

Digenetic trematode parasites of the flatfishes (Pleuronectiformes) of the Kerala coast, India

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Abstract. Eleven species of digenetic trematodes, including a new one, are reported from 21 species of pleuronectid flatfishes (representing 5 families) inhabiting the Arabian Sea, off the Kerala coast, India. The parasites are *Proisorhynchus* sp. metacercaria; *Stephanostomum* sp. metacercaria; *Decemtestis mehrai* Srivastava, 1936; *Macvicaria cynoglossi* (Madhavi, 1975); *M. longicaudus* (Hafeezullah, 1971); *M. jagannathi* (Gupta et Singh, 1985); *Pseudopecoelus scomberi*

(Hafeezullah, 1971); *Lepocreadioides orientalis* Park, 1939; didymozoid larva (Type 1); didymozoid larva (Type 2) and *Monorchoides hafeezullahi* sp. n. There are 36 new host records. A list of digenetic trematodes recorded so far from the flatfishes of India is also given. The adult trematodes collected except *L. orientalis* showed an endemic distribution to seas around Indian peninsula. The host specificity of parasites is discussed.

Introduction

Pleuronectid flatfishes constitute a substantial fishery in the southwestern (Kerala) coast of India. Considering the great diversity of 91 species of flatfishes inhabiting Indian waters (Menon 1977), there are several reports regarding the digenetic trematodes of the flatfishes of India. Digenetic trematodes reported so far from the flatfishes inhabiting Indian waters include: *Neidhartia microrhyncha* Chauhan, 1943 from *Psettodes erumei*; *Proisorhynchus arabiana* Srivastava, 1938 from *Synaptura orientalis*; *Pleorchis sciaenae* Yamaguti, 1938 from *Pseudorhombus diacanthus*; *Lepocreadioides orientalis* Park, 1939 from *Cynoglossus* spp.; *L. indicus* Srivastava, 1941 from *Cynoglossus* spp.; *Monascus orientalis* (Srivastava, 1941) Yamaguti, 1958 from *S. orientalis*; *Opegaster ditrematis* Yamaguti, 1942 from *P. erumei*, *Pseudorhombus triocellatus* and *P. micrognathus*; *Rhipidocotyle ghanensis* Fischthal et Thomas, 1968 from *P. erumei*; *Lepocreadioides srivastavae* Gupta et Mehrotra, 1970 from *Cynoglossus*

cynoglossus and *C. lingua*; *Rhipidocotyle karthai* Hafeezullah et Siddiqi, 1970 from *P. erumei*; *Plagioporus longicaudus* Hafeezullah, 1971 from *Cynoglossus lida*; *Opisthodiplomonorchis elongatus* Madhavi, 1974 from *P. erumei*; *Plagioporus cynoglossi* Madhavi, 1975 from *C. lida*; *Rhipidocotyle indicus* Gupta et Ahmad, 1976 from *C. lida*; *Pleorchis psettodesai* Gupta et Gupta, 1976 from *P. erumei*; *Lecithocladium keralense* Gupta et Gupta, 1978 from *P. erumei*; *L. psettodi* Gupta et Puri, 1982 from *P. erumei*; *Lecithaster bombayensis* Ahmad, 1983 from *P. diacanthus*; *Lepocreadioides thaparai* Gupta et Govind, 1983 from *C. lida*; *Neonotoporus overstreeti* Ahmad et Dhar, 1987 from *P. erumei*; *Podocotyloides* sp. from *Cynoglossus oligolepis*; *Allodecemtestis skrjabini* Ahmad, 1988 from *C. bilineatus* and *Plagioporus microlepsi* Salman et Srivastava, 1990 from *C. microlepis*.

The aim of the present paper is to provide information on 11 species of digenetic trematodes collected from 21 species of flatfishes inhabiting the

Arabian Sea, off the coast of Kerala. One species, *Monorcheides hafeezullahi* is new to science. There are 36 new host records.

Materials and methods

Twenty-one species of flatfishes belonging to 5 families were collected from trawlers from the Neendakara (08°30'N; 76°53.3'E), Vizhinjam (08°22'N; 76°85'E) and Veli (08°28'N; 76°57'E) landing centres of the Kerala coast from March 1992 to April 1994.

The list of fishes examined and total number of specimens in each species are given in Table I.

Table I. List of flatfishes examined for digenetic trematodes from the Kerala coast, India

Hosts	No. of fish examined
Family Bothidae	
<i>Bothus myriaster</i> (Temminck et Schlegel)	45
<i>Crossorhombus azureus</i> (Alcock)	62
<i>Engyprosopon grandisquamis</i> (Temminck et Schlegel)	55
<i>Laeops nigrescens</i> Lloyd	30
<i>Pseudorhombus arsius</i> (Hamilton)	45
<i>P. elevatus</i> Ogilby	85
<i>P. javanicus</i> (Bleeker)	36
<i>P. triocellatus</i> (Schneider)	60
Family Cynoglossidae	
<i>Cynoglossus arel</i> (Schneider)	254
<i>C. dubius</i> Day	121
<i>C. lida</i> (Bleeker)	118
<i>C. macrostomus</i> Norman	259
<i>C. puncticeps</i> (Richardson)	55
Family Pleuronectidae	
<i>Samaris cristatus</i> Gray	48
Family Psettodidae	
<i>Psettodes erumei</i> (Schneider)	55
Family Soleidae	
<i>Aesopia cornuta</i> Kaup	48
<i>Euryglossa orientalis</i> (Schneider)	65
<i>Solea ovata</i> Richardson	48
<i>Synaptura commersoniana</i> (Lacepede)	52
<i>Zebrias altipinnis</i> (Alcock)	36
<i>Z. synapturoides</i> (Jenkins)	61

The fishes collected frozen from the trawlers were examined both externally and internally for digenetic trematodes. The digenetic trematodes were fixed in 10% neutral buffered formalin, under coverglass pressure, dehydrated in graded concentrations of alcohol and stained in Gower's carmine. The figures were drawn using camera lucida attachment.

The specimens were deposited in the National Museum, Zoological Collections, Zoological Survey of India, Calcutta (ZSINZC), under the accession numbers indicated. Measurements are in micrometers (μm) unless otherwise indicated. The terms prevalence (%) and mean intensity (given in brackets after the host

name) follow those of Margolis et al. (1982). Asterisk mark before the hosts indicate new host records.

Results

Bucephalidae Poche, 1907

Prosorhynchus sp. metacercaria (Fig. 1)

Hosts: **Crossorhombus azureus* (4.8%; 1.7), **Engyprosopon grandisquamis* (65.5%; 2.0), **Laeops nigrescens* (10%; 4.7), **Pseudorhombus elevatus* (35.3%; 3.5), **P. javanicus* (19.4%; 3.9) (Bothidae); *Cynoglossus arel* (21.3%; 1.2), **C. lida* (47.5%; 4.6) (Cynoglossidae); *Psettodes erumei* (1.8%; 1.0) (Psettodidae); **Aesopia cornuta* (43.8%; 2.0), *Zebrias altipinnis* (16.7%; 1.5) and **Z. synapturoides* (31.1%; 1.6) (Soleidae).

Location: Intestine and muscle.

Locality: Neendakara and Vizhinjam coasts, Kerala.

Specimens deposited: ZSINZC No. w 8276/1, w 8277/1 and w 8278/1.

Description (based on 10 specimens). Body long, cylindrical, 1.33–2.90 \times 0.27–0.37 mm, rounded at both ends, maximum width in the region of the pharynx. Anterior end with a conical rhynchus, 117–200 \times 100–117. Tegument spiny. Pharynx muscular, 57–86 in diameter, situated in the posterior half of the body. Intestinal caecum large, 333–629 \times 0.114–0.250, sac-like, directed anteriorly and filled with fat globules. Oesophagus, 220–270 long. Rudiments of testes and ovary present close to the intestinal caecum. Cirrus sac short, 243–856 \times 57–144. Vitellaria small, rounded, follicular, lateral in anterior half of body, apparently coalescing in midbody anteriorly.

Remarks. Members of the genus *Prosorhynchus* have been reported from several species of marine fishes of India. *P. arabianus* and *P. manteri* were described by Srivastava (1938) from the intestine of marine fishes. Hafeezullah and Siddiqi (1970) reported on *P. tsengi* Tsing, 1933, *P. epinepheli* Yamaguti, 1939, *P. atlanticus* Manter, 1940 and *P. chorinemi* Yamaguti, 1952 infecting the marine fishes of the east and west coasts of India. Madhavi (1976) described *P. atlanticus*, *P. chorinemi*, *P. pacificus* and *P. indicum* from the marine fishes off Andhra coast, Bay of Bengal. Recently Madhavi et al. (1994) reported metacercaria of *Prosorhynchus* sp. from mullets and its cercaria from the bivalve, *Modiolus undulatus* from Chilka lake. Bilqees (1976) described *P. erumenis* from the Indian turbot, *Psettodes erumei* off the Karachi coast.

The present metacercariae occurred free in the intestine or muscles as well as encapsulated in the muscles of the host body. Heavy infection of the muscles could be detected externally by the presence of dark-reddish or nearly black spots amidst a diffuse

ratio, 1:2; distance between suckers, 425; pharynx, 150 × 175; cirrus sac, 250 × 100; testes, 100 × 100; ovary, 175 × 175; eggs, 150–175 × 100.

Remarks. *Decemtestis mehrai* was first described by Srivastava (1936) from *Sillago sihama*. Later Gupta and Mehrotra (1970) collected this species from two marine fishes (*Ariodes dussumieri* and *Triacanthus brevirostris*) off Kerala coast, south India. Except for the slight differences in morphometry, the present specimens closely resemble *D. mehrai*. The present specimens are smaller (667 × 233) than those described by Srivastava (2.2–2.7 × 0.73–0.94 mm) and Gupta and Mehrotra (1.77–1.94 × 0.682–0.686 mm). *Cynoglossus lida* is a new host for *D. mehrai*.

Macvicaria cynoglossi (Madhavi, 1975) (Fig. 4)
Syn. *Plagioporus cynoglossi* Madhavi, 1975

Hosts: **Cynoglossus arel* (35%; 4.4), *C. lida* (5.1%; 1.5) (Cynoglossidae); **Aesopia cornuta* (77.1%; 1.6),

**Zebrias altipinnis* (63.9%; 1.4) and *Z. synapturoides* (68.9%; 3.1) (Soleidae).

Location: Intestine.

Locality: Neendakara and Vizhinjam coasts, Kerala. Specimens deposited: ZSINZC No. w 8260/1, w 8261/1 and w 8262/1.

Measurements (based on 10 specimens). Body, 1.24–3.96 × 0.36–0.84 mm; oral sucker, 117–133 in diameter; ventral sucker, 217–360 in diameter; sucker ratio, 1:1.85–2.88; distance between suckers, 450–950; pharynx, 67–100; anterior testis, 93–107; posterior testis, 107–133; ovary, 80–93; cirrus sac, 480–600 × 77–100; eggs, 58–100 × 20–38.

Remarks. The specimens agree well with *M. cynoglossi* as described by Madhavi (1975) in all the details. The species was first described from *Cynoglossus lida* off Waltair coast, Bay of Bengal, India, as *Plagioporus cynoglossi*. Gibson and Bray (1982) reorganised the genus *Plagioporus* Stafford, 1904 and erected the new genus *Macvicaria* for accommodating some of the marine *Plagioporus* species. Earlier, *P. cynoglossi* was not placed in *Macvicaria* by Bray (1985) because of the shape of the seminal vesicle (elongated or saccular) and the lobed testis. But later, in 1990, Bray proposed a new combination, *M. cynoglossi*, as the current concept of this genus includes elongated and saccular seminal vesicle and lobed testes.

Macvicaria longicaudus Hafeezullah, 1971 comb. n. (Fig. 5)

Syn. *Plagioporus longicaudus* Hafeezullah, 1971

Hosts: **Cynoglossus dubius* (58.7%; 7.7), **C. macrostomus* (23.2%; 2.7) (Cynoglossidae) and **Synaptura commersoniana* (51.9%; 1.4) (Soleidae).

Location: Intestine.

Locality: Neendakara and Vizhinjam coasts, Kerala. Specimens deposited: ZSINZC No. w 8263/1, w 8264/1 and w 8265/1.

Measurements (based on 10 specimens). Body, 3.48–4.6 × 0.6–0.84 mm; oral sucker, 133–217 × 167–217; ventral sucker, 267–333 in diameter; sucker ratio, 1:1.67–2.00; distance between suckers, 750–950; pharynx, 83–200 × 117–217; testes, 167–383 × 167–300; ovary, 100–133; cirrus sac, 500–583 × 67–133; eggs, 57–72 × 34–49.

Remarks. The present material closely resembles *P. longicaudus* described by Hafeezullah (1971b) from *C. lida* from the Gulf of Mannar, Tuticorin, India. Gibson and Bray (1982) erected a new genus, *Macvicaria*, incorporating many members of the genus *Plagioporus* and considered that the latter is restricted to freshwater fishes. Considering the close proximity of the present species to *Macvicaria*, it is transferred into this genus. *C. dubius*, *C. macrostomus* and *S. commersoniana* are new host records for *M. longicaudus*.

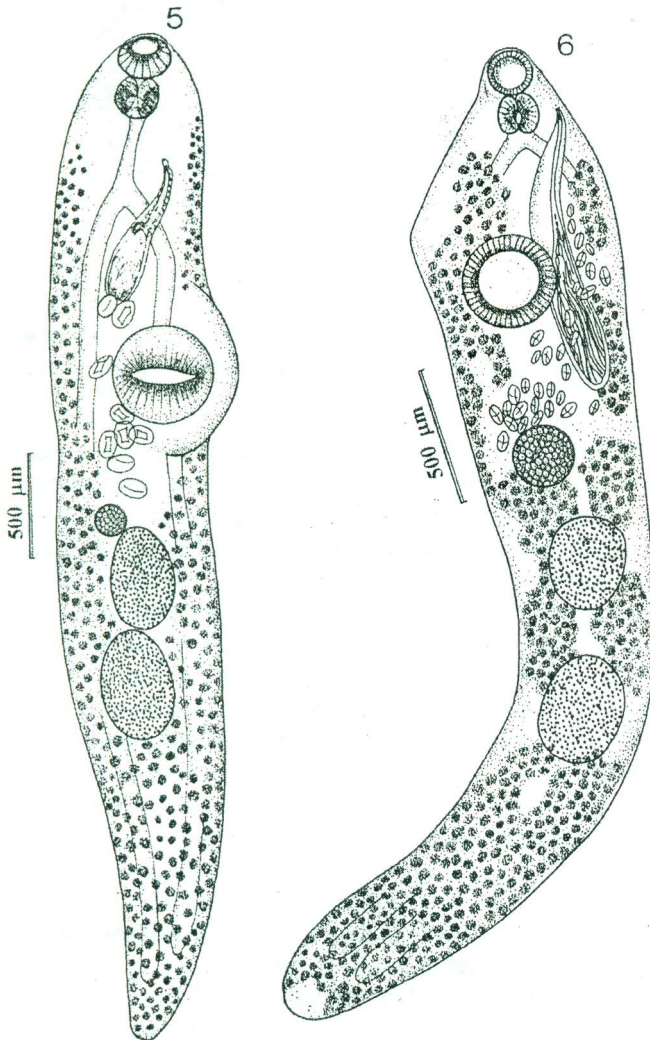


Fig. 5. *Macvicaria longicaudus*, dorsal view. Fig. 6. *Macvicaria jagannathi*, ventral view

Macvicaria jagannathi Gupta et Singh, 1985 comb. n. (Fig. 6)

Syn. *Plagioporus jagannathi* Gupta et Singh, 1985

Hosts: **Bothus myriaster* (53.3%; 2.8), **Engyprosopon grandisquamis* (30.9%; 1.9), *Pseudorhombus elevatus* (34.1%; 1.8) and **P. javanicus* (33.3%; 2.2) (Bothidae).

Location: Intestine.

Locality: Neendakara and Vizhinjam coasts, Kerala.

Specimens deposited: ZSINZC No. w 8266/1, w 8267/1 and w 8268/1.

Measurements (based on 10 specimens). Body, 1.175–3.25 × 0.325–0.5 mm; oral sucker, 80–130; ventral sucker, 150–250; sucker ratio, 1:1.85–2.02; distance between suckers, 150–250; pharynx, 60–100; anterior testis, 130–240 × 120–180; posterior testis, 150–250 × 120–180; ovary, 60–130; cirrus sac, 400–533 × 60–80; eggs, 60–80 × 30–50.

Remarks. Except for the slightly larger size, the present material resembles *P. jagannathi* as described

by Gupta and Singh (1985) from *Pseudodax moluccanus* from Puri, Bay of Bengal, India. Based on the reorganization of the genus *Macvicaria* proposed by Gibson and Bray (1982) this species is transferred to the genus *Macvicaria* as *M. jagannathi*.

Pseudopecoelus scomberi (Hafeezullah, 1971) (Fig. 7)
Syn. *Pseudopecoeloides scomberi* Hafeezullah, 1971

Host: **Engyprosopon grandisquamis* (1.8%; 1.0) (Bothidae).

Location: Intestine.

Locality: Vizhinjam coast, Kerala.

Specimens deposited: ZSINZC No. w 8269/1.

Measurements. Body, 3.96 × 0.6 mm; oral sucker, 117 × 117; ventral sucker, 183 × 183; distance between suckers, 217; pharynx, 80 × 80; anterior testis, 120 × 120; posterior testis, 133 × 120; ovary, 120 × 173; eggs, 33–50 × 17–33.

Remarks. The three species of *Pseudopecoelus* reported from India are *P. scomberi* (Hafeezullah, 1971), *P. bilqeesae* Ahmad et Dhar, 1987, and *P.*

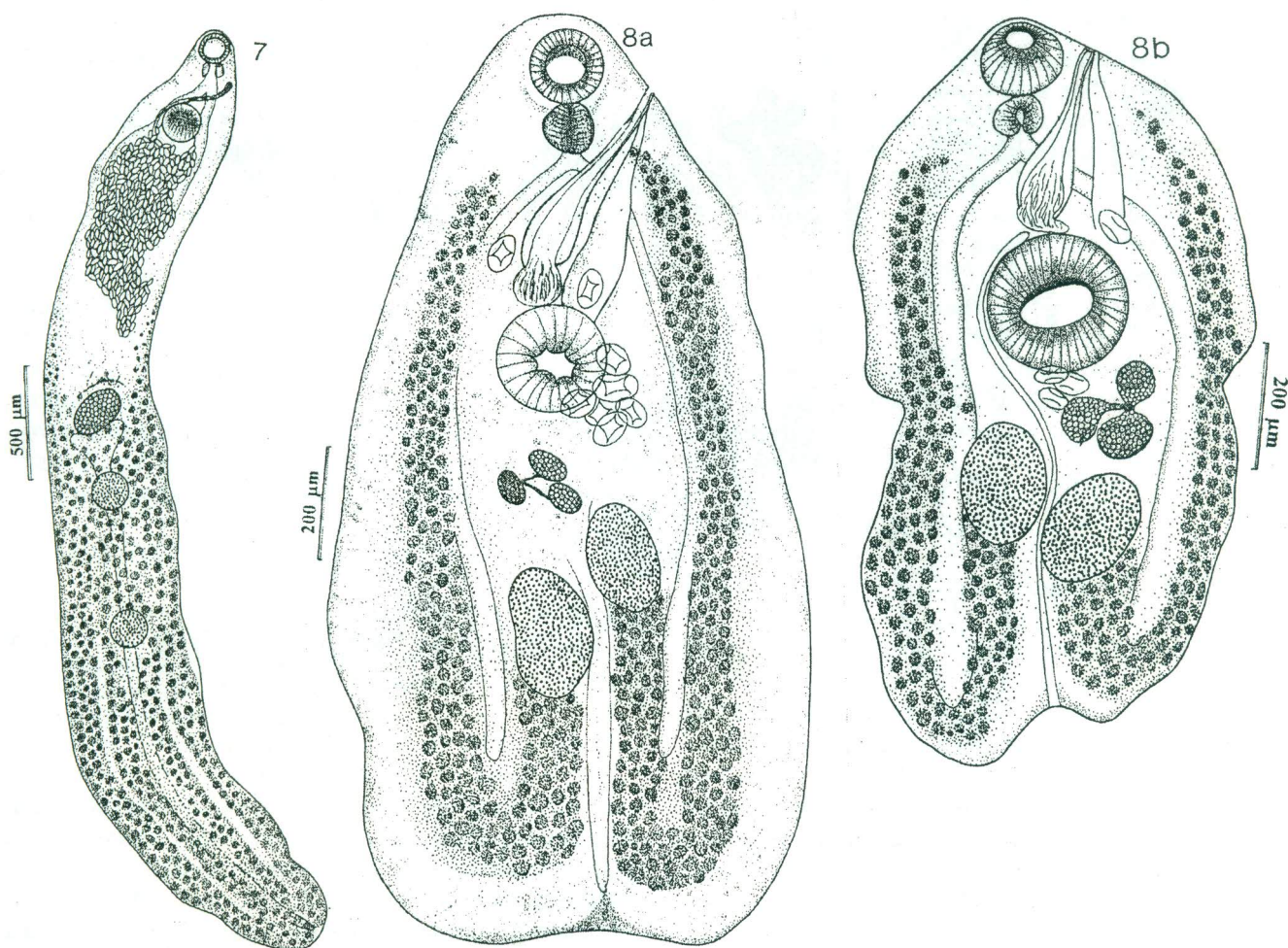


Fig. 7. *Pseudopecoelus scomberi*, dorsal view. Fig. 8a, b. *Lepocreadioides orientalis*, ventral view

dollfusi Ahmad et Dhar, 1987. The present material closely resembles *P. scomberi* described by Hafeezullah (1971b). Hafeezullah first described this species as *Pseudopocoeloides scomberi* from the carangid fish, *Scomberoides tol*. But later, Madhavi (1975) transferred it to the genus *Pseudopocoelus*. *Engyprosopon grandisquamis* is a new host for *P. scomberi*.

Lepocreadiidae (Odhner, 1905) Nicoll, 1935

Lepocreadioides orientalis Park, 1939 (Fig. 8a, b)

Syn. *Lepocreadioides indicus* Srivastava, 1941; *Lepocreadioides srivastavai* Gupta et Mehrotra, 1970; *Bicaudum otolithi* Bilqees, 1971; *Lepocreadioides thaparai* Gupta et Govind, 1984

Hosts: *Cynoglossus arel* (78.3%; 9.9), *C. dubius* (22.3%; 5.4), *C. lida* (21.2%; 1.9), *C. macrostomus* (40.2%;

Measurements (based on 10 specimens). Body, 1.099–2.966 × 0.267–0.5 mm; oral sucker, 67–107; ventral sucker, 133–267; sucker ratio, 1:1.45–1.65; distance between suckers, 267–333; pharynx, 33–67; testes, 200–300 × 67–100; ovary, 80–167; cirrus sac, 233 × 100; eggs, 67 × 33.

Remarks. *Lepocreadioides orientalis* was originally described by Park (1939) from the flatfish, *Areliscus joyneri* from Simmi Island, North Tyosen, Korea.

Lepocreadioides indicus was reported by Srivastava (1941) from *Platycephalus insidator* from Puri and Karachi. Hafeezullah (1970) recorded this species from various flatfishes of the family Cynoglossidae (*C. bilineatus*, *C. dubius*, *C. lida*, *C. lingua*, *C. macrolepidotus*, *C. puncticeps* and *C. sindensis*), oc-

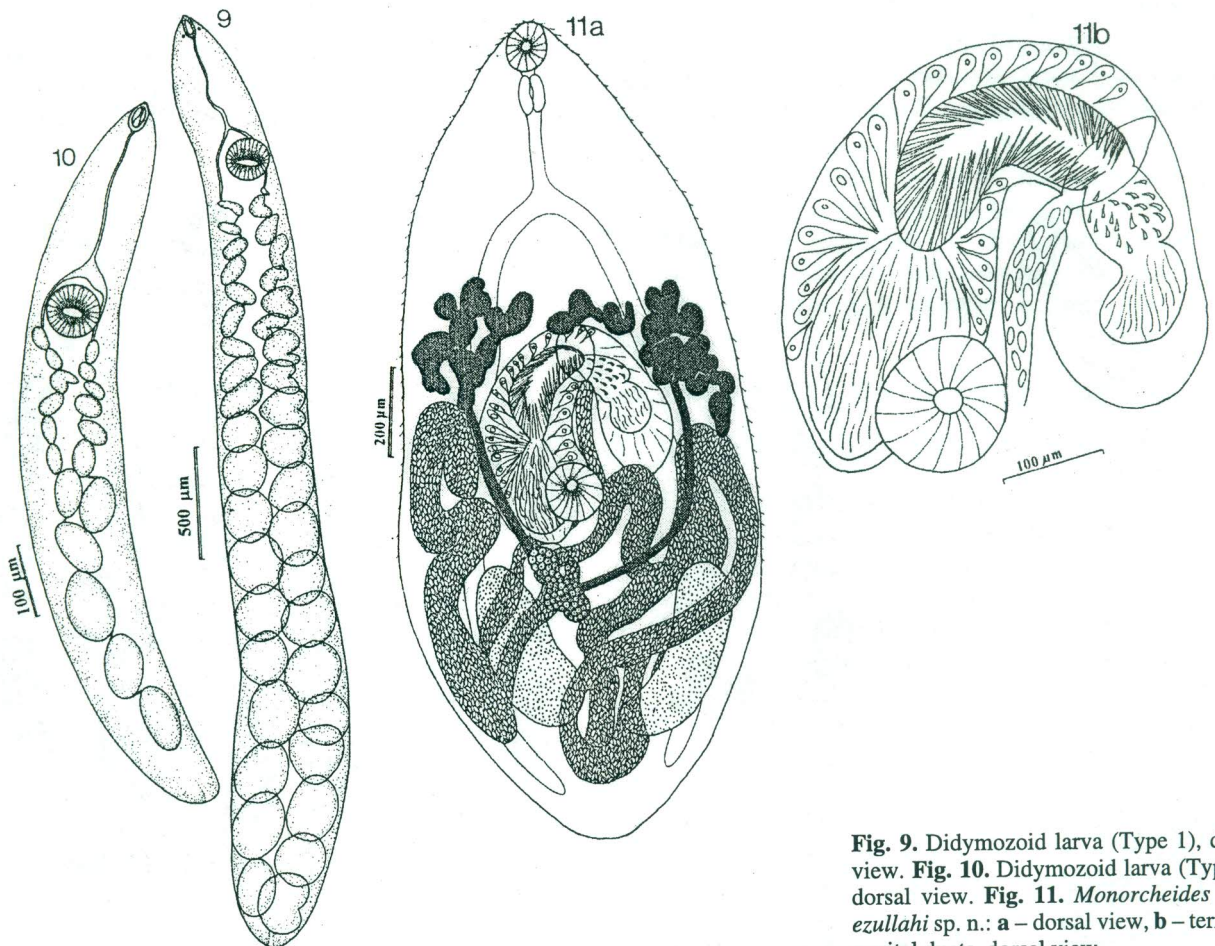


Fig. 9. Didymozoid larva (Type 1), dorsal view. Fig. 10. Didymozoid larva (Type 2), dorsal view. Fig. 11. *Monorcheides hafeezullahi* sp. n.: a – dorsal view, b – terminal genital ducts, dorsal view

2.4), * *C. puncticeps* (21.8%; 1.4) (Cynoglossidae); * *Aesopia cornuta* (12.5%; 1.8), * *Zebrias altipinnis* (19.4%; 1.0) and *Z. synapturoides* (11.5%; 1.1) (Soleidae).

Location: Stomach, intestine.

Locality: Neendakara and Vizhinjam coasts, Kerala.

Specimens deposited: ZSINZC No. w 8270/1, w 8271/1, w 8272/1 and w 8273/1.

curing along the east and west coasts of India. Madhavi (1972) also recorded this species from *C. lida* off the Waltair coast, India. Gupta and Mehrotra (1970) recorded *L. srivastavai* from *Cynoglossus cynoglossus* and *C. lingua* off the Kerala coast. Gupta and Govind (1983) recorded *L. thaparai* from the fish *C. lida* from Puri coast, Orissa, India.

Recent investigations by Hafeezullah and Chakrabarti (1994) consider the genus *Bicaudum* Bilquees, 1971 to be a synonym of *Lepocreadioides* Yamaguti, 1936 and *L. srivastavai*, *L. indicus* and *Bicaudum otolithi* are synonyms of *L. orientalis* Park, 1939. Thus, so far *L. orientalis* has been reported from 9 species of the flatfish belonging to the genus *Cynoglossus*. Considering the high prevalence of *L. orientalis* in flatfishes of the family Cynoglossidae, it may be presumed that this parasite is the most common digenetic inhabiting the intestine of *Cynoglossus* spp.

Two morphological variants of this species (one with foliate body with posterior median and lateral emarginations and the second with more or less oval body) were encountered during the present study (Fig. 8b and a, respectively).

Didymozoidae Poche, 1907

Didymozoid larva (Type 1) (Fig. 9)

Hosts: * *Cynoglossus arel* (12.2%; 1.8), * *C. lida* (24.6%; 2.1) and *C. macrostomus* (2.7%; 1.4) (Cynoglossidae).

Location: Intestine, muscle.

Locality: Neendakara and Vizhinjam coasts, Kerala.

Specimens deposited: ZSINZC No. w 8279/1.

Description (based on 10 specimens). Body long, narrow, 1.633–3.199 × 0.133–0.367 mm, tapering at anterior end and rounded at posterior end, covered with smooth tegument. Oral sucker small, oval, 96–115 × 29–88; ventral sucker large, subspherical, 157–171 in diameter; distance between suckers, 314–386. Oesophagus sinuous and narrow, bifurcating just anterior to ventral sucker. Behind the ventral sucker, each caecum formed into 19–21 chambers; anterior chambers small, oval to irregular, posterior ones large and rounded. One pair of eye spots, crescentic, on either side of the oral sucker. Parenchymal gland cells fill the entire body.

Didymozoid larva (Type 2) (Fig. 10)

Hosts: * *Pseudorhombus arsius* (6.7%; 2.3), * *P. elevatus* (7.1%; 1.5), * *P. javanicus* (2.8%; 1.0) and * *P. triocellatus* (5%; 1.7) (Bothidae).

Location: Intestine.

Locality: Neendakara and Vizhinjam coasts, Kerala.

Specimens deposited: ZSINZC No. w 8280/1.

Description (based on 5 specimens). Body robust but narrow, 1.0–1.484 × 83–133, smoothly tapering towards anterior and posterior ends. Tegument smooth. Oral sucker oval, 34–43 × 17–23, projecting slightly from the body at the anterior end. Ventral sucker large, subspherical, 80–86 × 80–86. Distance between suckers, 584–717. Oesophagus narrow, indistinct, bifurcating just in front of ventral sucker into unequal

branches; proximal parts of branches dilated. Right caecum divided into 11–13 chambers and left into 6–8 chambers. Eye spots absent.

The smaller size, lesser and unequal number of chambers of caeca, dilated proximal parts of caeca and absence of eye spots distinguish didymozoid larva Type 2 from Type 1.

Remarks. Kjøie and Lester (1985) are of the opinion that "with the present knowledge, it is impossible to classify the larval didymozoids to generic or taxa levels and the larval didymozoids should not be given Latin names to avoid double taxonomic system, one for the larval and other for the mature didymozoids".

Several workers have reported on the occurrence of didymozoid larva in marine fishes and suggested that fishes play a role of paratenic hosts in the transfer of didymozoid metacercariae indicating that crustaceans act as the second intermediate hosts to these parasites (Kjøie and Lester 1985). As the majority of flatfishes are benthophagous and since crustaceans form a major component of their food (Ramanathan et al. 1977, Radhamanyamma 1988), it is quite probably that these fishes act as a paratenic hosts for didymozoids.

In the present study two types of didymozoid larvae were collected from flatfishes; the first type occurred in three species of *Cynoglossus* and the second type in four species of *Pseudorhombus*, suggesting a comparatively high degree of host-specificity for the two types.

Though Type 1 larvae were collected both from the intestine and muscles of cynoglossid fishes, they were more abundant in the muscles. Didymozoid larvae with eye spots have been reported earlier from marine fishes of Australia by Kjøie and Lester (1985). According to these authors, the eye spots present in larval didymozoids may help them in their migration inside the final host, especially when the infection site of the parasite is close to the surface of the fish where some light may penetrate.

Monorchiidae Odhner, 1911

Monorcheides hafeezullahi sp. n. (Fig. 11a, b)

Host: *Pseudorhombus triocellatus* (33.3%; 1.7) (Bothidae).

Location: Pyloric caeca.

Locality: Vizhinjam coast, Kerala.

Specimens deposited: ZSINZC holotype No. w 8274/1; paratype No. w 8275/1.

Description (based on 10 specimens). Body sub-oval, widest in hindbody, slightly narrowing anteriorly, 0.875–1.75 × 0.625–0.8 mm, somewhat opaque, reddish in colour. Tegument spined up to the level of ovary (about 2/3 distance from anterior tip). Eye spot pigment absent. Suckers poorly developed. Oral sucker rounded, subterminal, 120–133 in diameter. Ventral

sucker, 133–147, slightly postequatorial in position; sucker ratio, 1:1.11–1.18; distance between suckers, 867–900. Prepharynx short; pharynx oval, distinct, 50–83 × 32–50. Oesophagus, 167–200; caecal bifurcation nearer to oral sucker than to ventral sucker; caeca slender, extending nearly of posterior end of the body, terminating blindly. Testes elliptical, 325–375 × 125–150, symmetrically postequatorial, in posterior third of body. Genital pore median, preacetabular at midway between caecal bifurcation and ventral sucker. Cirrus sac large, 450–625 × 175–225, proximal end of it situated slightly posterior to ventral sucker, containing oval seminal vesicle, short pars prostatica surrounded by numerous prostatic cells and long, protrusible cirrus armed with long, needle-like spines. Genital atrium unarmed. Ovary small, 150–225 × 75–125, 2–4 lobed, submedian to right, between the testes. Receptaculum seminis absent. Uterus voluminous, occupying all available space in postacetabular part of body, ultimately joining metraterm and metraterm sac at its distal part. Metraterm sac well differentiated, smaller than cirrus sac, divisible into two parts, posterior part muscular, thick-walled, unarmed and anterior part with triangular recurved spines. Vitellaria in lateral bunches of irregularly lobed follicles, postacetabular, extending up to level of genital pore or slightly anterior thereto. Vitelline ducts wide, converging towards vitelline reservoir near ovary. Eggs oval, 8–12 × 7–8. Excretory pore subterminal; vesicle apparently Y-shaped.

Remarks. The following species have been described in the genus *Monorcheides* Odhner, 1905: *M. diploorchis* Odhner, 1905; *M. soldatovi* Issaitschikow, 1928; *M. petrowi* Layman, 1930; *M. cumingae* (Martin, 1938) Martin, 1939; *M. decapteri* Manter et Pritchard, 1961; and *M. alexanderi* Arai, 1962. Martin (1940) expressed the opinion that *M. petrowi* may not belong to this genus. Margolis and Ching (1965) transferred it to the genus *Pentagramma* Chulkova, 1939. Among other species, *M. alexanderi* probably does not belong to this genus. With its postacetabular vitellaria and tubular excretory bladder, it readily fits into the genus *Diplomonorchis* Hopkins, 1941. *M. alexanderi* thus becomes *D. alexanderi* (Arai, 1962) comb. n. *M. cumingae* also has postacetabular vitellaria and in this and other characters it also fit into the genus *Diplomonorchis* Hopkins, 1941.

Monorcheides hafeezullahi sp. n. closely resembles *M. decapteri* Manter et Pritchard, 1961 in appearance, but differs in the robust body, in having four-lobed rather than three-lobed ovary, in the character and distribution of vitelline follicles and in the armature of terminal genitalia. In *M. decapteri* vitelline follicles are ovoid to elongate overlapping the acetabulum; the cirrus is armed with needle-like and thorn-like spines and metraterm with needle-like spines. In the new

species, the cirrus spines are of uniform type, being needle-like and metraterm has thorn-like spines.

Monorcheides diploorchis differs from *M. hafeezullahi* sp. n. in having a large three-lobed, dome-shaped ovary, largely intercaecal vitellaria, genital pore immediately posterior to caecal bifurcation and oral sucker distinctly larger than ventral sucker. *M. soldatovi* has a large three-lobed ovary, the vitellaria are distributed in the lateral fields between intestinal bifurcation and anterior margin of testes and the cirrus sac does not extend posterior to ventral sucker.

The species name is given in honour of Dr. M. Hafeezullah.

Conclusions

The pleuronectiform flatfishes of the Kerala coast harbour a characteristic, diverse, though not rich, trematode fauna. All the adult parasites collected during the present study except *Lepocreadioides orientalis* Park, 1939 have a distribution restricted to the seas around the Indian subcontinent. This is in conformity to the greater endemicity of the fish parasite fauna of the Indo-Pacific region (Rohde 1993).

Stephanostomum sp. metacercaria, *Macvicaria jagannathi*, didymozoid larva (Type 1) and didymozoid larva (Type 2) restricted their occurrence to a single host family. Of these, *Stephanostomum* sp. metacercaria and didymozoid metacercariae were stenoxenic. *Macvicaria cynoglossi*, *M. longicaudus* and *Lepocreadioides orientalis* infected two families of flatfishes, Cynoglossidae and Soleidae.

Prosorhynchus sp. metacercarial infection was noted in four (Bothidae, Cynoglossidae, Psettodidae and Soleidae) out of the five host families examined. This parasite, however, was a cosmopolitan form recorded from flatfishes of several parts of the world (Yamaguti 1971).

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