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Prevalence and morphological details in the common freshwater ciliate, *Coleps hirtus* from nashik district of Maharashtra

Sunil N. Bhamare[1], Susheel V. Nikam[2] and Bhimrao N. Jadhav[3]
[1]Department of Zoology K.R.A. College Deola Dist. Nashik (M.S.).
[2]Department of Zoology, Dr. B.A.M. University Aurangabad (M. S.).
[3]Department of Zoology Swami Dayanand College Gangapur Aurangabad (M. S.).

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ABSTRACT
A ciliate *Coleps hirtus* is primarily a member of the Prostomatea (Schewiakoff, 1896), subclass Hypotrichia. During the period two years Jan. 2007 to Dec. 2008 total number of 1626(677 in Jan. to Dec. 2007 and 947 in Jan. to Dec. 2008) samples was examined, the number of positive samples with Coleps sp. was 281. The percentage prevalence was 14.33 and 19.43 respectively. Morphologically it show barrel shaped body with number of rectangular peculiar calcareous plates and three spinous processes at the posterior side. The characters help to understand this species even in swimming condition.

Introduction

The members of Class Prostomatea (Schewiakoff, 1896) of Phylum Ciliophora are more or less ovoid with simple cilia in rows. They May have associated toxicysts or inconspicuous compound cilia. In division a second mouth forms on one side and moves to the front once the daughter cells split. Somatic monokinetids usual, with radial transverse ribbon, slightly convergent postciliary ribbon, and anteriorly directed kinetodesmal fibril that do not overlap those of other kinetids; somatic kinetids often arranged in paratenes. Cytostome apical to subapical; oral dikinetids, radial to tangential to perimeter of oral area; oral dikinetid postciliary ribbons that extend laterally (from each dikinetid, overlapping one another, and, in some species, forming a circular microtubular band that supports. The walls of a shallow precytostomal cavity; with rhabdos-like cytopharyngeal apparatus. Stomatogenesis ventral with migration of cytostome to apical position following cytokinesis. This class includes subclass Holotricha, in these individuals, uniform ciliation over the body surface. Nutrition is hilozoic or saprozoic. Encystment is common. Cytostome absent in Astomatida. The holotricous ciliates are widely and abundantly distributed in all fresh and salt waters. This subclass includes order Gymnostomatida or Prorodontina. In the individuals of this subclass cytostome opens directly to the outside. Cytopharynx with trichites. Body ciliature is simple, no oral cilia. This order includes suborder Rhabdophorina, in these organisms cytostome is located at anterior end or laterally. Trichites in the cytopharyngeal wall (Rabdophorine). Uniform body ciliation. Many carnivorous forms. This suborder has the Family Colepidae, in which Cytostome at anterior end. Body barrel shaped with pellicular plates. Uniform ciliation. Genus Coleps is a member of this family.

Genus Coleps show inducible morphological defences, forming lateral or dorsal projections that reduce the ability of ciliate, amoeboid, oligochaete or turbellarian predators to ingest them (Kuhlmann et al., 1998). While some behavioural defences have been reported [jumping responses and diel vertical migration (DVM)], it is unclear whether the behaviours are inducible, and in the case of DVM, whether this is even a defence strategy (Gilbert, 1994; Rossberg and Wickham, 2008).

Systematics

Domain: Eukaryota
Kingdom: Protozoa Goldfuss, 1818, Rown, 1858
Subkingdom: Biciliata
Infrakingdom: Alveolata Cavalier & Smith, 1991
Phylum: Ciliophora Doflein, 1901, Copeland, 1956
Subphylum: Intramacronucleata Lynn, 1996
Class: Prostomatea Schewiakoff, 1896
Order: Prorodontida Corliss, 1974
Family: Colepidae Ehrenberg, 1833
Genus: Coleps Nitzsch, 1827
Species: C. hirtus (Muller, 1786) Nizsch, 1827 Spencer, 1923

Material and Methods

The water samples were collected from different parts of Nashik dist (Deola, Nandgaon; Surgana, Satana) of Maharashtra state. Water samples were collected in wide mouth, sterilized glass bottles. Due care was taken and the samples were collected from where the submerged plants and decaying leaves were present. Mostly the samples were collected during morning and evening. The temperature of the sample bottles were maintained with the help of ice bags. Rapid movements of ciliates make it difficult to identify ciliate species.

To immobilize their movements methyl cellulose solution was used. The three culture methods were used for the preparation of permanent slides which were Hay infusion, Wheat infusion and Rice infusion. The Hay infusion and Rice grain infusion are most effective methods for Coleps species. Different culture media and methods published by Mackinnon and Hawes (1961), Kirby (1950) and committee on cultures, Society of Protozoologist (1958).

Tele:
E-mail addresses: bhamaresunil71@gmail.com

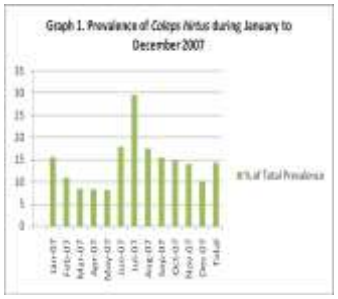
Water sample is obtained from different water bodies contains a mixer of organism, by adding any type of culture media (Wheat or rice infusion) can generally rise the number of certain ciliate species (by rising the bacterial population present)in the water sample, but often lower the number of species. However the rough sample containing several ciliates including Coleps and unknown bacterial and algal floras can be obtained for several weeks. Selection of a particular ciliate species and culturing it in the isolation of organisms other than its prey may obtain a greater degree of control over a culture.

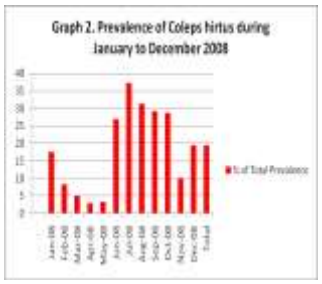
Culture were examined under low power and then in to high power microscope taking care to focus at all levels in the culture watching for movements of any kind. Movements of ciliates were also trapped in video camera for the proper understanding. Dry silver impregnation was used to study infraciliature of the ciliates. For the permanent slides the ciliates were fixed in terms of number of individuals and species composition. Methyl cellulose has been found too many advantages, as it arrest the movement, ciliates can be identified by their appearance. The species identification has been made mainly on the basis of arrangement of cilia, size and shape of body and structure of macro and micronucleus.

Results and discussions

During the period two years Jan. 2007 to Dec. 2008 total number of 1626(677 in Jan. to Dec. 2007 and 947 in Jan. to Dec. 2008) samples was examined, the number of positive samples with Coleps sp. was 281. During Jan. 07 to Dec. 07 the total no of 97 samples were positive and the percentage prevalence was 14.33%. The maximum no. of samples found positive in July 2007 and it was 29.63% and minimum was in May and it was only 8.20% the minimum to moderate was seen during the rest of the months.

During Jan. 08 to Dec. 08 the total no of 184 samples were positive and the percentage prevalence was 19.43%. The maximum no. of samples found positive in July 2008 and it was 37.23% and minimum was in April and it was only 2.90% the minimum to moderate was seen during the rest of the months. The month wise prevalence of Coleps hirtus is shown in table 1 and 2.





Morphological details of Genus Coleps Nitzsch, 1827

The genus Coleps is first reported by Nitzsch, 1827 and is a member of class Prostomatia (Schewiakoff, 1896) and order Prodontida. The individuals of this order has an apical or slightly sub apical and ventral cytostome which is permanently opened to the surface but in some species mouth opening is rounded or oval in outline may be little sunken in a slight invagination or shallow atrium or an unadorned oral groove may be present. The species of this genus has the barrel shaped body.

Cytostome is at anterior side of the body and it directly opens to the outside. It is surrounded by slightly longer cilia. The cytopharyngeal complex is still of the rhobdos type. Pellicular plates are present which are regularly arranged in longitudinal rows and their number varies from species to species. There are 2 to 8 Spinous projections present at or near the posterior end of the body. Some species possess one or more long caudal cilia at the posterior end.

These organisms are commonly found in salt or fresh water.

The genus Coleps has following six species,

Coleps hirtus Muller, 1786
C. elongatus Ehrenberg, 1838
C. bicuspis Noland, 1925
C. octopinus Noland, 1925
C. spiralis Noland, 1925
C. heteracanthus Noland, 1925

The present author reported and redescribed the species Coleps hirtus (Muller, 1786) from Nashik district.

Coleps hirtus Muller, 1786

Coleps hirtus was first reported by O. F. Muller in 1786 by the name Coleps hirta. Nitzsch (1827) and Ehrenberg (1830, 1831) named it as Coleps hirtus. Many other workers such as Stein (1867), Fromental (1874), Kent (1880-1882), Maupas (1885, 1888, 1889) Butschli (1887-1889), Scheweakoff (1893, 1896), Rous (1901), Bhatia (1916, 1936), Ghosh (1921), Gulati (1925), Noland (1925, 1936), Lepsi (1926), Sandon (1927), Kahl (1935), Bick (1972, 1974), Mahajan and Nair (1974), Foissner et.al. (1994), Kasai (2001) and Kiyose (2001, 2003) reported the same genus. The same species, Coleps hirtus has been reported by Shaikh (2006) and C. elongatus is by Deshmukh (2010) from Aurangabad district. The present author has redescribed here C. hirtus

Description of the species

The body of the present species is barrel shaped, which covered by regularly arranged prominent ectoplasmic pellicular plates that are made of amorphous calcium carbonate. It measures about 37.5 to 62.5µ in length and 30 to 42.5µ in width. The nucleus is rounded to oval, centrally located in the body. The nucleus is seen reddish to brown in colour in living condition. It measures about 15 to 22.5µ in length and 10 to 20µ in width. The single, rounded contractile vacuole is located at the posterior end.

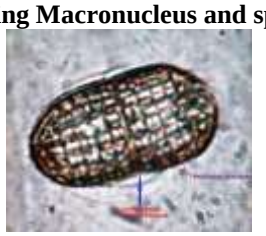
Anterior as well as posterior end of the body is rounded or slightly flattened, surrounded by tooth like projections of the plates. Oral aperture is circular and apically situated, which is surrounded by special plates. Oral basket is inconspicuous and surrounded by slightly long cilia. There are about 15 to 20 longitudinal rows of plates are present. At the posterior end three spinous processes are observed. Body has uniform ciliation along the regular longitudinal rows of plates. The ciliate moves along the axis with a moderate speed and also swims in a circular path.

They are commonly found in all types of water containing organic detritus. It also occurs in reservoirs, lakes and ponds. Single specimen can found in more or less polluted waters. These organisms feed saprophytically upon other protozoan or

rotifers etc., and on algae, flagellates and small ciliates, which are captured alive.

Plate No. 1.

A. W.M. showing Macronucleus and spinous projections



B. Binary fission

Comments

Genus Coleps was first reported by Nitzsch, 1827. Many other workers such as Stein (1867), Fromental (1874), Kent (1880-1882), Maupas (1885, 1888, 1889) Butschli (1887-1889), Scheweakoff (1893, 1896), Rous (1901), Bhatia (1916, 1936), Ghosh (1921), Gulati (1925), Noland (1925, 1936), Lepsi (1926), Sandon (1927), Kahl (1935), Bick (1972, 1974), Mahajan and Nair (1974), Foissner et.al. (1994), Kasai (2001) and Kiyose (2001, 2003) reported the same genus. The same species, Coleps hirtus has been reported by Shaikh (2006) and C. elongatus is by Deshmukh (2010) from Aurangabad district.

Body barrel shaped with regularly arranged pellicular ectoplasmic platelets, which is the main characteristic the genus Coleps. Coleps hirtus is long and has 15 to 20 longitudinal rows of pllicular platelets, Colpes elongatus has 14-17 rows of platelets while there are 16 rows of platelets in C. bicuspis and in C. octospinus there are about 24 rows of platelets present. C. spiralis is having 23 longitudinal rows of platelets.

Noland reported 16 longitudinal rows of pellicular platelets while Rao (1979) reported 14 to 16 rows of platelates. Shaikh (2006) observed 14 to 18 platelets in Coleps hirtus. Deshmukh (2010) reported 14 to 17 plates in C. elongatus while present author reported 15 to 20 longitudinal rows of these pellicular platelets. In number of rows of platelets, it is found to be more close to C. hirtus, C. elongatus and C. bicuspis but differs from C. elongatus as it is slender and narrower as C. hirtus is broader than the C. elongatus, C. spinous and also differs from C. bicuspis which has two posterior process while present species has 3 spinous processes at posterior. It also differs from C. octospinous which has 8 spinous posterior processes. Present species lacks the caudal cilium and hence differs from C. bicuspis and C. spiralis as these have a long caudal cilium at the posterior end.

After the discussion and comparison of the present species with all the species of genus Coleps, it is found to be more similar to C. hirtus only minor differences in morphometrics and hence redescribed here as Coleps hirtus.

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Table- I

Showing the Month wise Prevalence of *Coleps hirtus* during the period Jan.2008 to Dec.2007

Sr. No	Month	Total No. of Host Examined	No. of +ve Hosts	% of Total Prevalence
1	Jan-07	45	7	15.56
2	Feb-07	55	6	10.91
3	Mar-07	47	4	8.51
4	Apr-07	60	5	8.33
5	May-07	61	5	8.20
6	Jun-07	67	12	17.91
7	Jul-07	54	16	29.63
8	Aug-07	57	10	17.54
9	Sep-07	58	9	15.52
10	Oct-07	60	9	15.00
11	Nov-07	64	9	14.06
12	Dec-07	49	5	10.20
	Total	677	97	14.33

Table- II

Showing the Month wise Prevalence of *Coleps hirtus* during the period Jan.2008 To Dec.2008

Sr No	Month	Total No.of Host Examined	No.of .+ve Hosts	% of Total Prevalence
1	Jan-08	68	12	17.65
2	Feb-08	84	7	8.33
3	Mar-08	79	4	5.06
4	Apr-08	69	2	2.90
5	May-08	62	2	3.23
6	Jun-08	89	24	26.97
7	Jul-08	94	35	37.23
8	Aug-08	80	25	31.25
9	Sep-08	89	26	29.21
10	Oct-08	87	25	28.74
11	Nov-08	69	7	10.14
12	Dec-08	77	15	19.48
	Total	947	184	19.43

Table 17: Comparison of present species with the species of the genus *Coleps*

Sr. No.		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
	Particular	*C. hirtus* Muller, 1786	*C. elongatus* Ehrenberg1838	*C. bicuspis* Noland, 1925	*C. octospinous* Noland, 1925	*C. spiralis* Noland	*C. heterocanthus*, Noland	*C. hirtus* Shaikh, 2006	*C. elongatus* Deshmukh 2010	*C. hirtus* Present author
1	Body dimensions	Barrel shaped	Barrel shaped	Barrel shaped	Barrel shaped	Barrel shaped	Barrel shaped	Barrel shaped	Barrel shaped	Barrel shaped
2	Body size	40µ to 65u long	40u to 55u long	55µ long	80µ-110µ long	50µ long	90µ by 35µ	L- 73µ to 116µ W- 44 to 62µ	L- 38.59 to 45µ W-15.89 to 24.97µ	L- 37.5 to 62.5µ W- 30 to 42.5µ
3	No. of rows of pellicular platelets	15-20	14-17	16	24	23	--	14-18	14 to 17	15-20
4	Posterior spinous projections	3	3	2	8	--	Anterior process on one side, posterior spines drawn together	3	3	3
5	Habitat	Fresh water	Fresh water	Fresh water	Fresh water	Fresh water	Fresh water	Fresh water	Fresh water	Fresh water