

## Metacercariae of trematodes (Plathelminthes: Trematoda) of *Garra dembecha* (Actinopterygii: Cyprinidae) from Lake Tana, Ethiopia

## Метацеркарии трематод (Plathelminthes: Trematoda) карповой рыбы *Garra dembecha* (Actinopterygii: Cyprinidae) из оз. Тана, Эфиопия

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The paper presents a study of metacercariae collected from *Garra dembecha* Stiassny et Getahun, 2007 in Lake Tana, Ethiopia. Metacercariae of five unidentified species are described, namely: *Diplostomulum* sp. 1, *Diplostomulum* sp. 2, *Diplostomulum* sp. 3 (Diplostomidae), *Ichthyocotylurus* sp. 1, *Ichthyocotylurus* sp. 2 (Strigeidae) and *Posthodiplostomum nanum* Dubois, 1937. The most striking feature of the *Diplostomulum* sp. 2 metacercaria is thickening of muscle fascicles at the base of the pseudosuckers. The most characteristic feature of the *Diplostomulum* sp. 3 is division of a body into the anterior and posterior parts mismatching the anterior and posterior segments of body. This is the first record of *Ichthyocotylurus* metacercariae from fish in Africa. Detailed morphological descriptions and illustrations of species are presented.

Статья представляет собой изучение метацеркарий, собранных от *Garra dembecha* Stiassny et Getahun, 2007 в оз. Тана, Эфиопия. Описаны метацеркарии пяти неидентифицированных видов трематод: *Diplostomulum* sp. 1, *Diplostomulum* sp. 2, *Diplostomulum* sp. 3 (Diplostomidae), *Ichthyocotylurus* sp. 1, *Ichthyocotylurus* sp. 2 (Strigeidae) и *Posthodiplostomum nanum* Dubois, 1937. Наиболее отличительной особенностью метацеркарий *Diplostomulum* sp. 2 служит наличие мощных пучков мышц в основании псевдоприсосок. Характерная особенность метацеркарий *Diplostomulum* sp. 3 – деление тела на переднюю и заднюю части, несоответствующие переднему и заднему сегментам тела. Это первая регистрация метацеркарий рода *Ichthyocotylurus* от рыб Африки. Приведены подробные морфологические описания, рисунки и фотографии.

**Key words:** parasites, Africa, Lake Tana, Trematoda, metacercariae, Diplostomidae, Strigeidae, *Diplostomulum*, *Ichthyocotylurus*, undescribed species

**Ключевые слова:** паразиты, Африка, озеро Тана, Trematoda, метацеркарии, Diplostomidae, Strigeidae, *Diplostomulum*, *Ichthyocotylurus*, неописанные виды

## INTRODUCTION

The cyprinid fish genus *Garra* Hamilton, 1822 consists of approximately 70 species distributed from Borneo to West Africa through southern China, South and Southeast Asia, the Middle East, the Arabian Peninsula, and East Africa. Seventeen species were recognised in Africa (Getahun, 2000). In Lake Tana, *Garra* is represented by a single species, *G. dembecha* Stiassny

et Getahun, 2007. However, the Lake Tana bottom-dwelling *Garra* might be a mini-species flock with at least two more endemic species, *G. regressus* Stiassny et Getahun, 2007 and *G. tana* Stiassny et Getahun, 2007, and may be even more (Stiassny & Getahun, 2007). Most species of *Garra* occur in fast flowing water of rivers and mountain streams, where they commonly adhere to the surface of the underwater gravel and rocky substrates mainly by the mental ad-

hesive disc modified from the lower lip and also by horizontally extended paired fins.

The parasite fauna of *Garra* in African waters has not yet been studied. The aim was to investigate the metacercariae of trematodes of *Garra* for the first time in literature. Systematic analysis of the parasites recorded is presented below.

## MATERIAL AND METHODS

One hundred seven *G. dembecha* specimens were captured and examined for the presence of metacercaria infections. During September–December (2006–2008) and May 2007 fish were sampled using a fish trap in Bahar-Dar Gulf of Lake Tana (11°33'N 37°22'E). Fish were brought alive to the laboratory and immediately dissected. The metacercariae were isolated and excysted mechanically using needles. Worms were killed in hot 4% formaldehyde and preserved in 70% ethanol, subsequently stained in alum carmine, dehydrated in ascending concentrations of ethanol and mounted in Canada balsam as permanent slides. All slides are deposited in the Parasitological Collection of the Institute for Biology of Inland Waters RAS (Russia, Borok). Measurements (mm) are given as a range with the mean in parentheses; two-dimensional measurements are length (first) and width (second).

## RESULTS

Superfamily **DIPLOSTOMOIDEA**  
Poirier, 1886

Family **DIPLOSTOMIDAE** Poirier, 1886

Subfamily **CRASSIPHIALINAE**  
Sudarikov, 1960

*Posthodiplostomum* Dubois, 1936

*Posthodiplostomum nanum* Dubois, 1937  
(Figs 1, 9)

*Host: Garra dembecha.*

*Other hosts: Barbus humilis* Boulenger, 1902.

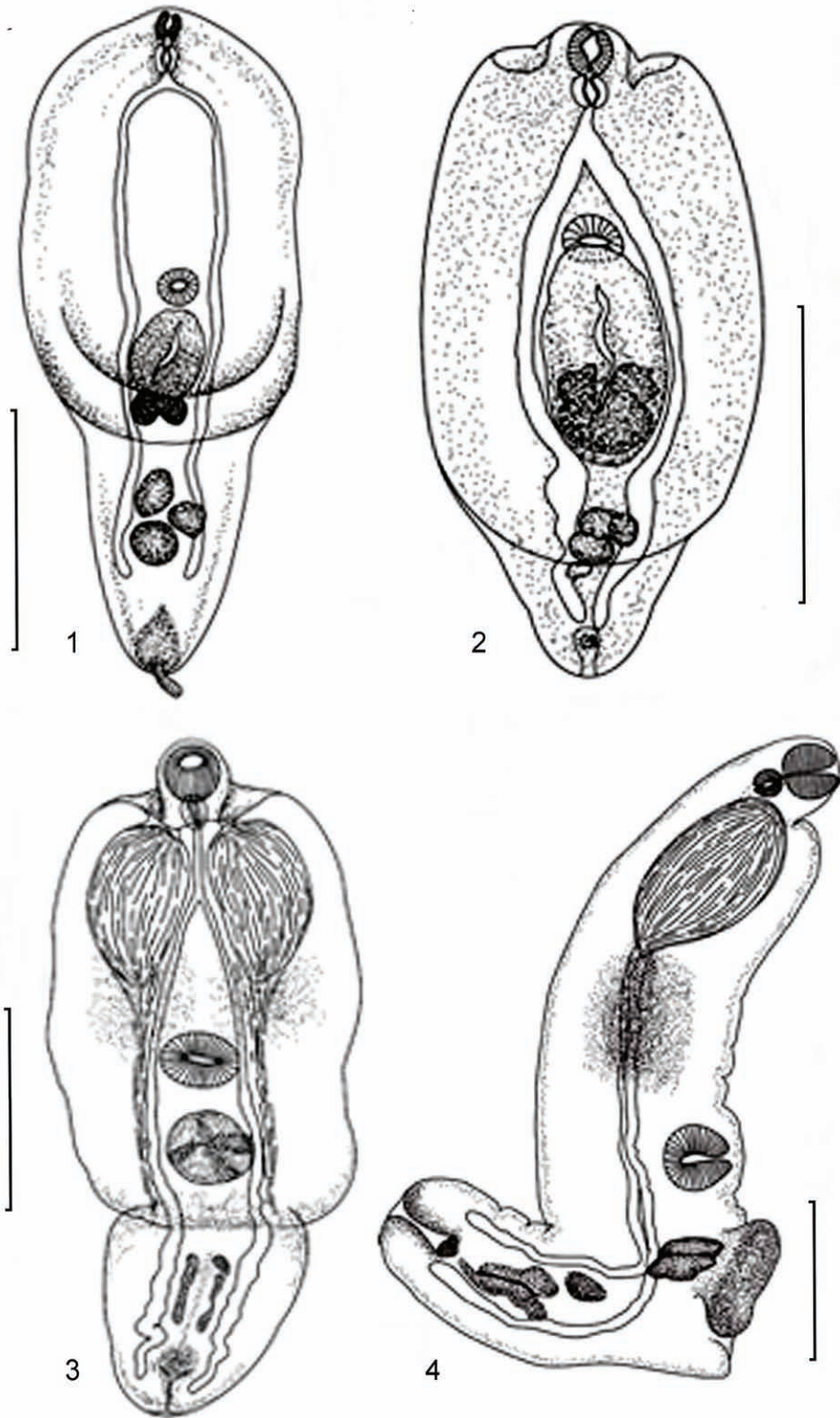
*Site:* intercostal muscles.

*Material studied:* five specimens.

*Prevalence and intensity:* 2.9% (two fishes infected / 68 fishes examined), 2–3 (mean 0.07) metacercariae per fish specimen of *G. dembecha*; 2.0% (1/50), two specimens in *B. humilis*.

*Description* (based on five whole-mounted specimens). Metacercariae in oval, thin-walled cysts of gray color (not measured). Cyst grey due to presence of numerous excretory granules. Body distinctly bipartite, 0.765–0.945 (0.862) long and 0.315–0.465 (0.402) wide. Anterior segment spatulate, with well developed ventral cavity; posterior segment conical, 0.288–0.342 (0.317) long. Oral sucker round, terminal, 0.033–0.044 × 0.033–0.044 (0.038 × 0.04) in diameter, with terminal mouth. Oral sucker smaller than ventral one, ventral to oral sucker length ratio varying from 1:1.33 to 1:1.25 (1.32). Ventral sucker round, post-equatorial, 0.044–0.055 × 0.044–0.055 (0.05 × 0.049) in diameter. Pseudosuckers absent. Brandes' organ oval, 0.11–0.161 × 0.092–0.11 (0.138 × 0.102), with medial longitudinal slit, situated immediately posterior to ventral sucker; proteolytic gland in shape of two lateral glandular masses at base of Brandes' organ. Prepharynx absent, pharynx longitudinal oval, 0.033–0.044 × 0.022–0.033 (0.04 × 0.029). Oesophagus very short or absent; intestine caeca narrow, long, reaching primordia of genital atrium. Genital primordia situated in posterior segment in form of groups of darkly stained cells. Two testis, diagonal, anterior testis (0.04 × 0.035) and, posterior testis (0.045 × 0.041); ovary 0.045 × 0.071. Primordia of genital atrium round or oval, 0.114 × 0.072. One specimen characterised by everted genital cone 0.077 long (Fig. 1).

*Remarks.* The morphology of the metacercariae well corresponds to that in *Posthodiplostomum nanum* as described by Williams (1967). In Africa, Williams and Chaytor (1966) reported *P. nanum* metacercariae from the liver and muscles of the cypriniform *Epiplatys sexfasciatus* Gill, 1862 and



**Fig. 1–4.** *Posthodiplostomum nanum*, specimen with everted genital cone (1); *Diplostomulum* sp. 1 (2); *Diplostomulum* sp. 2, ventral (3) and lateral view (4). Scale bars: 0.5 mm.

**Table 1.** Size of metacercariae of *Posthodiplostomum nanum* from different fish species.

Characters	Fish species	
	<i>Epiplatys sexfasciatus</i> , <i>E. senegalensis</i> (Williams, 1967)	<i>Garra dembecha</i> , <i>Barbus humilis</i> (our data)
Body length	0.71–1.4 (0.96)	0.765–0.945 (0.862)
Body width	0.62–1.76 (0.67)	0.315–0.465(0.402)
Posterior segment, length	0.18–0.39 (0.31 × 0.25)	0.288–0.342 (0.317 × 0.24)
Oral sucker, length	0.04–0.07 (0.05)	0.033–0.044 (0.038)
Oral sucker, width	0.04–0.06 (0.05)	0.033–0.044 (0.04)
Ventral sucker, length	0.05–0.06 (0.06)	0.044–0.055 (0.05)
Ventral sucker, width	0.04–0.08 (0.06)	0.044–0.055 (0.049)
Brandes' organ, length	0.08–0.11 (0.09)	0.11–0.161 (0.138)
Brandes' organ, width	0.09–0.14 (0.11)	0.092–0.11 (0.102)
Pharynx, length	0.04–0.06 (0.05)	0.033–0.044 (0.04)
Pharynx, width	0.02–0.03 (0.03)	0.022–0.033 (0.029)

*E. senegalensis* Steindachner, 1870 from Sierra-Leone. Development of the adult trematodes was followed in experimental hosts (chicken and heron) (Williams, 1967). An adult *P. nanum* Dubois, 1937 was described from a heron *Butorides virescens* Linnaeus, 1758 in Brazil, however, this species as adult have not been found in Africa. The larvae studied differ from those found in cypriniform fishes from Sierra-Leone by a smaller size and an aspinose anterior segment (Table 1).

Family **DIPLOSTOMIDAE** Poirier, 1886

***Diplostomulum*** Brandes, 1892

***Diplostomulum* sp. 1**

(Figs 2, 10)

*Host:* *Garra dembecha*.

*Site:* muscles.

*Material studied:* two specimens.

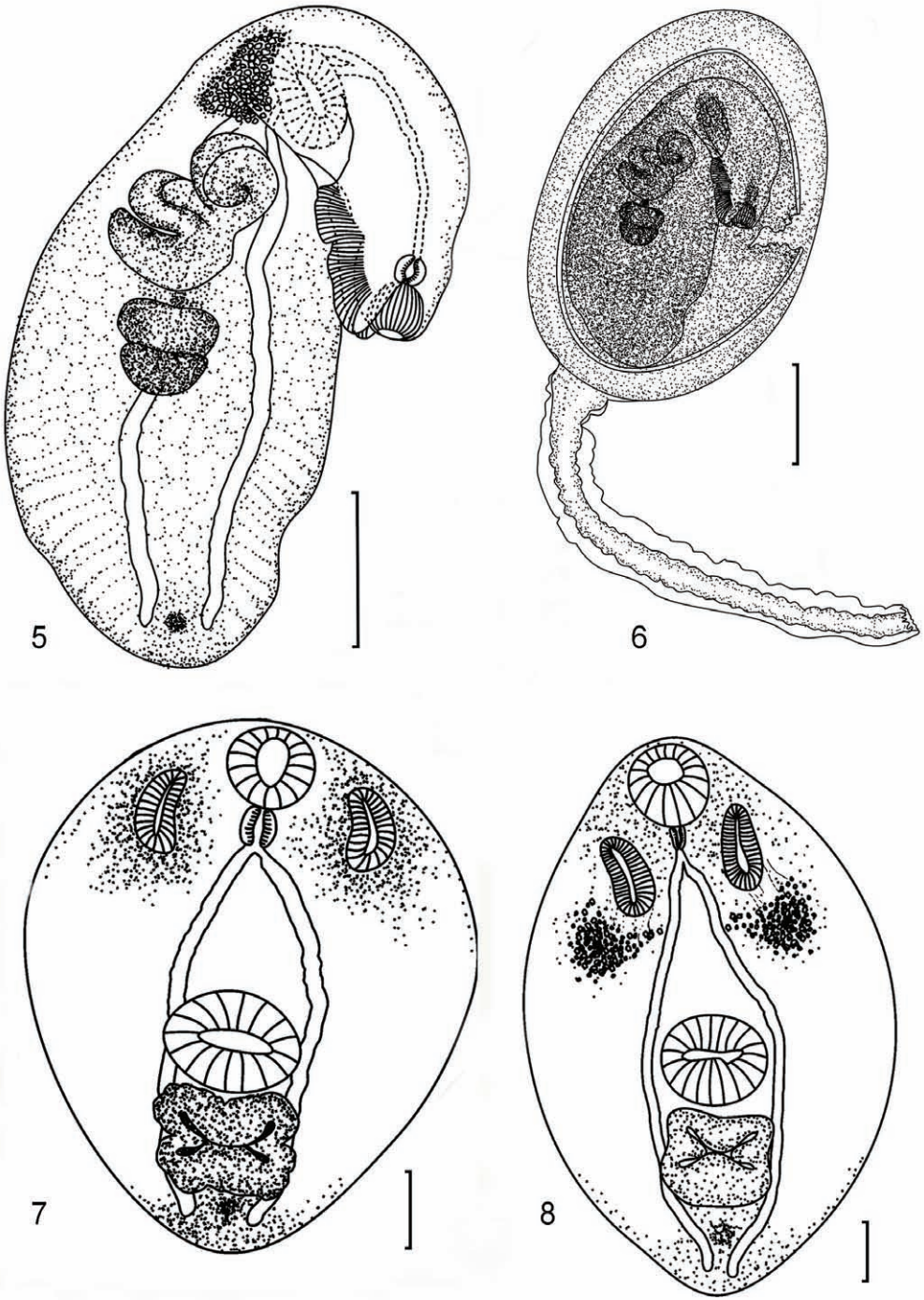
*Prevalence and intensity:* One of twenty six fish examined (3.8 %) were infected, two specimens.

*Description.* Metacercaria free and without cyst wall, body elongated-oval, 0.729–

0.738 long and 0.36–0.465 wide, indistinctly bipartite, tegument smooth. Posterior segment conical, 0.077–0.11 long. Oral sucker terminal, 0.055–0.057 × 0.044–0.053. Pseudosuckers not developed, small fosses in shape, 0.044–0.077 long and 0.022–0.029 wide, situated lateral to oral sucker. Ventral sucker rounded, 0.055–0.059 × 0.057–0.066, almost equal in size to oral sucker. Suckers length ratio 1:1–1:1.04. Prepharynx absent, pharynx narrow, 0.033–0.044 × 0.022–0.033; oesophagus short, 0.013–0.018. Intestinal caeca wide, passing Brandes' organ and reaching near posterior extremity. Brandes' organ large, 0.22–0.222 × 0.132–0.136, elliptical with median longitudinal slit, immediately posterior to ventral sucker; ventral sucker overlapping with anterior margin of Brandes' organ. Associated proteolytic gland large, situated at base of Brandes' organ. Genital primordial near posterior margin of posterior part of body in form of groups of darkly stained cells.

*Remarks.* The larvae studied that are free and without a cyst wall, correspond in their morphology (having undeveloped





**Fig. 5–8.** *Diplostomulum* sp. 3, ventral view (5) and metacercaria in cyst and capsule (6); *Ichthyocotylurus* sp. 1 (7); *Ichthyocotylurus* sp. 2 (8). Scale bars: 0.1 mm.

pseudosuckers in the shape of small fosse and an elongated Brandes' organ) to the larvae of the subfamily Alariinae (e.g. genera *Paralaria* Krause, 1914 and *Procyotrema* Harkema et Miller, 1959) (Sudarikov, 1971). However, members of these genera have been reported from otters and racoons in North and South America only; their metacercariae develop during trans-enteropulmonary migration in a definitive host. Of eleven genera belonging to the subfamily Alariinae, metacercariae of only two genera are not known – of *Podospathalium* Dubois, 1932 (in Didelphiidae, Brazil) and *Prudhoella* Beverly-Burton, 1960 (in otters, Africa) (Niewiadomska, 2002). The metacercariae of the subfamily Alariinae parasitise in mammal (final hosts) and amphibians (accessory hosts) except for the genus *Cynodiplostomum* Dubois, 1936 (carnivorous mammals are final hosts; a *Clarias* is the second intermediate host, Africa). The otter *Aonyx capensis* Illiger, 1815 occurs in Lake Tana. It is very likely that metacercariae of *Diplostomulum* sp. 1 belong to the genus *Prudhoella*.

### *Diplostomulum* sp. 2

(Figs 3–4, 11)

*Host:* *Garra dembecha*.

*Other hosts:* *Barbus humilis*.

*Site:* subcutaneous muscles of body, seldom in muscles of gill cover.

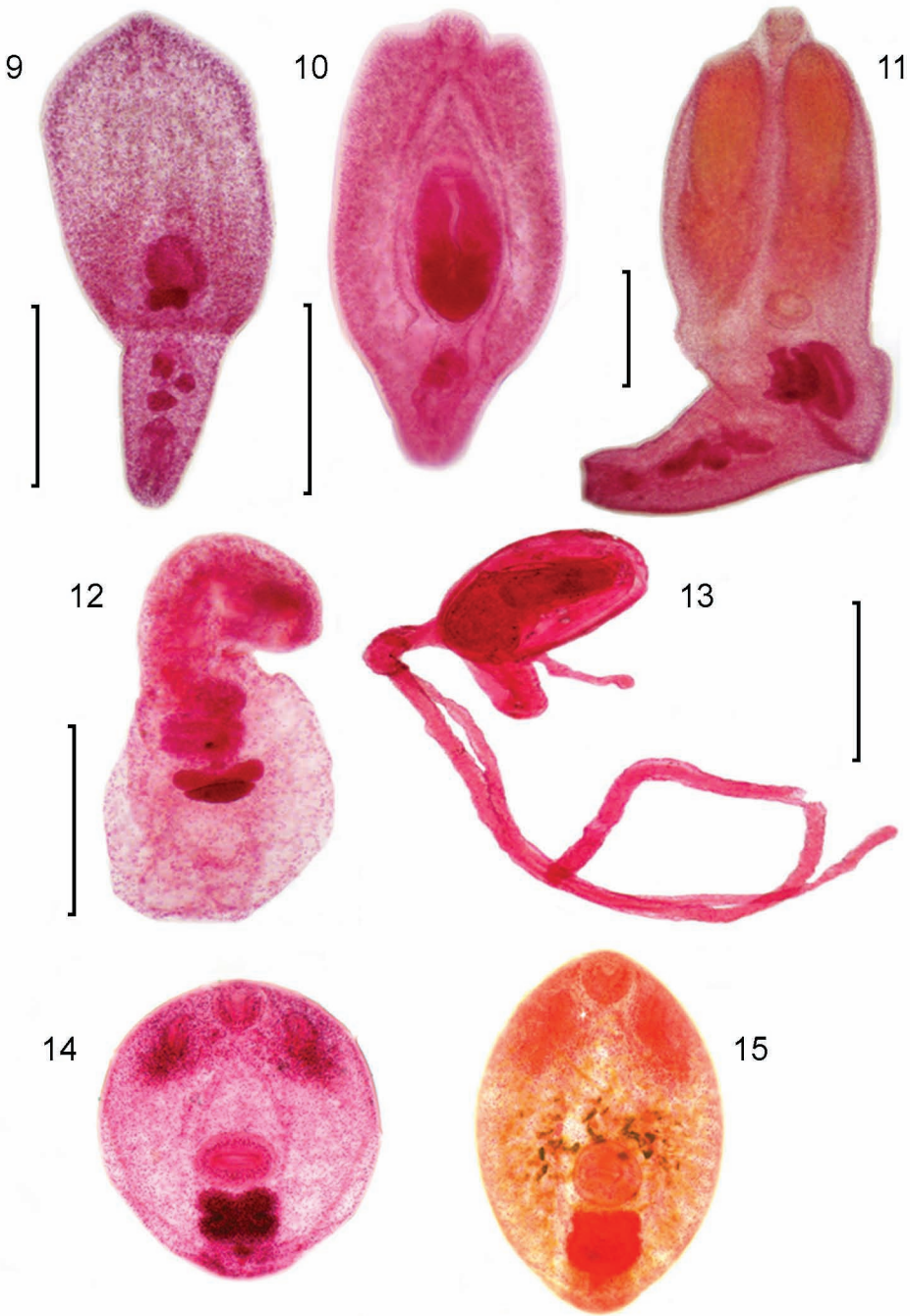
*Material studied:* 18 specimens.

*Prevalence and intensity:* 8.5% (five fishes infected / 59 fishes examined), 1–3 (mean 0.14) metacercaria per fish for *G. dembecha*; 5.9% (4/68), 1–2 (mean 0.07) for *B. humilis*.

*Description* (based on eight whole-mounted specimens). Each metacercaria enclosed in oval, thick-walled and transparent cyst,  $1.26\text{--}1.368 \times 0.612\text{--}0.762$  ( $0.72 \times 1.308$ ). Cyst wall  $0.002\text{--}0.004$ . Encysted metacercaria occupying entire space within cyst. Metacercariae forming unclearly recognisable black spots and small tubercles under skin of *G. dembecha* specimens.

Black spots under skin of *B. humilis* specimens clearly visible. Body scoop-shaped, distinctly bipartite, spineless, with maximum width at level of anterior margin of ventral sucker. Total length  $1.908\text{--}2.376$  (2.206), width  $0.828\text{--}1.08$  (0.909). Anterior segment big,  $0.488\text{--}0.535 \times 0.311\text{--}0.334$  ( $0.611 \times 0.322$ ), rectangular, covered by fine spines; posterior segment small, conical, strongly folded dorsally under blunt or right angle,  $0.72\text{--}0.99$  (0.812) long, tegument aspinose. Ventral cavity shallow. Oral sucker  $0.153\text{--}0.21 \times 0.156\text{--}0.198$  ( $0.177 \times 0.181$ ), terminal or subterminal, spherical, protruding strongly from anterior end of body. Pseudosuckers not developed, as small fossa in shape. Two fascicles of longitudinal muscle attached at base of pseudosuckers and extended to posterior segment. These fascicles of muscle forming powerful thickenings  $0.495\text{--}0.684$  long and  $0.3\text{--}0.33$  wide ( $0.315 \times 0.597$ ). Distance between oral sucker and ventral sucker  $0.585\text{--}1.05$  (0.809). Ventral sucker transversely oval, post-equatorial,  $0.15\text{--}0.198$  long and  $0.216\text{--}0.27$  wide ( $0.184 \times 0.257$ ), bigger than oral sucker. Prepharynx absent. Pharynx longitudinally oval, muscular,  $0.09\text{--}0.12 \times 0.082\text{--}0.09$  ( $0.104 \times 0.089$ ). Oesophagus narrow,  $0.22\text{--}0.36$ , long. Intestine bifurcating about halfway between oral and ventral suckers; caecae narrow, almost reaching posterior margin of body. Brandes' organ  $0.336\text{--}0.39 \times 0.162\text{--}0.204$  ( $0.361 \times 0.183$ ), oval, covered by fine spines, situated medially in posterior third of anterior segment, at some distance from ventral sucker, protruding slightly from ventral surface, with medial longitudinal slit; proteolytic glands situated dorsally (no at base) of Brandes' organ. Genital rudiments located at middle of posterior segment, well developed; testes  $0.216\text{--}0.42 \times 0.06\text{--}0.12$  ( $0.27 \times 0.098$ ), oblong, opposite; ovary  $0.078\text{--}0.192 \times 0.12\text{--}0.15$  ( $0.119 \times 0.128$ ), oval, to left of middle line, pretesticular. Genital atrium median, shallow,  $0.144\text{--}0.39$  (0.21).

*Remarks.* The metacercariae were identified as belonging to the combined genus



**Fig. 9–15.** *Posthodiplostomum nanum*, (9); *Diplostomulum* sp. I (10); *Diplostomulum* sp. 2 (11); *Diplostomulum* sp. 3, excysted metacercaria (12) and metacercaria in cyst and capsule (13); *Ichthyocotylurus* sp. 1 (14); *Ichthyocotylurus* sp. II (15). Scale bars: 0.5 mm.



*Diplostomulum*. These metacercariae show no resemblance to any other known species. Their most striking feature is the strong thickening of muscle fascicles at the base of pseudosuckers. The arrangement of proteolytic glands dorsally of Brandes' organ (not at base as in other species) is also an unusual feature of the species. This combination of the characters distinguishes the new species from metacercariae of all species described earlier.

***Diplostomulum* sp. 3**  
(Figs 5–6, 12–13)

*Host:* *Garra dembecha*.

*Other hosts:* *Barbus humilis*.

*Site:* liver.

*Material studied:* 18 specimens.

*Prevalence and intensity:* 6.3% (five fishes infected / 80 fishes examined), 3–18 (mean 0.6) metacercariae per fish for *G. dembecha*; 28.0% (14/50), (1–88, 3.2) for *B. humilis*.

*Description* (based on seven whole-mounted specimens). Metacercariae folded within transparent, thin-walled, oval cyst  $0.63\text{--}0.783 \times 0.36\text{--}0.54$  ( $0.732 \times 0.46$ ) (Figs 6, 13). Cyst surrounded by thin capsule; each capsule having long, coiled "tail". Distance between cyst wall and capsule wall  $0.018\text{--}0.096$  (0.051). Body bipartite, tegument smooth, anterior part and posterior part divided by constriction, so body figure-of-eight in shape, but anterior part, apparently, not matching up in shape with anterior segment and posterior part not matching up in shape with posterior segment. Margin between anterior segment and posterior segment invisible. Total body length  $0.957\text{--}1.305$  (1.13). Anterior part oval,  $0.372\text{--}0.585 \times 0.216\text{--}0.369$  ( $0.469 \times 0.3$ ). Posterior part oval,  $0.45\text{--}0.72 \times 0.27\text{--}0.477$  ( $0.577 \times 0.352$ ), longer than anterior part. Oral sucker funnel-shaped, terminal,  $0.055\text{--}0.077 \times 0.055\text{--}0.01$  ( $0.066 \times 0.068$ ) in diameter, flanked by pseudosuckers. Pseudosuckers largest, auriculate,  $0.099\text{--}0.132$  (0.11) long, larger than oral sucker di-

ameter. Ventral sucker round,  $0.075\text{--}0.11 \times 0.077\text{--}0.099$  ( $0.09 \times 0.09$ ) in diameter, larger than oral sucker and situated near end of anterior part. Pharynx, oesophagus and intestinal bifurcation not easily observed, intestinal caeca extending almost to posterior end. Brandes' organ large, with several lobes,  $0.132\text{--}0.18 \times 0.12\text{--}0.18$  ( $0.155 \times 0.136$ ), medially in anterior third of posterior part of body. Proteolytic glands at noticeable distance from posterior to Brandes' organ, with anterior and posterior dorsal glandular masses; anterior of 2 masses somewhat "butterfly-like" or rectangular in shape, larger or smaller than posterior one; posterior mass hemispherical; combined masses  $0.06\text{--}0.102$  long and  $0.096\text{--}0.144$  wide ( $0.088 \times 0.121$ ). Genital primordia in posterior part of body in form of groups of darkly stained cells.

*Remarks.* The new metacercaria can be distinguished from all species in the genus *Diplostomulum* by possessing a combination of the following diagnostic characteristics: division of the body into the anterior and posterior parts mismatching the anterior and posterior segments of the body; a much larger pseudosucker (approximately two times longer than oral sucker diameter); the most characteristic feature of the larvae is the presence of associated proteolytic glands which are situated at a noticeable distance behind the Brandes' organ.

Family **STRIGEIDAE** Railliet, 1919

Subfamily **STRIGEINAE** Railliet, 1919

***Ichthyocotylurus*** Odening, 1969

***Ichthyocotylurus* sp. 1**  
(Figs 7, 14)

*Host:* *Garra dembecha*.

*Site:* mesentery.

*Material studied:* two specimens.

*Prevalence and intensity:* One of eighty fish examined (1.3%) were infected, two specimens.

*Description* (based on two whole-mounted specimens). Metacercariae in oval



**Table 2.** Size of metacercariae of *Ichthyocotylurus* sp. 2 at different sites of fish

Character	Muscles of body		Mesentery	
	Mean	Range	Mean	Range
Body length	1.26	0.99–1.4	0.965	0.9–1.06
Body width	0.86	0.81–0.9	0.727	0.61–0.83
Oral sucker, length	0.166	0.144–0.18	0.148	0.14–0.15
Oral sucker, width	0.167	0.15–0.18	0.153	0.15–0.16
Ventral sucker, length	0.206	0.18–0.222	0.179	0.17–0.19
Ventral sucker, width	0.232	0.216–0.258	0.216	0.21–0.23
Brandes' organ, length	0.182	0.138–0.21	0.173	0.15–0.2
Brandes' organ, width	0.263	0.24–0.282	0.231	0.19–0.25

or spherical thin-walled and transparent cyst (not measured). Body roundish, indistinctly bipartite, flattened dorsoventrally, tegument smooth, 0.468–0.72 long and 0.387–0.648 wide. Posterior segment of body small, with blunt end. Ratio of body length/body width 1:1.2–1:1.1. Oral sucker around, subterminal,  $0.09–0.12 \times 0.096–0.12$  in diameter. Pseudosuckers oblong or oval, with short slit-like aperture,  $0.048–0.09 \times 0.015–0.042$ . Ventral sucker transversely oval, post-equatorial, 0.07–0.15 long and 0.154–0.198 wide. Space around pseudosuckers filled with numerous cellular glands. Ratio of ventral sucker length to oral sucker 1:0.78–1:1.25. Pharynx small or appearing as absent, 0.021–0.022 long. Oesophagus short, 0.033–0.034 long. Intestinal caecae long, 0.33–0.54, almost reach posterior margin of body. Brandes' organ oval or butterfly in shape,  $0.101–0.144 \times 0.143–0.198$ , immediately posterior to ventral sucker.

**Remarks.** The larvae found in *G. dembecha* are morphologically identical with metacercariae of the genus *Ichthyocotylurus* Odening, 1969 that are widespread in fishes of the Holarctic Region (*I. platycephalus* Creplin, 1825, *I. variegatus* Creplin, 1825, *I. erraticus* Rudolphi, 1809, *I. pileatus* Rudolphi, 1802) (Sudarikov, 1971, 1984). In

terms of the size of metacercariae, *Ichthyocotylurus* sp. 1 is larger than *I. erraticus* and *I. pileatus*, but smaller than *I. variegatus* and *I. platycephalus*. So far, only four species of the genus *Ichthyocotylurus* mentioned above have been reported parasitising fishes and piscivorous birds and only in the northern hemisphere. No evidence existed that *Ichthyocotylurus* species occurred in Africa. This is the first record of *Ichthyocotylurus* metacercariae from fish in Africa.

Genus *Ichthyocotylurus* Odening, 1969

### *Ichthyocotylurus* sp. 2

(Figs 8, 15)

*Host:* *Garra dembecha*.

*Site:* mesentery and muscles of body.

*Material studied:* 16 specimens.

*Prevalence and intensity:* 9.4% (five fishes infected / 53 fishes examined), 1–5 (mean 0.3) metacercariae per fish.

*Description* (based upon 14 whole-mounted specimens). Metacercariae big, included in thin-walled, transparent cyst (not measured). Body ovoid, strongly convex, indistinctly bipartite and with aspinose tegument,  $0.9–1.4 \times 0.61–0.9$  ( $1.14 \times 0.8$ ), maximum width being at level of body midline. Ventral cavity not expressed. Ra-

tio of body length/body wide 1:1.48–1:1.56 (1.4). Oral sucker round, subterminal,  $0.14\text{--}0.18 \times 0.15\text{--}0.18$  ( $0.158 \times 0.161$ ). Two pseudosuckers oval, situated laterally to and lower than oral sucker,  $0.047$  ( $0.026\text{--}0.092$ ) long. Ventral sucker rounded or transversely elliptical, larger than oral sucker,  $0.17\text{--}0.22 \times 0.21\text{--}0.26$  ( $0.194 \times 0.225$ ), situated lower than body midline. Suckers length ratio 1:1.21–1:1.22 (1.23). Distance between anterior end and center of ventral sucker  $0.27\text{--}0.73$  (0.45) long. Brandes' organ compact, with ventral and dorsal lobes, almost equal in size to ventral sucker,  $0.138\text{--}0.21 \times 0.19\text{--}0.282$  ( $0.177 \times 0.247$ ), situated immediately posterior to ventral sucker. Proteolytic gland not enisled. Prepharynx and oesophagus absent, pharynx small, (0.023), not easily observed. Intestinal caecae almost reaching posterior margin of body. At some specimens, excretory vesicle being seen. Internal space of body filled with granules of black colour, located apparently in ducts or lacunae of secondary excretory system (Fig. 15). Metacercariae localising in muscles of fish, differ from specimens located in mesentery by having a larger body size (1.26–0.86 and 0.965–0.727 respectively) (Table 2). Numbers of black granules in larvae from muscles of fish are more than that of mesentery.

**Remarks.** The metacercariae correspond in their morphology (having the body indistinctly bipartite, the ventral cavity feebly expressed, and the proteolytic gland not enisled) to the larvae of the genus *Ichthyocotylurus* Odening, 1969. The metacercariae of *Ichthyocotylurus* sp. 2 differ distinctly from *Ichthyocotylurus* sp. 1 by a larger size and an egg-shaped, strongly convex body. The most characteristic feature of the larvae is the presence of the granules of black colour, filling the canals and the lacunae of secondary excretory system. The present form closely resembles *I. platycephalus* (Niewiadomska, 1970) and *Tetracotyle biwaensis* Goto et Ozaki, 1930 (Sudarikov, 1974) from the mesentery and liver of fishes, *Sarcocheilichthys variegatus* (Temminck

et Schlegel, 1846) and *Pseudogobio esocinus* (Temminck et Schlegel, 1846) from Lake Biwa (Japan); however, it differs from them by a larger size of the body, the suckers and the Brandes' organ.

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