

TWO NEW SPECIES OF PROTOZOAN CILIATES FROM THE SUBFAMILY OPHRYOSCOLECINAE, *EPIDINIUM TRILOBATUM* (N.SP.) AND *OPHRYOSCOLEX ECAUDATUM* (N.SP.) FROM THE RUMEN OF INDIAN CATTLE *BOS INDICUS*

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ABSTRACT

Morphology of two new species of rumen ciliates from the subfamily ophryoscolecinae is described from rumen of Indian cattle (*Bos indicus*) in Aurangabad district of Maharashtra state (India). *Epidinium trilobatum* (n.sp.) is identified by short oval body, convex body surfaces, the body terminates posteriorly with three blunt lobes never seen before, and rod shaped macronucleus, three skeletal plates. *Ophryoscolex ecaudatum* (n.sp.) is recognized by absence of long ventral caudal spine. The caudal complex is present with two circlets of spines.

Keywords: Rumen, Cattle, Protozoa, Ciliates, Ophryoscolecinae, *Epidinium*, *Ophryoscolex*

INTRODUCTION

Rumen is the largest compartment of the stomach occupies 80 per cent of the abdomen in the ruminant animals. The rumen does not secrete any enzyme but constantly receives the saliva. The pH of the rumen is in between 5-7.5. The condition is strictly anaerobic and temperature ranges from 38-41°C. In this way the rumen favors for microbial fermentation. Rumen microorganism includes viruses, bacteria, fungi and protozoa. Of them protozoa have large bodies and characteristic shape.

Gruby and Delafond (1843) first reported the protozoa from ruminants since then a number of protozoan species have been reported from different parts of the world Dogiel (1927) Becker & Talbott (1927), Hsiung (1932) Clarke (1964), Ogimoto & Imai (1981) and Dehority (1993,2005) Gocman (1999a,1999b, 2000) Gocman *et al.*, (2005) Martenele *et al.*, (2008), Gocman and Gurelli (2009), Dirk *et al.*, (2010), Dirk and Dehority (2011) and Gurelli (2014), but very few studies have been made in India. Kofoed and MacLennan (1930, 1932, 1933), Dasgupta (1935), Banerjee (1955), Mathur (1963), Misra (1972), Mukherjee & Sinha (1989,1990) studied rumen ciliates from different hosts. Kulkarni & Kshirsagar (2001) studied the genus *Entodinium* and reported 13 new species. The present paper deals with the taxonomy of two new species from the subfamily Ophryoscolecinae. One new species recorded from the genus *Epidinium* and one new species reported from the genus *Ophryoscolex*.

MATERIALS AND METHODS

During the present study rumen fluid samples were collected from 814 adult Indian cattle slaughtered at abattoirs of Kannad, Dist. Aurangabad of Maharashtra State (India). After the removal of the stomach the rumen was slit open and 10-15ml of rumen fluid was collected in a glass vial then the immediately the glass vial was closed airtight and brought to the laboratory. It was centrifuged and preserved by adding 1:1 glycerine alcohol solution. To determine the intensity of the ciliates live specimen were examined under the microscope by taking drop of fluid on a clean glass slide.

The permanent slides of the sample were made in duplicate stained by wet Tungstophosphoric Haematoxylin stain. Identification of genera and species of rumen ciliates were based on description published by earlier workers (Dehority 1993). All the measures of the ciliates were based on a study of 50 specimens (n=50) with an ocular micrometer, line drawings were made with a camera lucida at magnification 10x X 40x.

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Sub Kingdom : Protozoa
 Phylum : Ciliophora
 Class : Kinetofragminophorea
 Subclass : Vestibulifera
 Order : Entodiniomorphida
 Family : Ophryoscolecidae
Subfamily : Ophryoscolecinae
 Genus : *Epidinium* - Left ciliary zone below ant. end, 3 sk. plates
 Genus : *Ophryoscolex* - Left ciliary zone forms girdle about half way between the middle and the anterior end, 3 sk. plates.

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RESULTS AND DISCUSSION

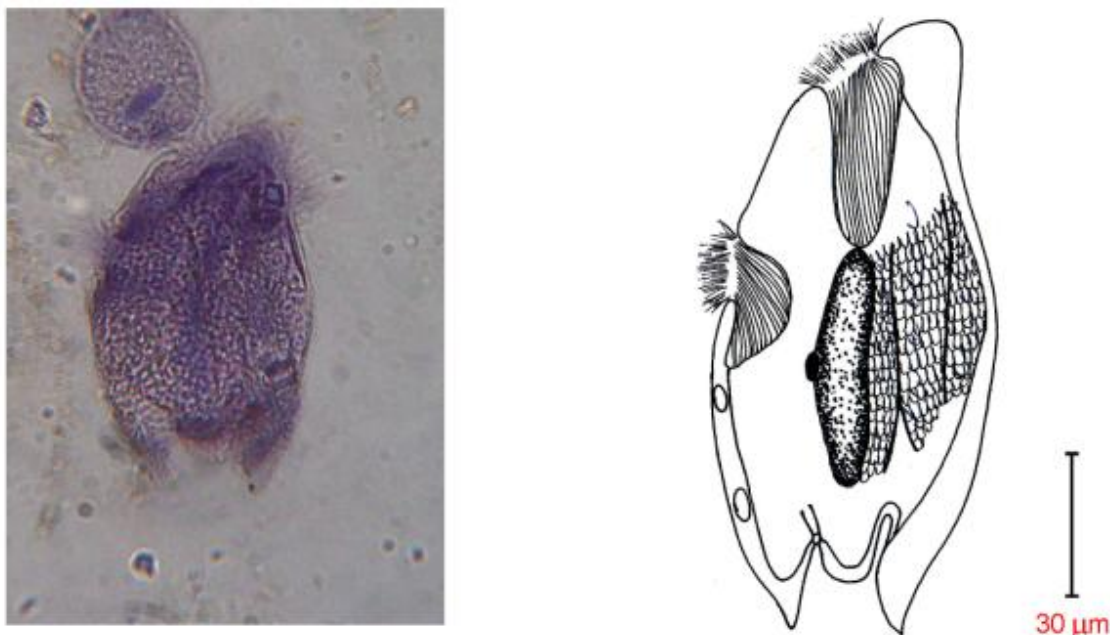


Figure 1: Photomicrograph & Linedrawing of *Epidinium trilobatum* n.sp. (40x X 10x)

Morphology

The body of this species is short, slightly ellipsoidal. The adoral ciliary zone large encloses mouth and the left ciliary one lies behind the anterior end of the body. The operculum is broad well developed. Both the body surfaces are more convex in the middle of the body extends posteriorly tapers and gives three short blunt ended lobes. It is the distinguishing character of this species. The endoplasmic sack well developed ellipsoidal in shape. The ectoplasm is clearly divided by a distinct boundary layer. The rectum is an ectoplasmic, tubular structure arises in posteroventral region of the endoplasmic sack and opens through circular anus. The macronucleus is rod shaped lies in middorsal region of the body. The micronucleus is small ellipsoidal body lies in a small depression at the middorsal side of the macronucleus. The contractile vacuoles are two in number lies in ectoplasm along the dorsal side close against the boundary line. Anterior found just behind the left ciliary zone and posterior contractile vacuole lies at the level of posterior end of macronucleus. There are three skeletal plates nearly of equal size arising anteriorly from the base of the ciliary zones upto posterior one third of the body.

Comments

This species is similar to the *Epidinium triacaudatum* (Kofoid & MacLennan, 1933) and *Epidinium bovis* (Banerjee, 1955) in body shape, two ciliary zones, three caudal projections and three skeletal plates similar in *Epidinium* group.

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However, this species differs from *Epidinium triacaudatum* in having short body as compared to long elongated body. The L/W ratio of this species is 1.32 as against the L/W ratio 2.31 of *E. triacaudatum*. It differs in the body surfaces, which are more convex than the straight in *E. triacaudatum*. It differs mainly in the caudal projections, which are blunt lobe like in this species while *E. triacaudatum* shows ventral spine longest, pointed and other two are pointed and long.

This species differs from the *E. bovis* in having short body as against the maximum length 200µm. The length of macronucleus is also less as compared to the *E. bovis*. This species differs in having three short, blunt posterior lobes as against three prominent spines of always-equal size.

In view of these differences, the species described here is considered new to the science.

Distinguishing Characters

Body is short with convex surfaces and posterior three short, blunt lobes.

Table 1: Comparative body dimensions of closely related species of *Epidinium* with that of *Epidinium trilobatum* n.sp.

Parameters	Authors		
	Kofoed & Maclellan (1933) <i>Epi.tricadatum</i>	Banerjee (1955) <i>Epi. bovis</i>	Present Study <i>Epidinium.trilobatum</i> n.sp. (n=2)
Length	85-131 (112)	150-200 (174.16)	80
Width	42-60 (49)	70-120 (87.5)	60.8
L/W ratio	2.02-2.5 (2.31)	--	1.32
Ma nu. L	19-80 (60)	70-110	32-41.6 (36.8)
Lobe/Spine L	5-35 (24)	50-85	8-14.4 (11.2)



Figure 2: Photmicrograph & Linedrawing of *Ophryoscolex ecaudatum* n. sp. (40x X 10x)

Morphology

The body of this species is elongated, large slender in shape. The adoral ciliary zone is large encloses mouth. The left ciliary zone lies behind anterior end of the body. It forms a girdle around the body starting from dorsal side, ends near the ventral skeletal plate. The dorsal surface is slightly convex the

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ventral surface is straight flat, extends to posterior end. The most striking feature of this species is the caudal complex. It shows the spines arranged in two circlets without any main caudal spine. The anterior circlet composed of bifurcate spines while the posterior circlet comprises ventral short spines of equal length. The mouth opens into a tubular wide oesophagus arises from the base of the adoral ciliary zone. It opens into the endoplasmic sack occupies all portion of the body. The ectoplasm is thick, separated by a distinct boundary line. The endoplasmic sack extends posteriorly and gives a tubular rectum. It opens through a circular anus lies in the posteroventral end of the body. The macronucleus is long rod shaped structure lies in the middorsal region of the body. The anterior end is smooth rounded, while the posterior end slightly shorter with blunt end. The micronucleus is a small ellipsoidal body lies in middorsal region of the body. There are ten contractile vacuoles arranged in two rows. The anterior row of five contractile vacuoles larger while posterior row of five contractile vacuoles is slightly small. The three skeletal plates lie in right ventral surface of the body. The dorsal plate lies close to the macronucleus arises from the operculum. The median plate starts from the ventral right side of the oral zone. The ventral plate arises from ventral edge of the oral zone and extends with median plate. The body dimensions and other measurements of *Ophryoscolex ecaudatum* n. sp. are given in table 2.

Comments

This species is similar to the *Ophryoscolex spinosus* (Kofoid & Maclellan, 1933) and *Ophryoscolex purkynjei* f. *bifidocinctus* (Gocman, 1999a) in shape, size and in having two caudal circlets of spines.

This species is close to the *O. spinosus* in length and having two caudal circlets of spines. It differs in the width of body. The L/W ratio is 1.79 as against the 1.92. This species is mainly differs from *O. spinosus* in having the two caudal circlets.

The posterior circlet has the short spines with equal length and the main, short ventral spine is absent which is present in *O. spinosus*. This species differs from *O. purkynjei* f. *bifidocinctus* in size. The L/W ratio is 1.79 as against 2.01. The *O. purkynjei* f. *bifidocinctus* shows a bifurcated short main ventral spine which is absent in the present species. The table 2 shows the comparative body dimensions of the closely related species with that of the species described. In view of these differences, the species described here is considered new to the science.

Distinguishing Characters

Body is large, straight caudal complex with two circlets of spines. The main, ventral spine is absent.

Table 2: Comparative body dimensions of closely related species of *Ophryoscolex* with that of *Ophryoscolex ecaudatum* n.sp.

Parameters	Authors <i>O. spinosus</i> Kofoid & Maclellan (1933)	<i>O. purkynjei</i> f. <i>bifidocinctus</i> Gocman (1999 a)	Present study <i>Ophryoscolex</i> <i>ecaudatum</i> n.sp (n=50)
Length	122-160 (146)	120-197.5 (157.55)	115.2-172.8 (146.13)
Width	63-82 (75)	65-92.5 (78.41)	60.8-112 (82.05)
L/W ratio	1.59-2.14 (1.92)	1.73-2.53 (2.01)	1.54-2.16 (1.79)
Ma.Nu L	60-86 (73)	45-77.5 (60.77)	35.2-83.2 (63.23)
Ma.Nu Dia	--	16.25-22.5 (18.75)	8-14.4 (11.01)
Mi.Nu Dia	5-8	10-13.75 (11.64)	6.4-11.2 (8.61)
Mouth	30-40 (36)	--	16-28.8 (22.28)
V. spine L	10-20 (14)	15-25 (21.39)	4.8-19.2 (10.20)

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