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Research Article

# A Study of Some Ophryscolecid Ciliates from the Rumen of Goat

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## Abstract

To study the morphology of rumen ciliates from the subfamily ophryoscolecinae from rumen of goat (Capra hircus) rumen samples were collected. The present paper deals with the study of ciliates from the genus Ophryscolex. O. purkeynjei, Stein (1858) recorded first time from the rumen of goat in India and occurrence of Ophryscolex caudatus, Eberlein 1895, O. caudatus, f. bicoronatus, O. caudatus, f. tricoronatus, is reported. Morphology of all the species with variations is described and data of body dimensions are recorded first time in India from the rumen of goat from the specimens taken at random (n = 20) from different slides and compared with earlier reports.

**Keywords:** Rumen; Ciliates; Ophryoscolecinae; *Ophryscolex*

## Introduction

The rumen microflora comprises bacteria, fungi and protozoa. Gruby and Dalofond in 1842 first described the rumen protozoa majority are ciliates and flagellates are few in number have an important role in contributing nutrients to the host animal Ogimoto and Imai [21]. Ruminants like goats have a similar complex ecosystem in the gut harbouring a variety of microorganisms capable of bringing out diverse types of fermentation William and Coleman [23]. Though the composition of rumen ciliates varies by geographic regions host species and their feed consumption. A large number of ciliates have been observed in different condition Kamara [13].

A number of protozoan species have been reported from different parts of the world Becker and Talbott [2], Dogiel [6], Hsiung T.S [12]. Clarke R.T.J. [3], Ogimoto and Imai [21] and Dehority [5], Gocman B [7,8]. Gocman., *et al.* [9,10], and Gurelli [11], but very few studies have been made in India. Kofoid and Maclennan [14-16], Dasgupta M [4], Banerjee A.K. [1], Mukherjee and Sinha [18,19]. studied rumen ciliates from different hosts. Kulkarni and Kshirsagar [17] studied the genus *Entodinium* and reported 13 new species. Sanghai [21,22]. studied the morphology of rumen ciliates from the rumen of cattle and goat. Zacarias Da silva., *et al.* [24] studied geographic distribution, host specificity, phylogeny and molecular dating Rumen ciliates associated with goats.

The present paper deals with the study of ciliates from the genus *Ophryscolex. O. purkeynjei*, Stein (1858) recorded first time from the rumen of goat in India and occurrence of *Ophryscolex caudatus*, Eberlein 1895**,** *O. caudatus*, f. *bicoronatus, O. caudatus*, f. *tricoronatus*, and detail morphometric measurements of above species reported first time in India from the rumen of goat.

## Material and Methods

In the present study rumen contents from 169 adult goats *Capra hircus* slaughter houses of Kannad, Dist. Aurangabad of Maharashatra State (India) were collected. The materials were preserved and 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 [5]). All the measures of the ciliates were based on a study of 20 specimens (n = 20) with an ocular micrometer, line drawings were made with a camera lucida at magnification 10x X 40x.

### *Ophryoscolex caudatus,* Eberlein 1895

### Description of the species: - (Figure 1)

The body of this species is heavy, large elongated in shape. The adoral ciliary zone is well developed and inclined which encloses mouth. The left ciliary zone situated behind the anterior end of

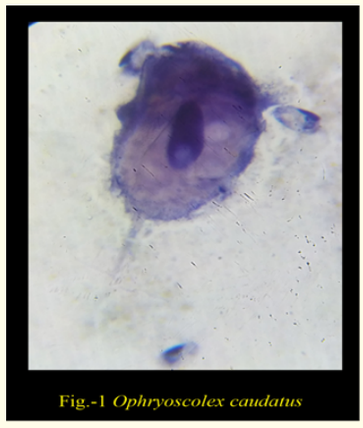


**Figure 1**

the body similar in *Epidinium.* It forms a median girdle around the body extending from dorsal skeletal plate upto the ventral skeletal plate. The body surfaces are greatly convex. The greatest diameter of the body observed in the middle of the body. The posterior ventral region of the body shows caudal complex. The main ventral caudal spine is straight, long and pointed.

The mouth opens into the oesophagus which is tubular lie in the right dorsal surface. It opens into the endoplasmic sack, occupies almost all portion of the body. The ectoplasm is thick separated by a distinct boundary line. The rectum is short tubular ectoplasmic structure situated in the posterior ventral end of endoplasmic sack. It opens through the anus, found in the anterior circlet of spines near the base of the main caudal spine.

The macronucleus is an elongated rod shaped body lies in the middorsal region of the body. The anterior end of macronucleus is broad, smooth rounded. The posterior end also smooth rounded nearly equal in size. The micronucleus is an ellipsoidal body found in the middorsal region of the macronucleus.

There are nine to ten contractile vacuoles arranged in two rows anterior contractile vacuoles slightly larger than the posterior contractile vacuoles. The skeletal complex is composed of three long skeletal plates lying in the right ventral side of the body as in the *Epidinium*. The dorsal plate arises from the operculum and ends in the middle of the body. The median plate starts from the right side of the oral zone with dorsal and ventral plate. The ventral plate runs along with the median skeletal plate.

### Comments

Dogiel [6] described this species with three formae *O.caudatus* f. *bicoronatus*, *O. cudatus* f. *trircoronatus* and *O.caudatus* f. *quadricoronatus*. Dasgupta [4] described *O.caudatus* f. *tricoronatus* from the rumen of goat in India but the dimensions are not given. Mukherjee and Sinha [19] detected this species from the rumen of goat but the measurements are not given.

A comparison of the body dimensions of the species described here and those given by earlier workers are shown in table1.

The table reveals that the length and the width of the species described here is smaller than the values recorded by previous authors. The L/W ratio is similar to the L/W ratio given by Dehority [5] and the L/W ratio recorded by the author.

| Parameters | Authors | | | | |
|---|---|---|---|---|---|
| | Dogiel [6] | Ogimoto and Imai [21] | Dehority [5] | Sanghai [21] from cattle | Present Study (n = 12) |
| Length | 128-180 (163) | 140-160 | 137-162 (150) | 134-185.6 (159.27) | 102.04-140.80 (120.53) |
| Width | 86-100 (96) | 80-110 | 80-98 (89) | 80-112 (97.42) | 61.44-81.92 (72.32) |
| L/W ratio | 1.7 | -- | 1.65 | 1.44-1.73 (1.64) | 1.43-1.83 (1.67) |
| Ma. Nu. L | -- | -- | -- | 60.8-83.2 (71.82) | 35.84-51.20 (43.52) |
| V. Spine L | -- | -- | 47-60 (54) | 8-22.4 (14.76) | 28.16-40.96 (33.49) |

**Table 1:** Comparative body dimensions of *Ophryoscolex caudatus.*

### *Ophryoscolex caudatus, f. bicoronatus* Eberlein 1895

### Description of the species: - (Figure 2)

The body of this species is heavy, large elongated in shape. The adoral ciliary zone is well developed and inclined which encloses mouth. The left ciliary zone situated behind the anterior end of the body similar in *Epidinium.* It forms a median girdle around the body extending from dorsal skeletal plate upto the ventral skeletal plate. The body surfaces are greatly convex. The greatest diameter of the body observed in the middle of the body. The posterior ventral region of the body shows caudal complex. The main ventral caudal spine is straight, long and pointed. The most identifying character is presence of two circlets of short spines around the ventral spine.

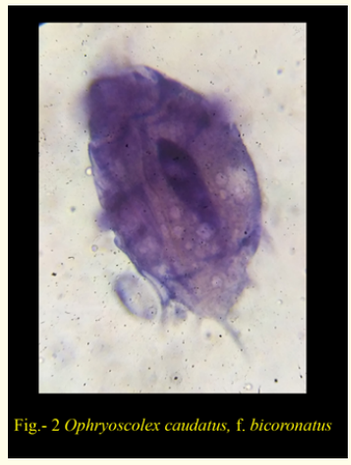

Fig.- 2 *Ophryoscolex caudatus,* f. *bicoronatus*

**Figure 2**

The mouth opens into the oesophagus which is tubular situated in the right dorsal surface. It opens into the endoplasmic sack, occupies greater portion of the body. The ectoplasm is thick separated by a distinct boundary line. The rectum is tubular ectoplasmic structure situated in the posterior ventral end of endoplasmic sack. It opens through the anus, found in the anterior circlet of spines near the base of the main caudal spine.

The macronucleus is an elongated rod shaped body lies in the middorsal region of the body. The anterior end of macronucleus is broad, smooth rounded. The posterior end also smooth rounded nearly equal in size. The micronucleus is an ellipsoidal body found in the middorsal region of the macronucleus.

There are nine to ten contractile vacuoles arranged in two rows anterior contractile vacuoles slightly larger than the posterior contractile vacuoles. The skeletal complex is composed of three long skeletal plates lying in the right ventral side of the body as in the *Epidinium*. The dorsal plate arises from the operculum and ends in the middle of the body. The median plate starts from the right side of the oral zone with dorsal and ventral plate. The ventral plate runs along with the median skeletal plate.

### Comments

Dogiel [6] described this species with three formae *O. caudatus* f. *bicoronatus*, *O. cudatus* f. *trircoronatus* and *O. caudatus* f. *quadricoronatus*. Dasgupta [4] described *O. caudatus* f. *tricoronatus* from the rumen of goat in India but the dimensions are not given. Mukherjee and Sinha [19] detected this species from the rumen of goat but the measurements are not given.

A comparison of the body dimensions of the species described here and those given by earlier workers are shown in table 2.

The table reveals that the length and the width of the species described here is smaller than the values recorded by previous authors. The L/W ratio is similar to the L/W ratio given Dogiel [6].

| Parameters | Authors | | | | |
|---|---|---|---|---|---|
| | Dogiel [6] | Ogimoto and Imai [21] | Dehority [5] | Gocman., *et al.* [10] | Present Study |
| Length | 128-180 (163) | 140-160 | 137-162 (150) | 120.00-145.00 (130.90) | 107.52-151.04 (125.82) |
| Width | 86-100 (96) | 80-110 | 80-98 (89) | 82.50-102.50 (92.50) | 56.32-92.16 (72.58) |
| L/W ratio | 1.7 | -- | 1.65 | 1.26-1.62 (1.42) | 1.53-2.00 (1.74) |
| Ma.Nu.L | -- | -- | -- | 57.50 72.50 (64.29) | 30.72-64.00 (50.94) |
| V. Spine L | -- | -- | 47-60 (54) | 32.50-65.00 (50.00) | 25.6-43.52 (34.43) |

**Table 2:** Comparative body dimensions of *Ophryoscolex caudatus* f. *bicoronatus.*

### *Ophryoscolex caudatus,* f. *tricoronatus,* Eberlein 1895

### Description of the species: - (Figure 3)

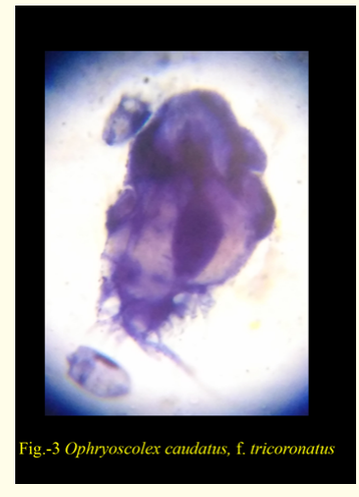

Fig.-3 *Ophryoscolex caudatus,* f. *tricoronatus*

**Figure 3**

The body of this species is heavy, large elongated in shape. The adoral ciliary zone is well developed inclined at an angle of 40° in which mouth is situated. The left ciliary zone lies behind the anterior end of the body. It forms a median girdle around the body extending from dorsal skeletal plate ends near the ventral skeletal plate. The body surfaces dorsal and ventral surface are greatly con-

vex. The maximum diameter found in the middle of the body. The posterior ventral region of the body shows caudal complex. The main ventral caudal spine is straight, long and pointed. Three circlets of short spines are present around the ventral spine which identifies this species.

The mouth opens into the oesophagus. The oesophagus is a tubular structure lie in the right dorsal surface. It opens into the endoplasmic sack, which occupies major portion of the body. The ectoplasm is thick separated by a distinct boundary line. The rectum is a narrow tube-like ectoplasmic structure lie in the posterior ventral end of endoplasmic sack. It opens through the anus, which found in the anterior circlet of spines near the base of the main caudal spine.

The macronucleus is an elongated rod-shaped body situated in the middorsal surface of the body. The anterior end of macronucleus is broad, smooth rounded. The posterior end also smooth rounded nearly equal in size. The micronucleus is an ellipsoidal body found in the middorsal region of the macronucleus.

The nine to ten contractile vacuoles arranged in two rows. The skeletal complex is composed of three long skeletal plates lying in the right ventral side of the body as in the *Epidinium*. The dorsal plate originates from the operculum and ends in the middle of the body. The median plate arises from the right side of the oral zone with dorsal and ventral plate. The ventral plate runs along with the median skeletal plate.

### Comments

Dogiel [6] described this species with three formae *O. caudatus* f. *bicoronatus*, *O. cudatus* f. *trircoronatus* and *O. caudatus* f. *quadricoronatus*. Dasgupta [4] described *O. caudatus* f. *tricoronatus* from the rumen of goat in India but the dimensions are not given. Mukherjee and Sinha[19] detected this species from the rumen of goat but the measurements are not given.

A comparison of the body dimensions of the species described here and those given by earlier workers are shown in table 3.

The table reveals that the body dimensions reported here are smaller than the dimensions given by earlier workers The L/W ratio is similar to the L/W ratio given by Dogiel [6]. and Gocman., *et al*. [10].

| Parameters | Authors | | | | |
|---|---|---|---|---|---|
| | Dogiel [6] | Ogimoto and Imai [21] | Dehority [5] | Gocman., *et al.* [10] | Present Study |
| Length | 128-180 (163) | 140-160 | 137-162 (150) | 123.75-182.50 (151.66) | 115.2-169.84 (135.30) |
| Width | 86-100 (96) | 80-110 | 80-98 (89) | 77.50-106.25 (88.50) | 69.12-89.60 (76.03) |
| L/W ratio | 1.7 | -- | 1.65 | 1.29-2.15 (1.72) | 1.57-1.94 (1.78) |
| Ma.Nu.L | -- | -- | -- | 50.00 -80.00 (66.48) | 43.52-71.68 (55.42) |
| V. Spine L | -- | -- | 47-60 (54) | 37.50-80.50 (59.53) | 23.4-61.44 (39.68) |

**Table 3:** Comparative body dimensions of *Ophryoscolex caudatus* f. *Tricoronatus.*

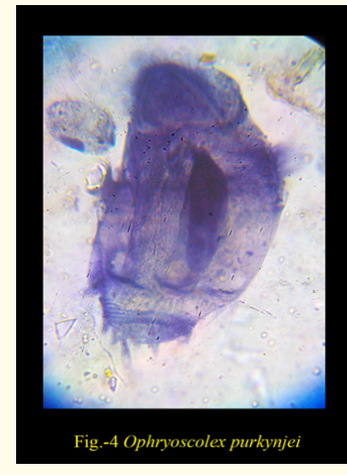


**Figure 4**

### *Ophryoscolex purkynjei,* Stein 1858

### Description of the species: - (Figure 4)

The body of this species is large, heavy and elongated. The adoral ciliary zone is larger well inclined at angle of 45°. The left ciliary zone situated much below the adoral ciliary zone as in *Epidinium.* It extends posteriorly and terminates near the ventral skeletal plate forming a girdle around the body. Both the surfaces are greatly convex, posteriorly become narrow and derive a complex of caudal spines. The maximum diameter found in the middle of the body. The main ventral spine is short, stout and there are three complex circlets of spines.

The mouth extends posteriorly into the tubular oesophagus found in right surface of the body. The endoplasmic sack originates behind the oral area to the posterior end of the body. The ectoplasm is thick and differentiated by a distinct boundary layer. The rectum is a narrow tubular ectoplasmic structure situated in the postero-ventral region of the body. It opens through the anus lies within the anterior circlet of spines near the base of main caudal spine.

The macronucleus is an elongate, rod shaped body found in the dorsal surface of the body. The anterior end of macronucleus is broad, smooth rounded. The posterior end also smooth rounded nearly of equal size. The micronucleus is a small ellipsoidal body lies in the middorsal region of the body.

There are nine contractile vacuoles found in two rows. The skeletal complex made up of three plates similar in *Epidinium*. The dorsal plate originates from the operculum to the level of micronucleus. The median plate starts from the right side of the oral zone lies between the dorsal and ventral plate. The ventral skeletal plate arises from ventral edge of oral area runs along with the median plate.

## Comments

Dogiel [6] reported this species in the rumen of cattle as *Ophryoscolex purkynjei*. Subsequently several authors described this species. Gocman [7] detected from the rumen of cattle in Turkistan with new formae *O.purkynjei* f. *bifidocinctus*. The comparative dimensions of the species described here and those given by earlier workers are shown in table 4.

The table indicates that the body dimensions of the present species are smaller as compared to the values given by previous authors. However, the L/W ratio is similar to the L/W ratio given Gocman., *et al.* [10]. The length of macronucleus measured here is less as compared to the length of macronucleus given by other authors.

| Parameters | | Authors | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Dogiel [6] | Becker and Talbott [2] | Ogimoto and Imai [21] | Dehority [5] | Gocman [7] | Gocman., *et al.* [10] | Gocman and Y. Sezgin [9] | Sanghai[21] from cattle | Present study (n = 16) |
| Length | 155-215 (185) | 200 | 150-190 | 155-215 (185) | 102.5-220 (151.83) | 117.5-197.5 (159.84) | 137.24-227.76 (182.15) | 131.2-192 (161.53) | 99.84-133.12 (117.76) |
| Width | 80-110 (95) | 80 | 80-110 | 80-110 (95) | 58.75-125 (84.46) | 65.00-110.00 (91.45) | 64.24-148.92 (107.34) | 80-115.2 (98.82) | 56.32-79.36 (66.56) |
| L/W ratio | 1.94 | -- | -- | 1.94 | 1.37-2.59 (1.81) | 1.54-2.12 (1.75) | -- | 1.39-1.82 (1.64) | 1.62-2.04 (1.77) |
| Ma nu. L | -- | -- | -- | -- | 36.25-100 (63.71) | 46.50-87.50 (62.86) | -- | 54.4-96 (72.77) | 35.84-53.76 (44.48) |
| Ma nu.Dia. | -- | -- | -- | -- | 12.5-26.26 (18.47) | 20.0-27.50 (22.96) | -- | 6.4-16 (12.04) | 8.96-14.08 (12.40) |
| Minu.dia. | -- | -- | -- | -- | 5-13.75 (10.62) | -- | -- | 6.4-12.8 (8.50) | 8.96-8.72 (8.65) |
| V.spine L | -- | -- | -- | -- | 6.25-40 (16.44) | -- | -- | 9.6-22.4 (14.48) | 12.8-19.2 (15.6) |

**Table 4:** Comparative body dimensions of *Ophryoscolex purkynjei.*

## Conclusion

The present paper deals with the study of ciliates from the genus *Ophryscolex.* The species *Ophryoscolex purkynjei* Stein (1858) observed first time in India from the rumen of goat. Occurrence of *Ophryscolex caudatus*, Eberlein 1895, *O. caudatus*, f. *bicoronatus, O. caudatus*, f. *tricoronatus*, and detail data of morphometric measurements of above species recorded first time in India from the rumen of goat. The body dimensions were compared with previous reporters and described the similarities.

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## Conflict of Interest

The author declare that there is no conflict of interest.

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