



Trematode parasites in fishes from Chilika: Three new records to India

A Ghosh & A N Rizvi*

Zoological Survey of India, M-Block, New Alipore, Kolkata – 700 053, India

*[E-mail: anrizvi@gmail.com]

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The study reports three species of parasitic trematodes viz. *Lecithochirium genypteri* Manter, 1954, *Opegaster plotosi* Yamaguti, 1940 and *Saccocoelioides octavus* Szidat, 1970 which were collected from the fishes *Polydactylus sextarius* (Bloch & Schneider, 1801), *Glossogobius giuris* Hamilton, 1822 and *Liza parsia* (Hamilton, 1822), respectively from the Chilika lake. All the three reported species form new records of Indian fauna, while all three fish species form new host records for the respective parasites. The description and distribution of these parasites have been discussed in the present study.

[**Keywords:** Distribution, *Glossogobius giuris*, *Lecithochirium genypteri*, *Liza parsia*, *Opegaster plotosi*, *Polydactylus sextarius*, *Saccocoelioides octavus*]

Introduction

Adult trematodes are usually parasitic in vertebrate hosts. There are several reports on foodborne trematode infections which cause diseases that mainly include the parasites of the genera, *Clonorchis* and *Opisthorchis*. These parasitic flukes cause infection in humans via the consumption of contaminated food like raw fish¹. Trematodes usually infect the intestine of the fish hosts, but in heavy infection, these may invade the bile duct, lungs and other tissues. Very few works have been reported on the trematode parasites of fishes from Chilika, namely, Southwell², Chaudhury³, Gupta & Ahmad⁴, Rukmini & Madhavi⁵, Dutta⁶, and Dutta & Manna⁷.

During the surveys of Chilika lake for studying trematode parasites of fishes, three trematode parasites were recovered from three different fish species and on examination, were found to be new records to Indian fauna. The purpose of this paper is to provide information on the morphology and distribution of the trematode parasites, viz. *Lecithochirium genypteri* Manter, 1954^(ref. 8), *Opegaster plotosi* Yamaguti, 1940^(ref. 9) and *Saccocoelioides octavus* Szidat, 1970^(ref. 10) which were collected from the fishes *Polydactylus sextarius* (Bloch & Schneider, 1801)¹¹, *Glossogobius giuris* Hamilton, 1822^(ref. 12) and *Liza parsia* (Hamilton, 1822)¹², respectively. These trematode species are new records to India and also the fish species form the new host records for the respective

parasites. The three reported species of the genera, *Lecithochirium* Luhe, 1901, *Opegaster* Ozaki, 1925 and *Saccocoelioides* Szidat, 1954 were compared with the species reported from India¹³⁻²⁰ (Tables 1 – 3).

Materials and Methods

Fish hosts were collected during the surveys from different parts of Chilika lake, a brackish water lake and a shallow lagoon with estuarine character spread across the districts of Puri, Khurda and Ganjam in the state of Odisha in eastern India. Fish hosts were dissected to collect the parasites on the spot itself so that live specimens could be collected. Collected trematodes were then kept in normal saline for the relaxation of the specimens. Live trematodes were then slightly pressed in between a slide and a coverslip so that the morphological characters of these parasites can be well studied under a microscope. Trematodes were then fixed in FAA solution and preserved in 70 % alcohol for further processing. In the laboratory, trematodes were stained with Borax Carmine stain and differential staining was performed with the help of acidified ethyl alcohol. Parasites were then passed through gradation of ethyl alcohol for dehydration, cleaned in Clove oil and mounted in Canada Balsam. The permanent slides were examined under the microscope (LEICA DM 1000) to study the morphological characters. Trematodes were identified based on the keys to generic diagnosis²¹⁻²³ and species identification was done based on published literature.

Result and Discussion

Three species of Trematode parasites of fishes from Chilika are reported which add new records to Indian fauna:

1. *Lecithochirium genypteri* Manter, 1954 (Order Plagiorchiida, Suborder Hemiurata, Family Hemiuridae, Subfamily Lecithochiriinae, Genus *Lecithochirium* Luhe, 1901).

Diagnostic characters: Body elongated with ecsoma, 2.062×0.665 mm; maximum width at the posterior of the acetabulum; ecsoma short, 0.7401 in length; oral sucker much smaller than acetabulum, sucker ratio almost 1:2; pre-oral lip conspicuous, pre-pharynx absent; pharynx subglobular; intestinal

caeca extends into ecsoma, narrower at the anterior, becomes wider as it proceeds to the hinder region; acetabulum pre-equatorial; genital pore median; pre-somatic pit conspicuous with distinct margin; testes symmetrical, spherical, separated by uterine coils, situated just below the acetabulum; ovary post testicular, transversely ovoid; posterior end of the seminal vesicle at the mid-acetabular region; vitellaria in two groups, 7 lobed (3 and 4 lobes each), compact, lobes as long as wide; uterus does not extend into ecsoma. Comparative data of morphological characters and photographs are provided (Tables 1, 4, Fig. 1). A list of hosts is provided in Table 5.

Table 1 — Comparative chart of morphological characters of the species of the Genus *Lecithochirium* Luhe, 1901 with the species reported from India

Species	Valid status	Morphological characters							
		Body shape	Ecsoma	Length × width	Sucker ratio	Pre-somatic pit	Vitellaria	Testes	Ovary
<i>L. acutum</i> Chauhan, 1945	Valid	Elongate; tapering anteriorly above the acetabulum	Short, $0.464 \times 0.352 - 0.416$	$3.232 - 4.400 \times 0.560 - 0.800$	$1:3.06 - 3.83$	Well developed, glandular with an oval opening	2 groups; one with fingerlike 3 lobes and another with 4 lobes	Rounded or transversely oval, tandem, just behind the acetabulum	Oval, post-testicular, just behind the centre of the body
<i>L. agarwali</i> (Gupta & Gupta, 1989)	To be assessed								
<i>L. anisotestes</i> Surekha & Vijayalakshmi, 2007	Not known								
<i>L. bilqeesae</i> (Gupta & Gupta, 1989)	To be assessed								
<i>L. cynoglossusi</i> Gupta & Jain, 1991	To be assessed								
<i>L. durdanae</i> (Gupta & Gupta, 1986) Bray, 199	Valid	Elongate	Partially extended	$3.9 - 5.88 \times 0.92 - 1.11$	$1:228 - 2.33$	-	7 lobed	spherical, pre-equatorial	Entire
<i>L. ernakulamensis</i> Dwivedi & Gupta, 2007	To be assessed								
<i>L. fotedari</i> Gupta & Gupta, 1990	Valid	Elongate	-	$3.05 - 3.71 \times 0.47 - 0.750$	-	present	7 lobed, compact	Overlapping each other, pre-equatorial, obliquely tandem	Entire, oval
<i>L. indicum</i> (Gupta & Govind, 1984)	Valid	Elongate	-	$3.17 - 4.96 \times 0.86 - 1.06$	1:2.4	absent	Seven lobed; lobes short digitiform	symmetrical, pre-equatorial	Entire, spherical

(Contd.)

Table 1 — Comparative chart of morphological characters of the species of the Genus *Lecithochirium* Luhe, 1901 with the species reported from India (*Contd.*)

Species	Valid status	Morphological characters							
		Body shape	Ecsoma	Length × width	Sucker ratio	Pre-somatic pit	Vitellaria	Testes	Ovary
<i>L. jairajpurii</i> (Gupta & Govind, 1984) Madhavi, 2011	Valid	Elongate	-	3.66 – 4.05 × 0.802 – 0.87	1:1.5	absent	Seven lobed; lobes compact, digitiform	symmetrical, slightly overlapping posterior margin of the acetabulum	
<i>L. tanimae</i> Gupta & Jain, 1991	To be assessed								
<i>L. tumbilense</i> Surekha & Vijaya Lakshmi, 2005	Valid	Elongate	Half as long as body; 1.3 – 2.1	4.05 – 4.2 × 0.76 – 0.91	-	-	Seven deep lobes (arranged in 4 and 3), overlapped by the ovary in the Ecsoma region	Round to oval	Round, situated in ecsoma
<i>L. leiperi</i> Gupta & Singh, 1985	Valid	Elongate	0.62 – 0.73	2.51 – 3.19 × 0.57 – 0.75	1:2.5 – 3.0	Surrounded by muscular wall	7 lobes, four sinistral and three dextral	symmetrical, pre-equatorial	Entire, postequatorial
<i>L. mugili</i> Gupta & Jain, 1991	To be assessed								
<i>L. pampi</i> Gupta & Puri, 1981	To be assessed								
<i>L. polynemi</i> Chauhan, 1945	Valid	Elongated, tapering at both ends	Retractile, 0.704 – 1.232 × 0.336 – 0.656	3.632 – 4.288 × 0.696 – 0.712	1:3.31 – 3.76	Present, appears as a small sucker	In 2 groups; situated just behind the ovary; the right one with 3 thick lobes; another one with 4 lobed	Elongate oval, tandem, post acetabular	Spherical, post-testicular, situated at the last quarter of the body
<i>L. pristipomai</i> Gupta & Jain, 1991	To be assessed								
<i>L. pritchardae</i> (Singh & Gupta, 1985) Madhavi, 2011	Valid	Elongate	1.64 – 2.2	4.58 – 4.99 × 1.25 – 1.47	1.6:1.9	absent	compact, consisting of seven digitiform lobes	Symmetrical	Entire, pre-equatorial
<i>L. testelobatus</i> Surekha & Vijayalakshmi, 2005	Valid	Triangular	Broad, 0.6 – 0.95	2.55 – 2.71 × 0.5 – 0.74	1; 1.5	-	6 lobed, lobes short	large, lobed, with lateral lobate extension	Entire, oval
<i>L. priacanthi</i> Yamaguti, 1953	Valid	Elongate	Retracted with a blunt end, 0.18 – 0.25	1.93 – 2.54 × 0.61 – 0.72	1:3.07	-		Large, oval, situated laterally	Oval situated at the posterior third end
<i>L. genypteri</i> Manter, 1954	Valid	Elongate	Short, 0.7401	2.062 × 0.665	1:2	Conspicuous with distinct margin	7 lobed, in two groups (3 & 4 lobes), as wide as long	Symmetrical, lateral	Transverse, situated behind the left testis

Table 2 — Comparative chart of morphological characters of the species of the Genus *Opegaster* Ozaki, 1925 with species reported from India

Species	Morphological characters						
	Body shape	Length × width	Sucker ratio	Vitellaria	Testes	Ovary	Habitat
<i>O. anguilli</i> Harshey, 1933	Elongately oval	2.64 – 4.20 × 0.89 – 1.38	1: 1.7	extend a little cephalad to the intestinal fork	Ovoid or rectangular, tandem, situated in the third quarter of the body	Transversely broad, submedian	Freshwater
<i>O. ditrematis</i> Yamaguti, 1942	Elongately oval	1.55 × 0.55	1:2	Extends level of the pharynx to posterior end, mostly in extracaecal fields	Transversely elongated, tandem, indented on anterior and posterior margins	Transversely elongated, a little to the right of midline	Marine
<i>O. beliyai</i> Pande, 1937	Elongately oval, anterior end pointed	1.28 – 2.7 × 0.45 – 0.97	-	extend from the level of the middle of the oesophagus to the posterior end of the body.	Transversely elongated, triangular, situated in the middle of the posterior half of the body	Transversely elongated, kidney-shaped	Fresh & Marine
<i>O. jamunicus</i> Srivastava, 1968	Foliate, anterior end pointed, posterior end rounded	2.072 – 3.216 × 0.736 – 1.506	1:1.8	Extend from the level of the intestinal bifurcation to the posterior end of the body in the lateral field	Notched, transversely elongated, tandem, situated in the middle third of the body	Reniform, median	Fresh
<i>O. mastacembalii</i> Harshey, 1937	Ovate	1.39 – 1.56 × 0.35 – 0.48	1:1.774	Extend from the level of the middle of the pharynx to the posterior end of the body	Compact, triangular or globular, tandem, situated in the posterior half of the body	Transversely elongated, entire,	Brackish, fresh
<i>O. mehrii</i> Harshey, 1937	Ovate	2.46 to 3 – 4.3 × 0.88 to 1.16	1:1.5	Extend from the level of the middle of the oesophagus to the posterior end of the body, filling post testicular region except for the excretory bladder	Globular or ovoid, tandem, contiguous, situated in the third quarter of the body	Median, irregularly ovoid, contiguous to anterior testis	Brackish, fresh
<i>O. minimus</i> (Tubangui, 1928) Tubangui & Musilungen, 1944	Elongate, ovate	1.33 – 2.09 × 0.27 – 0.5	1:1.52	Extend from the level of the acetabulum to the posterior end of the body	Globular or oval, tandem	Elliptical, median	Marine
<i>O. paramacrorchis</i> Hafeezullah, 1971	Elongate	2.628 – 3.27 × 0.882 – 1.059	1:1.6 – 1.8	Extend from the level of caecal bifurcation to the posterior end of the body	Deeply lobed, tandem, immediately postequatorial	Transversely elongated, submedian	Marine
<i>O. plotosi</i> Yamaguti, 1940	Elongate, oval	1.261 × 0.495	1:1.6	Extends from the level of the posterior portion of the pharynx to the posterior end of the body	transversely elongated, tandem, highly lobed, contiguous, situated in the posterior half of the body	highly lobed, transversely elongated	transversely elongated,

Table 3 — Comparative chart of morphological characters of the species of the Genus *Saccocoelioides* Szidat, 1954 with the species reported from India

Species	Morphological characters						
	Body shape	Length × width	Sucker ratio	Intestinal caeca	Vitellaria	Testis	Ovary
<i>S. martini</i> Madhavi, 1979	Small, oval	0.76 – 0.84 × 0.33 – 0.40	1:1.03	Short, terminating at the extent of the ovary	Follicular, distributed at the lateral fields near testis	Single, triangular, situated near the posterior end of the body	Small, pre-testicular
<i>S. chilkaensis</i> Dutta, 1995	Small	0.81 – 1.07 × 0.32 – 0.35	1:1	Short, stumpy, terminating near the level of the testis	Follicular, situated posterior to caecal ends.	Single, situated at the posterior end of the body	Entire, small
<i>S. octavus</i> Szidat, 1970	Small, fusiform	0.788 – 0.913 × 0.339 – 0.39	1:1	Bulbous, terminating at the testicular region	Follicular, two groups, one in pretesticular region, another post testicular	Large	Entire

Table 4 — Comparative chart of morphological characters of the reported Trematode species with original descriptions

Morphological characters	<i>Lecithochirium genypteri</i> Manter, 1954		<i>Opegaster plotosi</i> Yamaguti, 1940		<i>Saccocoelioides octavus</i> Szidat, 1970	
	Original description	Present description	Original description	Present description	Original description	Present description
Body shape	Elongated	Elongated	Elongated oval	Elongated oval	Fusifiform	Fusifiform
Length × width	2.000 – 3.052 × 0.672 – 0.980 mm	2.062 × 0.665 mm	1.420 – 1.450 × 0.369 – 0.377 mm	1.261 × 0.495 mm	0.868 – 0.959 × 0.232 – 0.307 mm	0.788 – 0.913 × 0.339 – 0.393 mm
Sucker ratio	1:1.7 – 1.9	1:2	1: 1.59 – 1.67	1: 1.5	Almost 1:1	Almost 1:1
Vitellaria	3 – 4 lobed	Trilobed	extends up to the level of the oesophagus	extends up to the level of the posterior portion of the pharynx	Forming large follicules	Forming large follicules
Testes	Symmetrical	Symmetrical	transversely elongated, tandem, highly lobed	transversely elongated, tandem, highly lobed	Single testis, large, post-equatorial	Single testis, large, post-equatorial
Ovary	Ovoid	Transversely ovoid	transversely elongated, lobed	transversely elongated, lobed	Pre-testicular	Pre-testicular

Table 5 — Fish host records of the reported Trematode parasites

Name of the species	Locality	Host	Reference
<i>Lecithochirium genypteri</i> Manter, 1954	Central New Zealand	<i>Trachurus novaezelandiae</i> Richardson, 1843	Manter, 1954
	South-Western Atlantic	<i>Genypterus blacodes</i> (Forster, 1801)	Gaevskaya & Kovaleva, 1978
	Southern Indian Ocean	<i>Genypterus capensis</i> (Smith, 1947)	Bary, 1991
	South America	<i>Dissostichus eleginoides</i> (Smitt, 1898)	Kohn, Fernandes & Cohen, 2007
		<i>Genypterus blacodes</i> (Forster, 1801)	
		<i>Genypterus brasiliensis</i> Regan, 1903	
		<i>Genypterus maculatus</i> (Tschudi, 1846)	
		<i>Merluccius hubbsi</i> Marini, 1933	
		<i>Merluccius australis</i> (Hutton, 1872)	
<i>Opegaster plotosi</i> Yamaguti, 1940	Japan	<i>Plotosus anguillaris</i> (Bloch, 1794) Syn. <i>Plotosus linetus</i> (Thunberg, 1787)	Yamaguti, 1940
<i>Saccocoelioides octavus</i> Szidat, 1970	Argentina	<i>Astyanax fasciatus</i> (Cuvier, 1819)	Szidat, 1970
	South America	<i>Astyanax fasciatus</i> (Cuvier, 1819)	Kohn, Fernandes & Cohen, 2007

Taxonomic summary

Host: *Polydactylus sextarius* (Bloch & Schneider, 1801).

Locality: Barkul in Chilika Lagoon, District: Khordah, Odisha.

Site of infection: Intestine.

Specimen details: ZSI/HQ/Platyhelminthes/W10508/1 (Zoological Survey of India, Kolkata).

Remarks: So far, 20 species have been reported from India¹⁶⁻¹⁹. The present species, *L. genypteri* was first reported from Central New Zealand⁸, later this species was recorded from South America²⁴, South

Western Atlantic²⁵ and Southern Indian Ocean²⁶. However, it was not reported from India and therefore, forms a new record in India. *L. genypteri* differs from other species by having conspicuous and pre somatic pit and having vitelline lobes as long as wide (Table 1, Fig. 1c). Two synonyms, for this species exists (WoRMS²⁷), namely, *Separodermidactus genypteri* (Manter, 1954) Manter & Pritchard, 1960 and *Sterrhurus genypteri* (Manter, 1954) Yamaguti, 1958. The fish, *Polydactylus sextarius* (Bloch & Schneider, 1801) forms new host record for the parasite.

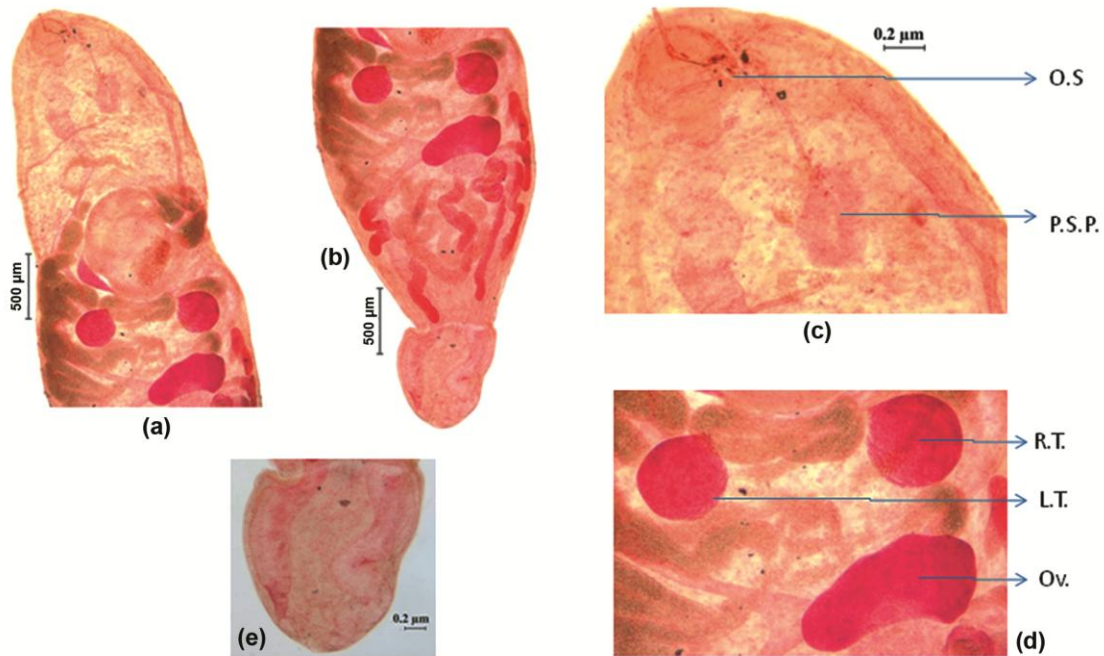


Fig. 1 — *Lecithochirium genypteri* Manter, 1954: a) anterior part, b) posterior part of the body, c) oral sucker and pre somatic pit, d) gonads, and e) ecsoma. (Oral Sucker: O.S., Pre-Somatic Pit: P.S.P., Right Testis: R.T., Left Testis: L.T., Ovary: Ov).

2. *Opegaster plotosi* Yamaguti, 1940 (Suborder Xiphidiata, Family Opecoelidae, Subfamily Opecoelinae, Genus *Opegaster* Ozaki, 1928).

Diagnostic characters: Body elongate, oval with a smooth cuticle, 1.261×0.495 mm in length; maximum width at the level of testes; oral sucker terminal; prepharynx short, distinct; pharynx, small, oval; ventral sucker with three papillae on each lip, pre equatorial, larger than oral sucker, sucker ratio almost 1:1.6; intestinal caeca extends up to the posterior end of the body and unite; testes and ovary at the third quarter of the body, contiguous; testes transversely elongated, tandem, highly lobed, contiguous, situated in the posterior half of the body; ovary highly lobed, transversely elongated; seminal vesicle reaches up to the anterior end of a ventral sucker; cirrus sac pyriform, genital pore at the level of mid-region of the oesophagus; vitellaria extends from the level of the posterior portion of the pharynx to the posterior end of the body, almost fills the post testicular region of the body; excretory vesicle tubular, reaches to the ovary. A comparative table of morphological characters from different distributions and also with other reported Indian species and photographs are provided (Tables 2, 4, Fig. 2).

Taxonomic summary

Host: *Glossogobius giuris* Hamilton, 1822.

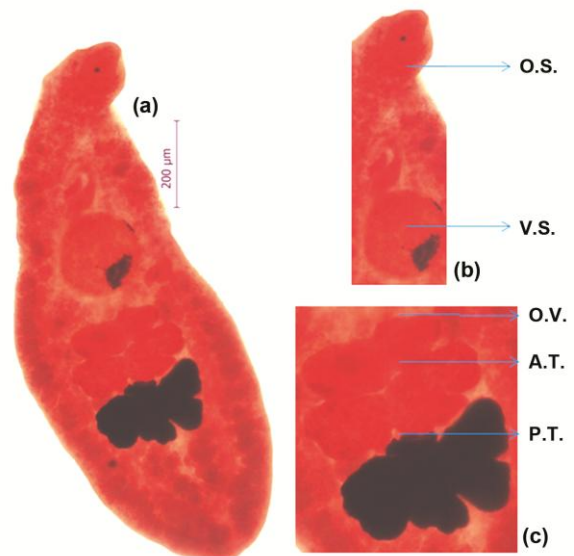


Fig. 2 — *Opegaster plotosi* Yamaguti, 1940: a) entire body, b) suckers, and c) gonads. (Oral Sucker: O.S., Ventral Sucker: V.S., Anterior Testis: A.T., Posterior Testis: P.T., Ovary: Ov).

Locality: Balugaon in Chilika Lagoon, District: Ganjam, Odisha.

Site of infection: Intestine.

Specimen details: ZSI/HQ/Platyhelminthes/W9877/1 (Zoological Survey of India, Kolkata).

Remarks: *Opegaster plotosi* Yamaguti, 1940 was first described from Japan⁹. So far, 8 species of the

genus have been reported from India (WoRMS²⁷). The present species differs from other known species of the genus *Opegaster* in having highly lobed, transversely elongated testes (Table 2; Fig 2c). *Opecoelus plotosi* (Yamaguti, 1940) Aken'ova, 2007 is considered synonym of *Opegaster plotosi* (WoRMS²⁷). The fish *Glossogobius giuris* Hamilton, 1822 forms new host record for *Opegaster plotosi*.

3. *Saccocoelioides octavus* Szidat, 1970 (Order Haploporata, Family Haploporidae, Subfamily Haploporinae, Genus *Saccocoelioides* Szidat, 1954).

Diagnostic characters: Body fusiform, spinose, 0.788 – 0.913 × 0.339 – 0.393 mm; oral sucker subterminal; almost equal to ventral sucker; sucker ratio 1:1; prepharynx long; intestinal caeca short, bulbous, bifurcates in front of the acetabulum and reaches up to testicular region; ventral sucker pre-equatorial, genital pore preacetabular, median; testis large, post-equatorial; ovary transversely elongated, pre-testicular, intercaecal; seminal receptacle absent; vitelline glands forming large follicles, made up of two groups, arranged in two lateral rows, one extending in the pre-testicular region up to the equatorial region of ventral sucker, another in post-testicular region, uterus occupies entire post-testicular region. A comparative table of morphological characters from different distributions and also with other reported Indian species and photographs are provided (Table 3, 4, Fig. 3).

Taxonomic summary

Host: *Liza parsia* (Hamilton, 1822).

Locality: Barkul in Chilika Lagoon, District: Khordah, Odisha.

Site of infection: Intestine.

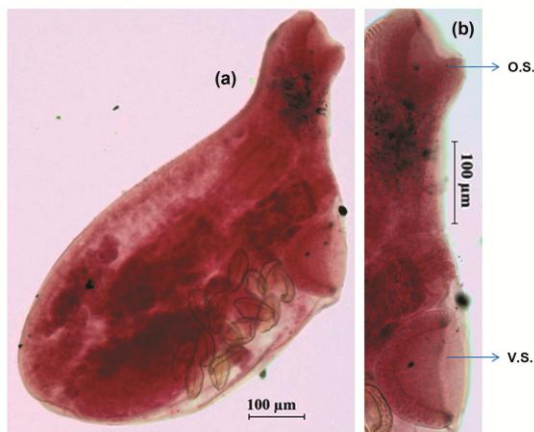


Fig. 3 — *Saccocoelioides octavus* Szidat, 1970: a) entire body, and b) suckers. (Oral Sucker: O.S., Ventral Sucker: V.S).

Specimen details: ZSI/HQ/Platyhelminthes/W9880/1 (Zoological Survey of India, Kolkata).

Remarks: *Saccocoelioides octavus* Szidat, 1970 was described from Argentina¹⁰, later it was recorded from South America²⁴. Only two species namely, *S. martini* Madhavi, 1979 and *S. chilkaensis* Dutta, 1995 are reported from India (WoRMS²⁷). The species differs from other species in having bulbous intestinal caeca, vitellaria arranged in two groups- one pre- and another post-testicular. *S. octavus* Szidat, 1970 is being recorded for the first time from India, while the fish, *L. parsia* (Hamilton, 1822) forms a new host record for the species. *S. bacillaris* Szidat, 1973 is considered a synonym of *S. octavus* (WoRMS²⁷).

Conclusions

The present study deals with three species of trematodes viz. *L. genypteri* Manter, 1954, *O. plotosi* Yamaguti, 1940 and *S. octavus* Szidat, 1954 which were collected from the fishes *P. sextarius* (Bloch & Schneider, 1801), *G. giuris* Hamilton, 1822 and *L. parsia* (Hamilton, 1822), respectively from Chilika lake. All these three species were compared with other reported species from India and were found to be different and therefore, form a new record of Indian fauna, while all the three fish species form new host records for the respective parasites.

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Conflict of Interest

The authors have no conflict of interest.

Author Contributions

AG participated in surveys, collected & identified the parasites and prepared the manuscript as per the guidance of the second author. ANR participated in the survey and provided overall guidance.

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