* KUHL

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Introduction. The ciliates described in this paper were found at autopsy in the ceca of freshly-killed red spider monkeys, *Ateles geoffroyi*, collected in the jungles of Chiriqui Province, Panama, near Puerto Armuelles. They were present in considerable numbers in 13 of 72 specimens of this monkey, but absent from 8 white-faced monkeys, *Cebus capucinus capucinus*, and from 23 titi monkeys, *Saimiri orstedii orstedii*, that were living in the same locality. Our material was preserved in bulk in Bouin's fluid, and stained and mounted in toto or embedded, sectioned and stained after being brought back to the United States. We have examined the literature on parasitic Infusoria but have been unable to find any genus to which this species might belong hence we believe we are dealing with a heretofore undescribed genus and species.

The organism appears to belong to the Order Holotrichida, Suborder Gymnostomina and in or closely allied to the Family Nicollellidae. We propose for it the name *Taliaferria clarki* n.g., n.sp., in honor of Dr. William Hay Taliaferro, Professor of Parasitology at the University of Chicago and Dr. Herbert C. Clark, Director of the Gorgas Memorial Laboratory, Panama. No cysts were found hence only the trophozoite can be described.

General Morphology. The general shape of this species is indicated in figure 1. The transverse fixed and stained section shown in figure 3 demonstrates that it is approximately cylindrical. Measurements of length and breadth of 100 fixed and stained specimens taken at random are presented in the accompanying correlation table. This table indicates a high correlation between length and breadth.

In its general features, *Taliaferria clarki* resembles other ciliates such as *Balantidium coli*. It is comparatively large as indicated in the correlation table. As in *B. coli* the peristome, cytostome and cytopharynx are subterminal, the three organelles together resembling a funnel from which one

* The material on which this paper is based was collected in Chiriqui Province, Panama, R. P. in June, 1932, by Robert Hegner and Carl M. Johnson during an expedition under the auspices of the Gorgas Memorial Laboratory, Dr. Herbert C. Clark, Director. It was studied at the Johns Hopkins University and at the Bureau of Animal Industry of the U. S. Department of Agriculture. We are indebted to Miss Lydia Eskridge and Conrad Bauer for technical assistance.

side of the flared portion has been cut away. A conspicuous feature of *T. clarki* is the very thick ectoplasm that covers the entire body. It is two layered like the walls of a thermos bottle; the mouth of the bottle being represented by the cytopyge, the endoplasm being contained in a two layered sac like the liquid in a double-walled bottle. The ectoplasm of *T. clarki* resembles that of *Diplodinium ecaudatum* in structure as described by Sharp (1914) except in the following respects: (1) *T. clarki* is a holotrich, the entire body being clothed with cilia of equal length; (2) the micronucleus and the macronucleus are embedded in the endoplasm (Fig. 4); (3) the contractile vacuole is also in the endoplasm, being provided with an outlet through the inner layer of the ectoplasm (Fig. 4) and no doubt through the outer layer also.

Cytology. In so far as can be determined the minute structure of the nuclei and of the endoplasm of this ciliate does not differ from that of other ciliates; therefore this description deals principally with the ectoplasmic organelles. The cilia occur in rows that extend longitudinally from the anterior to the posterior end of the body. The rows appear to be closer together and to be thicker set with cilia than in such ciliates as *Balantidium coli* and *Buxtonella sulcata*. The cilia penetrate the thick outer layer of the ectoplasm. This layer covers the entire body being pierced by the cytopharynx and the tunnel-like cytopyge. A definite pore for the single contractile vacuole was not found.

The funnel-like peristome and cytopharynx are invested by a system of fine fibrillae that appear to connect proximally with the peristomial cilia and to terminate distally in the endoplasm (Fig. 2). Similar fibrillae appear to connect the cilia of the entire body with the inner layer of the ectoplasm which also invests the peristome. There is thus in *T. clarki* an integrated fibrillar system similar to that described by Rees (1922) in *Paramoecium caudatum* except that the ectoplasm of the latter ciliate is not two-layered. A neuromotorium, such as has been described as a center of neuromotor systems of certain other ciliates, was not observed.

The cytostome appears as a hole through the ectoplasm forming the beginning of the neck of the above mentioned funnel and leads from the peristome into the cytopharynx (Fig. 3). As in *Balantidium coli* and *Buxtonella sulcata* the cytopharynx is not provided with cilia. The relationship to the cytopharynx of the above mentioned fibrillae could not be determined.

The contractile vacuole was first demonstrated in serial sections that were cut 3 μ thick, where it was seen in the outer endoplasm and slightly caudad of the distal extremity of a shallow groove in the outer layer of the ectoplasm (Fig. 4), the groove beginning near the anterior end of the body about 1/4 of a circumference from the peristome (Fig. 3). The vacuole communicates with the ectoplasm through a small hole in the inner layer

(Fig. 4), but its path of exit through the outer layer could not be followed. The relationship of the above mentioned groove to the contractile vacuole was likewise not determined.

Except for its path of exit through the ectoplasm, the cytopyge in *T. clarki* and in *B. coli* are very similar. In *T. clarki* the opening to the exterior is at the end of a curved tunnel (Fig. 5).

The macronucleus and what appears to be the micronucleus are usually closely applied and appear as indicated in figure 1. The micronucleus cannot, in most in toto specimens, be distinguished as a separate body. It is separated slightly from the macronucleus in the specimen from which the section shown in figure 4 was made and is there seen to be surrounded by a definite membrane. Measurements of 10 macronuclei gave ranges of 21 to 28μ in length and 14–19μ in breadth, and an average length of 23.7μ and average breadth of 16.0μ. The macronucleus in specimens cleared in cedar oil is seen to contain one or several oval bodies; these are not visible in specimens stained with iron-haematoxylin.

The Genus *Taliaferria* exhibits the characters of the Family Nicollellidae. The body is ovate and circular in cross section. The thickened cortex covers the entire surface except where penetrated by the cytostome and cytopyge.

The characters of *Taliaferria clarki* are as follows: *Taliaferria clarki* sp. nov. Body ovate; transverse section, circular; range in length of 100 specimens, 83.2 to 145.6μ, and in breadth, 44.2 to 83.2μ; average length, 108.86μ; average breadth, 61.63μ; ratio of length to breadth, 1.77. Peristome, cytostome and cytopharynx subterminal. Ectoplasm of two layers, very thick, covering entire body. Cilia very numerous, in longitudinal rows, over entire body. An integrated fibrillar system present. One contractile vacuole in the endoplasm near the middle of the body. A cytopyge, subterminal in position, is connected by a curved canal with a rectal vacuole. The macronucleus is embedded in the endoplasm posterior to the center of the body; it is oval in shape; 10 specimens gave an average length of 23.7μ and an average breadth of 16.0μ. The micronucleus is closely applied to one end of the macronucleus. Habitat cecum and large intestine of the red spider monkey, *Ateles geoffroyi*.

Literature Cited

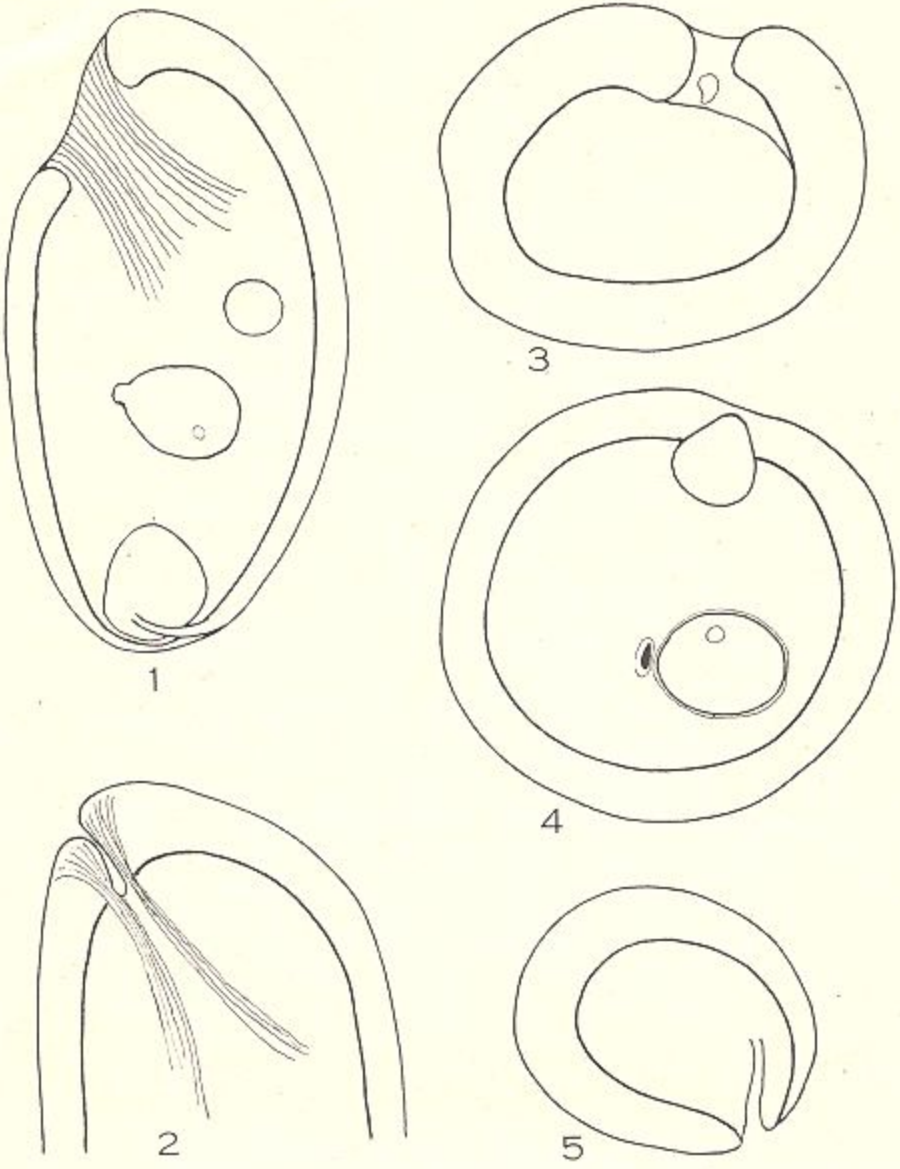
Rees, C. W. 1922. The neuromotor apparatus of *Paramecium*. Univ. Calif. Pub. Zool. 20: 333–364.

Sharp, R. G. 1914. *Diplodinium ecaudatum*, with an account of its neuromotor apparatus. Univ. Calif. Pub. Zool. 13:42–122.

TABLE SHOWING LENGTH AND BREADTH MEASUREMENTS OF 100 FIXED AND STAINED SPECIMENS OF *Taliaferria clarki* TAKEN AT RANDOM

Breadth in microns	Length in microns: 83.2	87.1	91.0	94.9	98.8	102.7	106.6	110.5	114.4	118.3	122.2	126.1	130.0	133.9	137.8	141.7	145.6	
44.2	2																	2
48.1					1													1
52.0	1	1	4	2	1	1	2											12
55.9		1	1	3	1	4	4	2	1	1								18
59.8			1	1	6	6	3	2		1	1							21
63.7					2	3	2	2	3	4	2	2		1				21
67.6						2		1	3	1	2	2	1					12
71.5									1			3			1			5
75.4						1	1								1			3
79.3													1			1		2
83.2													1		1		1	3
	3	2	6	6	11	17	12	7	8	7	5	7	3	1	3	1	1	100

	Length	*Breadth*
Range in microns	83.2 −145.6	44.2 −83.2
Mean in microns	108.86± 0.92	61.63± 0.53
Standard deviation	13.63± 0.65	7.85± 0.37
Coefficient of variation	12.52± 0.61	12.73± 0.62
Ratio of length to breadth	1.77	



Explanation of Plate XLI

Outline drawings of an in toto preparation (Fig. 1) and of sections made with a camera lucida at a magnification of 1000 and reduced. Cilia and other details have been omitted.

Fig. 1. Side view of a specimen of *Taliaferria clarki* showing peristome, contractile vacuole, macronucleus, micronucleus, rectal vacuole and cytopyge.

Fig. 2. Longitudinal section of anterior end showing cytostome and fibrillae.

Fig. 3. Transverse section near anterior end showing peristome, opening of cytostome and on the left side, the groove leading to the contractile vacuole.

Fig. 4. Transverse section near middle of body showing contractile vacuole, macronucleus and micronucleus. The nuclei were inserted from a section 9 μ distant.

Fig. 5. Transverse section near posterior end of body showing curved canal leading from the cytopyge to the rectal vacuole. All figures magnified ×500.