Occurrence of Trichodinid Ciliophorans (Ciliophora: Peritrichida) in the freshwater fishes of the river Churni with description of *Trichodina glossogobae* sp. nov. in West Bengal, India

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Received: 18 June 2011 / Accepted: 8 September 2011 / Published online: 25 September 2011
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Abstract Between January 2011 and March 2011 occurrence of trichodinid ciliophorans were studied in the freshwater fishes of the river Churni. The biodiversity survey revealed presence of a new species of the genus *Trichodina* (Ehrenberg 1830) infesting *Glossogobius giuris* (Hamilton-Buchanan). Another freshwater fish *Labeo bata* (Hamilton 1822) were found to be infested with two species of the genus *Tripartiella* Lom 1959: *Tripartiella bulbosa* (Davis 1947) Lom 1959 and *T. copiosa* Lom 1959. Adhesive disc size of the new *Trichodina* species is small measuring 30.6–46.9 (36.2 ± 3.9) μm in diameter. The centre of the disc is finely granular and transforms into dark when impregnated with silver. The overall prevalence of this species is 15.6% (12/77). *Tripartiella bulbosa* and *T. copiosa* are very small sized ciliophorans, measuring 16.7–23.8 (20.6 ± 2.2) μm and 15.2–22.4 (19.7 ± 1.9) μm in diameter, respectively.

Keywords *Trichodina glossogobae* sp. nov. · *Tripartiella* spp. · Ectoparasite · Ciliophora · Fish · India

Introduction

Trichodinid ciliophorans are best known as ectoparasites of skin, fin and gill of the fish with most of the species reported from freshwater environments and are widely dispersed and present in many zoogeographical localities (Lom and Dykova 1992).

Importance has always been given worldwide in the studies of their biology, distribution, the impact of several environmental parameters and pathogenicity (Lom and Hoffman 1964; Lom 1970a, 1973; Ahmed 1977; Calenius 1980; Das and Pal 1987; Van As and Basson 1987; Sanmartin Duran et al. 1991; Özer and Erdem 1999; Özer 2000).

In India, little information was available till late 1970 although Annandale (1912) was the first who reported the occurrence of *Trichodina pediculus* Ehrenberg, 1838 from the lymnocyndid medusa, *Lymnocynda indica* in Bombay Presidency of British India. In the decade of 1990, research on this important group got some momentum and as a result several new species as well as erstwhile described species belonging to the genera *Trichodina* Ehrenberg, 1838, *Paratrachodina* Lom, 1963, *Trichodinella* (Raabe 1950) Šramek-Hušek, 1953, *Dipartiella* (Raabe 1959) Stein, 1961 have so far been reported (Hagargi and Amoji 1979; Mukherjee and Haldar 1982; Mishra and Das 1993; Saha et al. 1995; Asmat 2000a, b, 2001; Mitra and Haldar 2004, 2005; Mitra and Bandyopadhyay 2006a, b, 2009).

Biodiversity survey of trichodinid ciliophorans in freshwater fishes of the river Churni of the district of Nadia, West Bengal, India revealed *Trichodina glossogobae* sp.

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nov. infesting fish *Glossogobius giuris* (Hamilton-Buchanan) and *Tripartiella bulbosa* (Davis 1947) Lom, 1959 and *T. copiosa* Lom, 1959 infesting *Labeo bata* (Hamilton 1822).

The present paper deals with the taxonomy, systematic and prevalence of the trichodinid ciliophoran species based on the wet silver nitrate impregnation technique and comparisons with closely related species.

Materials and methods

Host fishes were collected by fishing nets between January 2011 to May 2011 in the river Churni passing through Ranaghat of West Bengal (Fig. 1). Gill and skin smears were made on grease free slides at the river side. Slides containing trichodinid ciliophorans were impregnated using Klein's dry silver impregnation technique (Klein 1958). Examinations of prepared slides were made under an Olympus research microscope (Model CH 20i) at 1000 $\times$ magnification with an oil immersion lens and photographs were taken with an Olympus digital camera. All measurements are in micrometers and follow the uniform specific characteristics as proposed by Lom (1958), Wellborn (1967) and Arthur and Lom (1984). In each case minimum and maximum values are given, followed in parentheses by arithmetic mean and standard deviation. In the case of denticles and radial pins, the mode is given instead of the arithmetic mean. The span of the denticle is measured from the tip of the blade to the tip of the ray. Body diameter is

measured as the adhesive disc plus border membrane. The description of denticle elements follows the guidelines of Van As and Basson (1989). Sequence and method of the description of denticle elements follows the recommendations of Van As and Basson (1992) (Figs. 2–7).

Results and discussion

One new species of trichodinid ciliophorans belonging to the genus *Trichodina* Ehrenberg 1830 was obtained from the host fish *Glossogobius giuris* (Hamilton-Buchanan) and two species of the genus *Tripartiella* Lom, 1959; *Tripartiella bulbosa* (Davis 1947) Lom, 1959 and *T. copiosa* Lom, 1959 from *Labeo bata* (Hamilton 1822).

Trichodina glossogobae sp. nov. (Figs. 2–4, 8a–c, Table 1)

Body dimension of this trichodinid ciliophoran infesting freshwater fish occupies the bottom range of dimensions as a small sized and disc shaped trichodinid. Slightly elevated central area is occupied by a clear zone which contains black argentophilic granules or small black patches unevenly distributed on it. A finely striated border membrane surrounds the adhesive disc. Denticles are well impregnated, broad, rectangular in appearance, and occupy the major portion of the y-axes. The distal margin of the blade remains at close proximity to the border membrane.

Fig. 1 Courses of various rivers including the river Churni in the southern part of West Bengal, India. Grey area indicates district of Nadia

Figs. 2–7 Silver impregnated adhesive discs of trichodinids. 2–4: *Trichodina glossogobae* sp. nov. (scale bars 25 μ m). 5: *Tripartiella copiosa* Lom, 1959 (scale bar 20 μ m). 6 and 7: *Tripartiella bulbosa* (Davis 1947) Lom, 1959 (scale bars 20 μ m)

In most cases the distal margin is rounded, but in some younger specimens, it is slightly truncated. Tangent point is blunt and is situated lower to the uppermost point of the distal margin. Anterior margin takes a smooth curve and forms an unimpressive apex. Anterior blade apophysis is visible. Posterior margin of blade forms a shallow semi-lunar curve that is situated almost at the same level as the apex. Posterior blade apophysis is absent. Blade connection

is broad, but slightly constricted, establishing separate identities of blade and central part. The central part is also broad and triangular and ends into bluntly pointed tip that reaches halfway towards the y-1 axis. The central part fits tightly with the preceding denticle. The portion of the central part above and below the x-axis is similar. Ray connection is broad and flattened. Ray is significantly smaller than the blade. Ray maintains the same thickness

Fig. 8 Diagrammatic drawings of the denticles of trichodinids. **a–c** *Trichodina glossogobae* sp. nov. from *Glossogobius giuris* (Hamilton-Buchanan) in the present study; **d** *T. domerguei* f. *jadranica* Raabe, 1958 from *Mullus barbatus* of Adriatic Sea [redrawn from Raabe (1958)]; **e** *T. domerguei* f. *gobii* Raabe, 1959 from *Gobius minutus* of Baltic Sea [redrawn from Raabe (1959)]; **f–g** *T. jadranica* from *Calino nymus lyra* of Brittany Coast of France [redrawn from Lom (1970b)]; **h** *T. jadranica noblei* Lom, 1970 from *Eleotries sandwicensis* of Hawaii [redrawn from Lom (1970b)]; **i** *T. jadranica* from *Citharichthys spilopterus* of Cuban estuary [redrawn from Arthur and Lom (1984)]; **j–k** *T. jadranica* from *Occa ibura* of Pacific Ocean [redrawn from Stein (1975)]

along its length terminating into a blunt end and directed to the geometrical centre of the adhesive disc. There are 6–9 (6.7 ± 0.9) radial pins per denticle. Adoral ciliary spiral takes a turn around 380–390°.

Taxonomic summary

Type host: *Glossogobius giuris* (Hamilton-Buchanan)
 Host family: Gobiidae
 Type locality: River Churni, Ranaghat (Latitude: 23.17°, Longitude: 88.57°), W. Bengal, India
 Location: Gill filaments
 Prevalence: 12/77 (15.6%)
 Holotype: In slide no. GG-3/2011, deposited in the collection of the Department of Zoology, Ranaghat College, P.O. Ranaghat, Dist. Nadia, West Bengal, India.

Paratypes: In the above mentioned slide and other slides, deposited in the collection of the Department of Zoology, Ranaghat College, P.O. Ranaghat, Dist. Nadia, West Bengal, India.

Etymology: The species is named after the generic epithet of the type host *Glossogobius giuris* (Hamilton-Buchanan).

Remarks

Like all other trichodinids, the described species is also characterized by the morphology of the silver impregnated adhesive disc. Many species of *Trichodina* have somewhat similar size and denticle number and clear or subdivided central area as in this ciliophoran. Among these *Trichodina jadranica* Haider, 1964 show some similarities with the

Table 1 Morphometric comparison of *Trichodina glossogobae* sp. nov. (present investigation) with variations of *T. jadranica* Haider, 1964 obtained from various parts of the world

Species	<i>Trichodina</i> f. <i>jadranica</i>	<i>T. domerguei</i> f. <i>gobii</i>	<i>T. jadranica</i>	<i>T. jadranica noblei</i>	<i>Trichodina jadranica</i>	<i>T. jadranica</i>	<i>T. glossogobae</i> sp. nov.
Host	<i>Mullus barbatus</i>	<i>Gobius minutus</i>	<i>Colionymus lyra</i>	<i>Eleotris sandwicensis</i>	<i>Citharichthys spolioperna</i> , C. <i>griseus</i> ,	<i>Crenilabrus ocellatus</i>	<i>Glossogobius giurnis</i>
Locality	Adreatic Sea, Poland	Baltic Sea, Poland	Brittany coast, France	Oahu, Hawaii	Estuary of Baracuda, Cuba	Black Sea	River Churni, India
Location	Gills	Gills	Gills	Gills	Gills	Gills	Gills
References	Raabe (1958)	Raabe (1959)	Lom (1970b)	Lom (1970b)	Arthur and Lom (1984)	Grupcheva et al. (1989)	Present study
Diameter of							
Body	34–43	25–35	28–41 (36)	26–40 (32)	34.7–51.0 (3.3 ± 4.6)	35–50	30.6–46.9 (36.2 ± 3.9)
Adhesive disc	28–38	25–35 (30)	22–31 (27)	21–29 (25)	20.4–30.6 (24.9 ± 2.7)	20–27	24.5–38.7 (29.2 ± 3.4)
Dimension of body							
Denticulate ring	16–22	13–18	14–18	13–17 (14)	11.2–17.8 (14.2 ± 1.7)	12.5–16	15.3–28.6 (19.3 ± 2.7)
Central area	–	–	–	–	–	–	11.7–14.2 (11.9 ± 1.1)
Clear area	–	–	–	–	–	–	4.4–6.8 (4.9 ± 1.4)
Width of the border membrane	–	–	3	2.5	3.1–4.1 (3.4 ± 0.4)	2.9–3.9	2.6–4.6 (3.6 ± 0.5)
Number of denticles	22–25	19–23	18–23	21–25 (23)	17–22 (19.4 ± 1.2)	19–21	22–24 (21.3 ± 4.6)
Number of radial pins/denticle	8	6	6–7	6	5–7	6	6–9 (6.7 ± 0.9)
Dimension of denticle							
Span	–	–	–	–	6.1–6.7 (6.8 ± 0.5)	7.3–7.8	6.4–9.1 (7.9 ± 0.8)
Length	–	–	4.5–5.5	4	5.1–6.6 (5.9 ± 0.5)	2.9–4.3	3.1–5.3 (4.4 ± 0.7)
Dimension of denticle components							
Length of the ray	2.5–3	3–4 (3.5)	2.2–3	2.5–3	1.5–2.6 (2.1 ± 0.0)	2.9	2.0–3.8 (2.6 ± 0.6)
Length of the blade	3–4	3.5–4.5 (4)	2–2.8	2	2.6–4.1 (3.2 ± 0.4)	2.9–3.4	3.1–4.6 (3.8 ± 0.4)
Width of the central part	–	–	1.5	1.2	1.0–1.5 (1.4 ± 0.2)	1.5	1.1–2.2 (3.6 ± 0.5)
Adoral ciliary spiral	–	300°	–	–	360°	–	380–390°

present form obtained from the gill filaments of *Glossogobius giuris* (Hamilton-Buchanan).

Trichodinids obtained during the present study from the gills of *Glossogobius giuris* (Hamilton-Buchanan), resembles *T. jadranica* Haider, 1964, but differs in the shape of denticles and clear central area of the adhesive disc.

Raabe (1958) first described this species as *T. domerguei* f. *jadranica* from the gills of *Muttus barbatus* from the Adriatic Sea. It was subsequently designated as *T. domerguei* f. *jadranica* by Haider (1964); Lom and Laird (1969) considered it as a distinct species *T. jadranica* (Raabe 1958) Lom and Laird, 1969. But according to the International Code of Zoological Nomenclature (Article 50) the proper authorship for this species is *T. jadranica* Haider, 1964. Arthur and Lom (1984) elaborately discussed the systematic position of *T. jadranica* and commented that the published reports which may be referred to *T. jadranica* are those of *T. domerguei* f. *gobii* Raabe, 1959 from the gills of *Gobius minutus* of the Gulf of Puck and of the Gulf of Gdansk; *T. domerguei* f. *pleuronectes* sensu Raabe, 1958 from *Pleuronectes flesus* of the Baltic sea; *Trichodina* sp. sensu (Lom 1962) from *Solea maeoticus* of the Rumanian Black sea coast; *T. domerguei* Lom, 1962 from *Crenilabrus griseus* of the Rumanian Black sea coast; *T. domerguei* f. *jadranica* Zaika (1966) from *Mullus barbatus* of the Black Sea; *T. domerguei* f. *gobii* Zaika, 1966 from *Gobius melanostomus* of the Black sea; *Trichodina stomus* of the Black sea; *Trichodina* cf. *borealis* Lom, 1970b from *Isistiblennos zebra* of the South Pacific Ocean (Hawaiian Islands); *T. borealis* sensu Stein, 1975 from *Scophthalmus maeoticus*, *Pleuronectes flesus* and *Solea nausta* of the Black and Azov Seas; *T. anguilli* WV, 1961 from *Anguilla anguilla* of the Baltic sea; *T. anguilli* of Ergens and Lom (1970) and Stein (1975); *T. jadranica noblei*, the only subspecies of *T. jadranica* was established by Lom (1970b) from the gills of *Eleotris sandwicensis* of the Hawaian sea coast on the basis of shorter, wider and straight rays and more elongated and less crescent-shaped blades.

The species under discussion resembles *T. domerguei* f. *jadranica* Raabe, 1958 (Fig. 8d) and *T. domerguei* f. *gobii* Raabe, 1959 (Fig. 8e) morphometrically, but differs significantly when denticle structures are taken into consideration.

The tangent point of blade of the new species is flat, where that of *T. domerguei* f. *jadranica* and *T. domerguei* f. *gobii* is sharp. Apex of the blade in *T. glossogobae* sp. nov. is not prominent as in *T. domerguei* f. *jadranica* and *T. domerguei* f. *gobii*. Another significant difference between the new species and *T. domerguei* f. *jadranica* (Raabe 1958) and *T. domerguei* f. *gobii* (Raabe 1959) is the degree of the curve formed by the posterior margin of the blade in respect of y-axis. In the new species posterior margin forms a shallow curve. In *T. domerguei* f. *jadranica*

and *T. domerguei* f. *gobii* the curve is much deeper than the new species. Ray apophysis is not prominent in the new species (Fig. 8a–c), but prominent in *T. domerguei* f. *jadranica* Raabe, 1958 (Fig. 8d) and *T. domerguei* f. *gobii* Raabe, 1959 (Fig. 8e). Rays in *T. glossogobae* sp. nov. are mostly pointing towards the centre of the adhesive discs, but in *T. domerguei* f. *jadranica* Raabe, 1958 (Fig. 8d) and *T. domerguei* f. *gobii* Raabe, 1959 (Fig. 8e) are mostly pointed towards y + 1 axes. Above all, the new species has been obtained from *Glossogobius giuris* (Hamilton-Buchanan) inhabiting freshwater of India, but *T. domerguei* f. *jadranica* was described by Raabe (1958) from Adrearcic Sea, Poland and *T. domerguei* f. *gobii* from Baltic Sea by Raabe (1959).

The new species shows morphometric resemblances to *T. jadranica* (Lom 1970b), *T. jadranica noblei* (Lom 1970b), *T. jadranica* (Stein 1975), *T. jadranica* (Arthur and Lom 1984) to some extent but differs significantly when differences in respect of denticle morphology is considered.

Blade of *T. glossogobae* sp. nov. is angular, sickle shaped and does not occupy most spaces between y-axes (Fig. 8a–c), but that of *T. jadranica* (Lom 1970b) (Fig. 8f, g), *T. jadranica noblei* (Lom 1970b) (Fig. 8h), *T. jadranica* (Stein 1975) (Fig. 8j, k), *T. jadranica* (Arthur and Lom 1984) (Fig. 8i) broad, rectangular and occupies most places between y-axes. Ray apophysis is not prominent in the new species like the other species under comparison. In the new species described in this paper, short distal surface of the blade does not run parallel to the border membrane due to sickle-shaped and angular appearance. But in the species under comparison (Fig. 8f–k) the distal surface of the blade runs parallel to the margin of the border membrane due to the rectangular appearance and occupancy in the y-axes. In the new species the central clear area does not occupy most part of the central area (Fig. 8a–c). The case is different in other species under comparison where central clear area occupies most of the central area (Fig. 8d–k). Moreover, all

Fig. 9 Diagrammatic drawings of the denticles of trichodinids. **a** *Tripartiella copiosa* Lom, 1959 from gills of *Labeo bata* (Hamilton-Buchanan), present study; **b** *Tripartiella copiosa* Lom, 1959 from gills of *Rutilus rutilus* [redrawn from Lom (1959)]

Table 2 Morphometric comparison of *Tripartiella copiosa* (present study) with *Tripartiella copiosa* Lom and Haldar (1977)

Species	<i>Tripartiella copiosa</i>	<i>Tripartiella copiosa</i>
Host	<i>Labeo bata</i>	<i>Rutilus rutilus</i> , <i>Alburnus alburnus</i> , <i>Leuciscus leuciscus</i>
Locality	River Churni, West Bengal, India	Eurasian continent
Location	Gills	Gills
References	Present study	Lom and Haldar (1977)
Diameter of		
Body	15.2–22.4 (19.7 ± 1.9)	22–48
Adhesive disc	13.2–19.4 (16.1 ± 1.9)	14–45
Dimension of body		
Denticulate ring	6.1–9.7 (7.8 ± 1.1)	26–37
Central area	3.1–6.1 (5.1 ± 0.9)	–
Clear area	–	–
Width of the border membrane	1.5–2.0 (1.8 ± 0.2)	1.2–2.6
Number of denticles	21–24 (22 ± 1.1)	17–32
Number of radial pins/denticle	3–4 (3.6 ± 0.5)	4–6
Dimension of denticle		
Span	4.1–6.1 (5.1 ± 0.6)	–
Length	0.5–2.0 (2.1 ± 0.4)	–
Dimension of denticle components		
Length of the ray	0.5–2.0 (1.0 ± 0.4)	0.9–3.0
Length of the blade	3.1–4.6 (3.7 ± 0.5)	2.4–4.8
Width of the central part	0.4–1.0 (0.6 ± 0.2)	0.6–2.2
Adoral ciliary spiral	180–240°	180–225°

the species with which comparisons have been made (Fig. 8d–k) were described from the sea water inhabiting host fishes, but *T. glossogobae* has been obtained from freshwater inhabiting fishes.

Considering all the differences we propose the species which has been obtained from the gills of the host fish *Glossogobius giuris* (Hamilton-Buchanan) in the river Churni, new to science and designate this species in this paper as *Trichodina glossogobae* sp. nov.

Morphometric comparisons between *T. glossogobae* sp. nov. and different forms of *T. jadranica* Haider, 1964 are given in Table 1.

Tripartiella copiosa Lom, 1959 (Figs. 5, 9a; Table 2)

This is a small sized ciliophoran with a disc shaped body. The adhesive disc is surrounded by a finely striated border membrane. The centre of the disc is finely granular and uniformly dark when impregnated with silver. The denticulate ring consists of 21–24 (22 ± 1.1) small denticles.

The blade of denticle is broad, fills half of the space between y-axis and is obliquely directed backwards. The distal margin in most cases is truncated, adjoins and runs parallel to the border membrane. The lateral margins of blade are parallel. The anterior margin is almost parallel to

the y + 1 axis and constricts at the anterior projection. The posterior margin also has the same course and adheres to the y-1 axis throughout its length. The tangent point is flat, forming a line with y-axes. The anterior projection is prominent, but is a delicate spike-like extension. The blade is connected to anterior projection by a delicate section. The posterior projection is also prominent and touches the section between the blade and the anterior projection by its tip. The lateral projection fits well into the well developed notch at the denticle. The section between the anterior projection and the central part is delicate. The central part is also delicate. The ray is thin, slanted towards the posterior end and terminating as a rounded point.

There are 3–4 (3.6 ± 0.5) radial pins per denticle. The adoral zone of ciliary spiral takes a turn about 180–210°.

Taxonomic summary

Type Host: *Labeo bata* (Hamilton-Buchanan)

Type locality: River Churni, Ranaghat (Latitude: 23.17°, Longitude: 88.57°), W. Bengal, India.

Type Specimen: *Tripartiella copiosa* Lom, 1959

Lecotype: One slide no. LB-1 prepared on 19/02/2011 in the collection of the Department of Zoology, P.O. Ranaghat, Dist. Nadia, Pin- 741201, West Bengal, India.

Fig. 10 Diagrammatic drawings of the denticles of trichodinids. **a** *Tripartiella bulbosa* (Davis 1947) Lom, 1959 from gills of *Labeo bata* (Hamilton-Buchanan), present study; **b** *Tripartiella bulbosa* (Davis 1947) Lom, 1959 from gills of *Catla catla* [redrawn from Das and Haldar (1987)]

Remarks

Tripartiella copiosa is the type species of the genus *Tripartiella*. It was first described by Lom (1959) as *Trichodinella (Tripartiella) copiosa* from the gills of *Rhodeus sericeus* in Czechoslovakia. In 1963, he described the ciliophoran as *Tripartiella copiosa* Lom, 1959. In addition to its presence in *R. sericeus* he recorded the ciliate from many other host fish, viz., *Rutilus rutilus*, *Alburnus alburnus*,

Leuciscus leuciscus, *Blicca björkna*, *Lenuiseus cephalus*, *L. delineatus* and *Cobitis taenia* for this ciliophoran in Czechoslovakia. Kashkovsky (1974) made a report on it from *R. rutilus* in the Ural region of USSR. Lom and Haldar (1977) contributed in characterizing *T. copiosa* as the ciliophoran of the genus *Tripartiella* which possesses denticles with the anterior projection on the blade in form of a sharp spike. Based on this unique feature as well as blade shape as mentioned by Lom (1959) (Fig. 9b) in having the blade, with parallel lateral margins, obliquely directed backward and attached to the anterior projection through its stem-like narrow basal part, the ciliophoran is quite identical. During the peiord of present investigation *T. copiosa* was collected from the gills of *Labeo bata* (Hamilton-Buchanan) in the river Churni of West Bengal. Morphometric comparison of *T. copiosa* obtained in the present study with those of other author is presented in Table 2.

Tripartiella bulbosa (Davis 1947) Lom, 1959 (Figs. 6–7, 10a; Table 3)

The body of this small-sized ciliophoran is disc shaped. Adhesive discs of these specimens are dark. The denticulate ring consists of 5.1–11.2 (8.5 ± 1.6) uniquely shaped denticles. The blade is elongated, slanted obliquely

Table 3 Morphometric comparison of *Tripartiella bulbosa* (Davis 1947) Lom, 1959 (present study) with described populations

Species	<i>Tripartiella bulbosa</i>	<i>T. bulbosa</i>	<i>T. bulbosa</i>
Host	<i>Labeo bata</i>	<i>Margariscus margarita</i>	<i>C. idella</i> , <i>H. molitrix</i>
Locality	River Churni, West Bengal, India	USA	Bulgaria
Location	Gills	Gills	Gills
References	Present study	Davis (1947)	Golemansky & Grupcheva (1975)
Diameter of			
Body	16.7–23.8 (20.6 ± 2.2)	–	27–37
Adhesive disc	12.7–21.4 (17.6 ± 2.4)	22–26	20–24
Dimension of body			
Denticulate ring	5.1–11.2 (8.5 ± 1.6)	10–12	8–9
Central area	3.6–7.6 (5.8 ± 1.3)	–	–
Clear area	–	–	–
Width of the border membrane	1.0–2.0 (1.6 ± 0.4)	–	1.7–2.6
Number of denticles	18–24 (21.4 ± 1.5)	19–24	23–27
Number of radial pins/denticle	3–4 (3.7 ± 0.5)	5–6	3–5
Dimension of denticle			
Span	4.1–6.1 (4.9 ± 0.7)	–	–
Length	2.0–3.1 (2.7 ± 0.4)	–	–
Dimension of denticle components			
Length of the ray	0.5–1.4 (0.8 ± 0.3)	–	0.9–1.7
Length of the blade	3.1–4.1 (3.5 ± 0.5)	–	3.5–5.2
Width of the central part	0.5–0.7 (1.6 ± 0.4)	–	0.9–2.1
Adoral ciliary spiral	180–200°	270°	–

backwards with parallel lateral margins, which are constricted at either end. The distal margin of the blade is almost rounded. Tangent point is flat and is situated lower than the distal margin. Anterior projection of the blade is reduced to an insignificant tubercle. A well developed posterior notch is present. The section connecting the anterior projection and the central part is well-formed and curved towards the central area. The central part of the denticle is a short, knee like and bent. The ray is short and stumpy and directed towards the centre of adhesive disc.

There are 3–4 (3.7 ± 0.5) radial pins per denticle. Horse shoe shaped macronucleus has been observed. The adoral ciliary spiral makes a turn of 180–200°.

Taxonomic summary

Type Host: *Labeo bata* (Hamilton-Buchanan

Type locality: River Churni, Ranaghat (Latitude: 23.17°, Longitude: 88.57°), W. Bengal, India.

Type Specimen : *Tripartiella bulbosa* (Davis 1947) Lom 1959

Lectotype: Slide No. CC-30 prepared on 14/03/2011 in the collection of the Department of Zoology, Ranaghat College, P.O. Ranaghat, Dist. Nadia, Pin- 741201, West Bengal, India.

Remarks

T. bulbosa was first described by Davis (1947) from the gills of *Margariscus margarita* as *T. bulbosa* in West Virginia, USA. Pai (1950) reported it from *Macropodus chinensis* and tadpoles of *Bufo bufo* in the vicinity of Sanghai, China. Ivanova (1966) first made the identification of this species based on silver impregnation technique from *C. idella*, *H. molitrix* and *A. nobilis* in Krasnoyarsk region, USSR. Later, Kashkovsky (1974) and Golemansky and Grupcheva (1975) redescribed it from the mentioned three species of fishes in Bulgaria. Mukherjee and Haldar (1982) reported *T. bulbosa* from *Cirrhinus mrigala*, *Labeo rohita*, *L. bata*, *Mystus bleekeri* and *Ambasis nama*. Das and Haldar reported the same organism from *C. catla* and *C. mrigala* (Fig. 10b). Basu and Haldar (1998) reported *T. bulbosa* from cultured *C. mrigala* and *C. mrigala* x *L. rohita* in West Bengal.

During the present investigation the ciliophoran has been obtained from the gills of *Labeo bata* in the river Churni of West Bengal, India. According to Lom and Haldar (1977) *T. bulbosa* falls into the group of *Tripartiella* with denticles characterized by having a delicate central part, unconstricted blades at either end with parallel borders joining the centre by a more or less pronounced knee-

like bend, tubercle-shaped anterior projection and having a short and stumpy ray resembling short projecting spines. The ciliophoran obtained in the present investigation confirms the above characters of the species. Morphometric comparison of *T. bulbosa* obtained in the present study with those of other authors is given in Table 3.

Acknowledgment One of the authors (AKM) is thankful to the University Grants Commission (Eastern Regional Office), LB- 8, Sector-III, Salt Lake, Kolkata- 700 098 (West Bengal) for providing financial support in the form of Minor Research Project (MRP) vide Sanction No. F. PSW-087/10-11 (ERO). AKM is also thankful to the Principal, Ranaghat College and Head, Department of Zoology, Ranaghat College for allowing him to use necessary laboratory facilities.

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