Record of the species of *Tripartiella* (Lom, 1959) from fishes of Manipur

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Received: 24 January 2011 / Accepted: 18 December 2011 / Published online: 6 January 2012
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Abstract Survey on Trichodinid ciliophorans from the fresh water fishes of Manipur revealed three known species of the genus *Tripartiella* from the gills of major carps *Labeo rohita* (Hamilton); *Cirrhinus mrigala* (Hamilton); *Catla catla* and *Ciprinus carpio*. These are redescribed in this communication.

Keywords Trichodinid ciliophoran · *Tripartiella bulbosa* · *T. copiosa* · *T. obtuse* · Manipur

Introduction

The genus *Tripartiella* was established by Lom (1959). Haider (1964), Lom (1963), Hoffman (1967), Stein (1967, 1968), Kazubski and Migala (1968) recognized these trichodinid group as the most common invaders of fish gills in Europe. Mukherjee and Haldar (1982) were the first in India who reported the members of the genus *Tripartiella*. After that many authors like Samal (1987), Sarkar (1988), Saha et al. (1995), Basu and Haldar (1998), Mitra and Haldar (2003) have reported many species of *Tripartiella* from India. The members of this group have denticles consisting of blades, rays and central parts. The denticles are wedged together both by central parts and anterior projection. The adoral spirals of cilia make a turn of 180°–220°. During the course of the survey of protozoan parasites of the gills of piscine hosts three known species of *Tripartiella* viz. *Tripartiella bulbosa* (Davis 1947; Lom 1959), *Tripartiella copiosa* (Lom 1959) and *Tripartiella*

obtuse (Ergens and Lom 1970) were recovered from different host fishes in Manipur, India. The species of the genus *Tripartiella* have not been reported earlier from north-east India and the present communication is the first record of the genus from Manipur and other north eastern states of India.

Materials and methods

Host fishes (10–20 cm) were collected from different water bodies of Manipur, India (from 2006 to 2009). Gill scrapings were made at the site of collection. Air-dried gill scraping were brought to the laboratory and examined under microscope. Slides with trichodinid ciliates were impregnated with Klein's dry sliver impregnation technique (Klien 1958). Examinations of preparations were made under Olympus phase-contrast microscope at 100× magnification. Measurements were made according to the recommendations of Lom (1958), Wellborn (1967), Arthuy and Lom (1984) and Van As and Basson (1992). Numerous photomicrographs were made with the help of CCD camera fitted to Magnus Phase-contrast microscope in order to have comprehensive morphological analyses of the ciliates.

Result

Tripartiella bulbosa (Davis 1947; Lom 1959), (Fig. 1a–c)

Dimension Refer Tables 1 and 2.

Descriptions Body disc shaped. Adhesive discs dark. Uniquely shaped denticles. The blade is elongated, slanted obliquely backwards with parallel lateral margins, which

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Fig. 1 Microphotographs of *Tripartiella* species. **a–c** Photomicrographs of silver nitrate impregnated adhesive discs of *T. bulbosa* (Davis 1947; Lom 1959) from *L. rohita* (Hamilton) showing variation in appearance. Scale Bar–19.5 μ m. **d–f** Photomicrographs of silver nitrate impregnated adhesive discs of *T. copiosa* (Lom 1959) from

C. mrigala (Hamilton) showing variation in appearance. Scale Bar–17 μ m. **g–i** Photomicrographs of silver nitrate impregnated adhesive discs of *T. obtusa* (Ergens and Lom 1970) from *L. rohita* (Hamilton) showing variation in appearance. Scale Bar–16.5 μ m

are constricted at either end, but a sort of constriction is prominent at the mid length of blade. The distal margins of the blades are 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. Well developed posterior notch is present. The section connecting anterior projection and central part is well—formed and curved towards the central area. The central part of the denticle is short, knee like and bent. The ray is short, stumpy and directed towards the centre of adhesive disc.

Horse shoe shaped macronucleus observed. The adoral ciliary spiral makes a turn of 180°–200°.

Intraspecific variability During the present study, the specimen shows no significant variability in shape and structure of the denticles in the population studied.

Remarks *Tripartiella bulbosa* was first described by Davis (1947) from the gills of *Margariscus margarila* in West Virginia, USA. Pai (1950) reported it from *Macropodus chinensis* and tadpoles of *Bufo bufo* in the vicinity of Sanghai, China. Chen (1956) also recorded it

Table 1 Morphometry of 20 specimens of *T. bulbosa* (Davis 1947; Lom 1959) obtained in the present study

Characters ↓	Range	Mean	SD	SE	CV (%)
Diameter of body	16.5–24	22.09	2.170	0.686	9.823
Diameter of adhesive disc	17–21.5	19.4	1.428	0.451	7.360
Dimension of body...denticulate ring	8.5–11.5	10.4	0.943	0.298	9.067
Central area	3.5–7	4.35	1.001	0.316	23.011
Width of the border membrane	1.5–2	1.85	0.229	0.072	12.378
Number of denticles	20–25	22.4	1.854	0.586	8.276
Number of radial pins/denticle	5–6	5.6	0.489	0.154	8.7
Dimension of denticle...span	4.5–5.5	4.64	0.535	0.169	11.530
...length	2–3	2.5	0.387	0.122	15.48
Dimension of denticle components...length of the ray	0.5–1.5	0.95	0.35	0.110	36.842
Length of the blade	3.5–4	3.7	0.244	0.077	6.594
Width of the central part	0.5–1.5	0.95	0.35	0.110	36.842
Adoral ciliary spiral	190°–200°				

Table 2 Morphometric comparison of *T. bulbosa* obtained in the present study with those of Davis (1947), and Das and Haldar (1987)

Characters	<i>T. bulbosa</i>	<i>T. bulbosa</i>	<i>T. bulbosa</i>
Diameter of body	–	17.6–28.6 (22.2)	16.5–24 (22.09 ± 2.1)
Diameter of adhesive disc	22–26	15.4–22.0 (18.2)	13–21.5 (19.4 ± 1.42)
Dimension of body...denticulate ring	10–12	7.7–14.3	5.5–11.5 (10.4 ± 0.94)
Central area	–	–	3.5–7 (4.35 ± 1.00)
Width of the border membrane	–	1.1–3.5 (2.4)	1.5–2 (1.85 ± 0.22)
Number of denticles	19–24	21–24 (22)	20–25 (22.4 ± 1.85)
Number of radial pins/denticle	5–6	4.6	5–6 (5.6 ± 0.48)
Dimension of denticle...span	–	–	4–5.5 (4.64 ± 0.53)
...length	–	–	2–3 (2.5 ± 0.38)
Dimension of denticle components...length of the ray	–	1.0–1.6 (1.0)	0.5–1.5 (0.95 ± 0.35)
Length of the blade	–	2.2–3.8 (3.0)	3.5–4 (3.7 ± 0.24)
Width of the central part	–	0.5–1.5 (1.0)	0.5–1.5 (0.95 ± 0.35)
Adoral ciliary spiral	+270°	180°–200°	190°–200°
Host	<i>M. margarita</i>	<i>C. mrigala</i> , <i>C. catla</i>	<i>L. rohita</i> , <i>C. catla</i> and <i>C. mrigala</i>
Site of infection	Gill	Gill	Gill
Reference	Davis (1947)	Das and Haldar (1987)	Present study

from four Chinese herbivorous fishes, viz., *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Aristichthys nobilis* and *Mylopharyngodon piceus* in China. Later, Kashkovsky (1974) and Golemansky and Grupcheva (1975) redescribed it from Bulgaria. Mukherjee and Haldar (1982) reported *T. bulbosa* from *Cirrhinus mrigala*, *Labeo rohita*, *Labeo bata*, *Mystus bleekeri* and *Ambasis nana*. Das and Haldar reported the same from *Catla catla* and *Catla mrigala*. Basu and Haldar (1998) reported *T. bulbosa* from cultured *C. mrigala* and *C. mrigala* × *L. rohita* in West Bengal.

According to Lom and Haldar (1977) *T. bulbosa* falls into the group of *Tripartiella* with denticles characterized by having a delicate central part, unconstructed blade 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. Thus, we identify the present ciliophoran as *T. bulbosa* (Davis 1947; Lom 1959). It is the first report from north east India.

Schematic diagram of the denticles of *Tripartiella bulbosa* (Davis, 1947) Lom, 1959, present study.

Taxonomic summary

Host	<i>Labeo rohita</i> (Ham.), <i>Catla catla</i> and <i>Cirrhinus mrigala</i> (Ham.)
Localities	Kakyai Pat (24.542°N: 93.760°E), Khoidum pat (24.540°N: 93.886°E), Ikop pat (24.659°N: 93.870°E), Waithou pat (24.668°N: 93.962°E), Lamphel pat (24.825°N: 93.908°E). Manipur
Site of infection	Gill
Intensity	Low.

Tripartiella copiosa Lom 1959, (Fig. 1d–f)

Dimension Refer Table 3 and 4

Descriptions Body size small, disc shaped. Adhesive disc surrounded by a finely striated border membrane. The centre of this disc is finely granular and uniformly dark when impregnated. Denticle small. The blade of denticle is broad, fills half of the space between y-axis and obliquely directed backwards. The distal margin in most cases is truncated, adjoins and runs parallel to border membrane. The lateral margins of blade are parallel. The anterior margin is almost parallel to $y + 1$ axis and constricts at the anterior projection. The posterior margin also has the same

course and adheres to $y - 1$ axis throughout its length. The tangent point is flat, forms a line with y-axes. The anterior projection is prominent, but is a delicate spikelike extension. The blade is connected to anterior projection by a delicate section. The posterior projection is also prominent and touches the section between blade and anterior projection by its tip. The lateral projection fits well into the well developed notch at the denticle. The section between anterior projection and central part is delicate. The central part is also delicate. The ray is thin, slanted posteriorly terminating in a rounded point. The adoral zone of ciliary spiral takes a turn of about 180°–200°.

Intraspecific variability The adhesive disc morphology of the present population of *T. copiosa* obtained from Indian major carps *L. rohia*, *Catla catla*, *C. mrigala* and *Cyprinus carpio* show no significant variation in structure.

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 bericeus* in Czechoslovakia. In 1963, the same author described the ciliophoran as *T. copiosa* Lom 1959. 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 the form of a sharp spike. Based on this unique feature as well as blade shape as mentioned by Lom (1959) 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 present ciliophoran is quite identical with the earlier described ones. The morphometry of the present ciliophoran is also within the range of variability of *T. copiosa* Lom 1959 and hence we identify the present ciliophoran as *T. copiosa* Lom 1959. It is the first report from north east India.

Table 3 Morphometry of 20 specimens of *T. copiosa* (Lom 1959) obtained in the present study

Characters ↓	Range	Mean	SD	SE	CV (%)
Diameter of body	15.5–23.5	18.65	5.788	1.830	31.034
Diameter of adhesive disc	15–19.5	16.95	1.556	0.492	9.179
Dimension of body...denticulate ring	6.5–9	7.85	0.776	0.245	9.885
Central area	3.5–6.5	5.15	0.807	0.255	15.669
Width of the border membrane	1.5–2.5	1.95	0.415	0.131	21.282
Number of denticles	20–25	22.6	1.685	0.532	7.455
Number of radial pins/denticle	3–4	3.4	0.387	0.122	11.057
Dimension of denticle...span	4.5–6	5.3	0.509	0.161	9.603
...length	3.5–2.5	1.45	0.65	0.25	44.827
Dimension of denticle components...length of the ray	1–2.5	1.75	0.512	0.162	29.257
Length of the blade	3.5–4.5	4	0.387	0.122	9.675
Width of the central part	0.5–1	0.75	0.25	0.079	33.33
Adoral ciliary spiral	180°–200°

Schematic diagram of the denticles of *Tripartiella copiosa* Lom, 1959 present study.

Lamphel pat (24.825°N: 93.908°E),
Khongham pat (24.895°N: 93.890°E),
Kongba (24.797°N: 93.963°E), Nambol
(24.312°N: 93.669°E)

Site of infection Gill
Intensity Low.

Taxonomic summary

Host *Cirrhinus mrigala*, *Labeo rohita*, *Catla catla*, *Cyprinus carpio*
Localities Pumlen Pat (24.538°N: 93.960°E),
Khoidum pat (24.540°N: 93.886°E),
Waithou pat (24.668°N: 93.962°E),

Tripartiella obtusa (Ergens and Lom 1970), (Fig. 1g–i)

Dimension Refer Table 5 and 6

Descriptions The size of this ciliophoran is very small with a disc shaped body. Concave disc is surrounded by a finely striated border membrane. Central area of the adhesive disc is uniformly dark. The blade is elongated and slanted in a backward direction. The distal margin is

Table 4 Morphometric comparison of *T. copiosa* obtained in the present study with those of Lom and Haldar (1977) and Mitra (2002)

Characters	<i>T. copiosa</i>	<i>T. copiosa</i>	<i>T. copiosa</i>
Diameter of body	22–48	15.2–22.4 (19.7 ± 1.9)	15.5–23.5 (18.65 ± 5.788)
Diameter of adhesive disc	14–45	13.2–19.4 (16.1 ± 1.9)	13–19.5 (16.95 ± 1.55)
Dimension of body...denticulate ring	26–37	6.1–9.7 (7.8 ± 1.1)	6.5–10 (7.85 ± 0.77)
Central area	–	3.1–6.1 (5.1 ± 0.9)	3.5–6.5 (5.15 ± 0.807)
Width of the border membrane	1.2–2.6	1.5–2.0 (1.8 ± 0.2)	1.5–2.5 (1.95 ± 0.415)
Number of denticles	17–32	20–24 (22 ± 1.1)	20–27 (22.6 ± 1.685)
Number of radial pins/denticle	4–6	3–4 (3.6 ± 0.5)	3–4 (3.5 ± 0.38)
Dimension of denticle...span	–	4.1–6.1 (5.1 ± 0.6)	4.5–6 (5.3 ± 0.509)
...length	–	0.5–2	0.5–2.5 (1.45 ± 0.65)
Dimension of denticle components...length of the ray	0.9–3.0	0.5–2 (1.0 ± 0.4)	1–2.5 (1.75 ± 0.512)
Length of the blade	2.4–4.8	3.1–4.6 (3.7 ± 0.5)	3.5–4.5 (4 ± 0.387)
Width of the central part	0.6–2.2	0.4–1.0 (0.6 ± 0.2)	0.5–1 (0.75 ± 0.25)
Adoral ciliary spiral	180°–225°	180°–210°	180°–200°
Host	<i>Rutilus rutilus</i>	<i>L. bata</i>	<i>C. mrigala</i>
Site of infection	Gill	Gill	Gill
Reference	Lom and Haldar (1977)	Mitra (2002)	Present study

Table 5 Morphometry of 20 specimens of *T. obtusa* Ergens and Lom 1970 obtained in the present study

Characters ↓	Range	Mean	SD	SE	CV (%)
Diameter of body	13–25.5	20.7	4.190	1.325	20.24
Diameter of adhesive disc	12.5–20	16.5	1.830	0.578	11.090
Dimension of body...denticulate ring	8.5–11.5	10.05	1.082	0.342	10.766
Central area	3.5–6.5	4.95	0.820	0.259	16.565
Width of the border membrane	1–2	1.45	0.415	0.131	28.620
Number of denticles	18–22	20.3	1.417	0.448	6.980
Number of radial pins/denticle	3–5	4.1	0.7	0.221	17.073
Dimension of denticle...span	5.5–8.5	6.9	0.969	0.306	14.043
...length	2.5–3.5	2.9	0.374	0.118	12.896
Dimension of denticle components...length of the ray	1.5–2	1.65	0.229	0.072	13.878
Length of the blade	3.5–4	3.85	0.229	0.072	5.948
Width of the central part	0.5–1.5	1.05	0.35	0.110	33.33
Adoral ciliary spiral	180°–200°				

Table 6 Morphometric comparison of *Tripartiella obtusa* obtained in the present study with those of Ergens and Lom (1970), and Mitra (2002)

Characters	<i>T. obtusa</i>	<i>T. obtusa</i>	<i>T. obtusa</i>
Diameter of body	23–42 (30)	12.2–23.4 (19.1 ± 2.4)	13–25.5 (20.7 ± 4.190)
Diameter of adhesive disc	17–23 (21)	10.2–20.4 (15.8 ± 2.9)	12.5–20.5 (16.5 ± 1.830)
Dimension of body...denticulate ring	9–13 (11)	7.1–9.7 (7.8 ± 0.9)	8.5–11.5 (10.05 ± 1.082)
Central area	–	3.3–6.1 (4.4 ± 0.7)	3.5–6.5 (4.95 ± 0.820)
Width of the border membrane	2.0	1.0–2.0 (1.6 ± 0.4)	1–2 (1.45 ± 0.415)
Number of denticles	21–27 (24)	18–22 (19.9 ± 11.4)	17–20 (20.3 ± 1.417)
Number of radial pins/denticle	5	3–5 (3.7 ± 0.6)	3–5 (4.1 ± 0.7)
Dimension of denticle...span	–	5.1–8.2 (5.9 ± 0.7)	5.5–8.5 (6.9 ± 0.969)
...length	–	2.0–3.6 (2.6 ± 0.3)	2.5–3.5 (2.9 ± 0.374)
Dimension of denticle components...length of the ray	2.1	1–2 (1.3 ± 0.3)	1.5–2 (1.65 ± 0.229)
Length of the blade	3.1	3.1–4.1 (3.7 ± 0.4)	3.5–4 (3.85 ± 0.229)
Width of the central part	1.3	0.5–1.5 (0.9 ± 0.3)	0.5–1.5 (1.05 ± 0.35)
Adoral ciliary spiral	180°	180°–190°	180°–200°
Host	<i>G. gobio</i>	<i>Notopterus notopterus</i>	<i>L. rohita</i> ,
Site of infection	Gill	Gill	Gill
Reference	Ergens and Lom (1970)	Mitra (2002)	Present study

rounded with curved tangent point which forms a line with y – 1 axis and situated below distal margin. The anterior projection resembles a rounded triangle, forms together with a “V” shaped blade pointed anticlockwise. The part of blade adjoining this projection is stalk like. Due to bilateral convexity the shape of the blade appears club-shaped. The posterior projection is ill-developed. The anterior projection fits well into the notch of the preceding denticle and is connected to central part by a well developed, obliquely backward, but straight section. The central part is delicate and bluntly rounded in shape. The ray is stout, straight and short to a lesser extent, directed anteriorly and terminates in a rounded point. The adoral ciliary spiral turns about 190°–200°.

Remarks *Tripartiella obtusa* was first established by Ergens and Lom (1970) from the gills of *Gibio gobio* in Czechoslovakia. Lom and Haldar (1977) found this ciliophoran regularly but exclusively on the gills of *G. gobio* from Czechoslovakia. According to them the denticles of this species are much stouter and the anterior projections of denticles resemble a rounded triangle formed together with a “V” shaped blade pointed anticlockwise. The ciliophorans obtained in the present investigation have almost identical denticle structure with *T. obtuse* as mentioned by Ergens and Lom (1970) and Lom and Haldar (1977). However, the dimensions of the present ciliophoran are somewhat smaller than those of Ergens and Lom (1970). This variation might be due to the difference in the geographical region and host fishes from where the trichodinid ciliophoran were collected. Hence the present ciliophoran is identified as *T. obtusa* Ergens and Lom 1970 and it is the first report from north east India.

Taxonomic summary

Host	<i>Labeo rohita</i> (Ham.)
Localities	Kakching Khunou (24.403°N: 93.899°E), Mayang Imphal (24.659°N: 93.903°E), Nambol (24.312°N: 93.669°E), Waithou pat (24.668°N: 93.962°E)
Site of infection	Gill
Intensity	Low.

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