

SOME METACERCARIAE OF DIGENETIC TREMATODES IN FISHES FROM NUNGUA LAKE, GHANA

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ABSTRACT

Metacercariae of digenetic trematodes found in Nungua Lake, Ghana, fishes are: *Clinostomum tilapiae* Ukoli, 1966, from *Tilapia heudeloti* Duméril, *T. zillii* (Gervais) and *T. galilaea* Artedi, and *Euclinostomum heterostomum* (Rudolphi, 1809) from the first two host species only; *Clinostomoides brieni* Dollfus, 1950, *Nephrocephalus bagri-incapsulatus* (Wedl, 1861), and *Pseudoneodiplostomum thomasi* (Dollfus, 1935) from *Clarias senegalensis* Cuvier and Valenciennes. The last three are described and illustrated, *P. thomasi* for the first time. A few of the *P. thomasi* metacercariae fed to laboratory hatched crocodiles developed into adult worms.

RESUMEN

Se señala la presencia de las metacercarias de tremátodos digéneos encontradas en peces de Nungua Lake, Ghana, así como sus hospederos y su habitat. Se le encontró a *Clinostomum tilapiae* Ukoli, 1966, en *Tilapia heudeloti* Duméril, *T. zillii* (Gervais) y *T. galilaea* Artedi, y a *Euclinostomum heterostomum* (Rudolphi, 1809) en los dos primeros. De *Clarias senegalensis* se colectaron las metacercarias de *Clinostomoides brieni* Dollfus, 1950, *Nephrocephalus bagri-incapsulatus* (Wedl, 1861), y *Pseudoneodiplostomum thomasi* (Dollfus, 1935), las cuales se describen e ilustran, las de *P. thomasi* por primera vez. Unos pocos individuos de éstas se desarrollaron en tremátodos adultos al dárselas a unos cocodrilos nacidos en el laboratorio.

Nungua Lake is situated on the grounds of the University of Ghana Agricultural Research Station at Nungua in the Accra plains of southern Ghana at about 21 meters elevation. It was created in March 1954 by damming the small intermittent Mamahuma stream which drains into Sakumo lagoon near the port city of Tema. The lake is triangular shaped and about 1,430 meters long and 465 wide when full.

The fishes were netted by the Govern-

ment Fishery Department, Accra, and identified by the junior author prior to examination for parasites with the aid of the keys and descriptions given in the book by Irvine (1947). The metacercariae were fixed in corrosive acetate or Gilson's fixative under slight coverglass pressure, stained in Gower's carmine, and mounted in balsam. Specimens have been deposited in the U. S. National Museum Helminthological Collection as noted. All measurements are in microns.

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Family Clinostomatidae

Clinostomum tilapiae Ukoli, 1966
Metacercaria.

Hosts: *Tilapia heudeloti* Duméril, *T. zillii* (Gervais), *T. galilaea* Artedi (Cichlidae).

Habitats: Encysted in gill tissues and eye sockets.

Dates: 20 March 1959, 10 November 1965.

Specimens deposited: USNM Helm. Coll. No. 71632.

Discussion: Ukoli (1966a) described this species as metacercariae from the same host species and locality listed above, and as adults in naturally infected night herons, *Nycticorax n. nycticorax* (L.) (Ardeidae) and African darters, *Anhinga r. rufa* (Lacépède and Daudin) (Anhingidae) and experimentally infected cattle egrets, *Bubulcus ibis* (L.) (Ardeidae). Ukoli synonymized with *C. tilapiae* the adult *Clinostomum* sp. Dollfus, 1950 (fig. 57) from the heron *Ardea goliath* Cretzschmar (Ardeidae) from the Congo, and the metacercaria *Clinostomum* sp. Dollfus, 1950 (fig. 62) from *Tilapia melanopleura* Duméril from the Ivory Coast. Manter and Pritchard (1969) reported the adult in *Ardea goliath* from the Congo. Williams and Chaytor (1966) briefly described and illustrated the metacercaria of *Clinostomum* sp. from *Epiplatys senegalensis* (Steindachner) and *E. sexfasciatus* (Steindachner) (Cyprinodontidae) from Sierra Leone which we declare a synonym of *C. tilapiae*; they erroneously show the caeca opening into the excretory bladder and the distal part of the uterus and the cirrus sac as one structure.

Euclinostomum heterostomum
(Rudolphi, 1809) Travassos, 1928
Metacercaria

Hosts: *Tilapia zillii* (Gervais), *T. heudeloti* Duméril (Cichlidae).

Habitat: Encysted in kidneys.

Date: 13 September 1959.

Discussion: Ukoli (1966b) reported this metacercaria from the same host species and locality listed above. Adults were obtained by him from experimentally infected *Anhinga r. rufa* and long-tailed shags, *Phalacrocorax a. africanus* (Gmelin) (Phalacrocoracidae). He also reviewed the genus *Euclinostomum* Travassos, 1928, but made no reference to the earlier review by Fischthal and Kuntz (1936). The latter authors noted that specimens they recognized as *E. heterostomum*, either as metacercariae or adults, had been reported from South Africa, Mali, Egypt, southern Europe, Russia, Indochina, and India. Manter and Pritchard (1969) reported the metacercaria of *Euclinostomum* sp. from *Pelmatochromis kingsleyae* (Boulenger) (Cichlidae) from Gabon, stating that it probably is *E. heterostomum*.

Clinostomoides brieni Dollfus, 1950
Metacercaria (Fig. 1)

Host: *Clarias senegalensis* Cuvier and Valenciennes (Clariidae).

Habitat: Encysted in pharyngeal region.
Date: 11 November 1964.

Specimens deposited: USNM Helm. Coll. No. 71633.

Description (based on three metacercariae): Body elongate, sides nearly parallel, extremities round, 5,980-9,085 long by 1,075-1,670 wide at acetabular level or just preacetabular. Forebody 935-1,280 long, hindbody 4,570-7,130 long; forebody-hindbody length ratio 1:4.41-5.57. Tegument spined from level of posterior part of oral sucker or pharynx to posterior extremity, un-

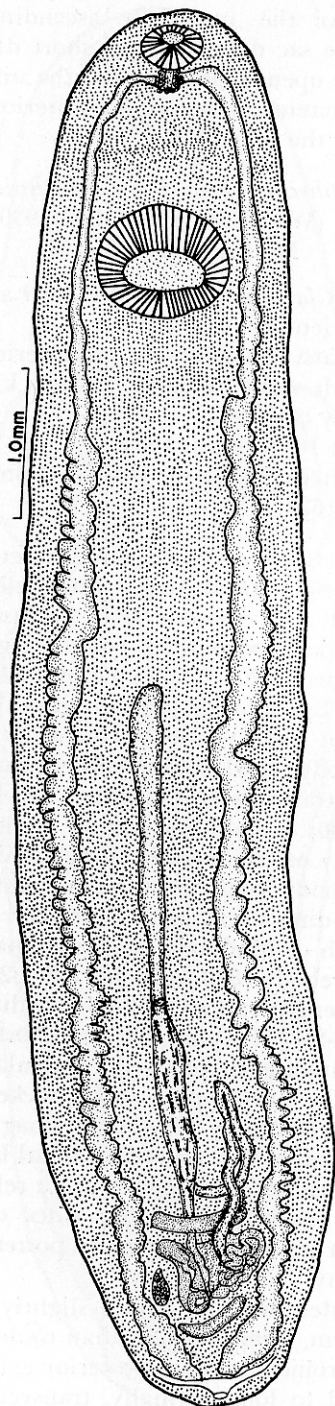


Figure 1. Metacercaria of *Clinostomoides brieni* Dollfus, 1950, ventral view.

spined anteriorly. Eye spots or scattered pigment granules on both sides of prepharynx or pharynx just anterior to caecal shoulders. Gland cells filling forebody. Oral sucker 175-195 by 295-340, lying 85-95 from anterior extremity; acetabulum transversally elongate, 475-675 by 590-895; sucker length ratio 1:2.29-3.39, width ratio 1:2.0-2.63. Prepharynx thick walled, muscular, 44-110 long; pharynx very muscular, with fibers radiating into surrounding parenchyma, margins indistinct, 140-200 by 110-195; prepharynx and pharynx surrounded by gland cells; no apparent esophagus; caecal bifurcation 407-735 preacetabular, lying dorsal to posterior part of pharynx, forming caecal shoulders before beginning descent, from acetabular level posteriorly caeca thick walled and with short diverticula on median and lateral sides, caeca terminating 135-185 from posterior extremity.

Testes two, tandem, intercaecal, much wider than long, in posterior one sixth to one eighth of body; anterior testis crescent shaped, ends round to very slightly lobed, 75-150 by 375-620, lying 3,565-5,790 postacetabular; posterior testis crescent to Y-shaped with arms widespread, 55-110 by 345-500, lying 230-445 posterior to anterior testis; posttesticular space 315-410 long. Cirrus sac thick walled, muscular, comma shaped, commencing anterior to ovary and ootype complex, 380-600 (longitudinal extent) by 105-260, containing bipartite, cell lined seminal vesicle, cell lined pars prostatica, prostate cells, and long, thick walled cirrus. Genital pore just submedian to right, immediately anterior to posterior testis.

Ovary small, very slightly lobed, dextral, intercaecal, longitudinally elongate, 200-287 by 92-144. Oviduct short, cell lined, surrounded by gland cells, passing sinistrally into ootype complex. Latter compact, 330-560 by 185-365, consisting

of profuse Mehlis' gland whose outer margin is much lobed, and the much winding oviduct. Uteroduct thick walled, surrounded by gland cells, emerging midventrally from ootype complex, ascending sinistrally and intercaecally with some undulations to a point 1,920-4,970 postacetabular before looping posteriorly on itself, then proscribing a U-shaped, dextrally directed bend lying dorsal to proximal part of uteroduct, ascending dorsal to and opening into uterine sac posterior to latter's midlength. Uterine sac median, elongate, narrow, thick walled, surrounded by gland cells, 2,515-4,140 by 33-230, anteriormost tip lying 1,410-3,530 postacetabular, descending to genital pore ventral to cirrus sac.

Excretory bladder Y-shaped, entirely postcaecal, thick walled, cell lined; arms extending anteriorly on each side of body in extracaecal position, uniting at anterior margin of oral sucker; pore terminal.

Discussion: This species was described by Dollfus (1950) from a single adult from *Ardea goliath* from the Congo. Prudhoe (1957) described the metacercaria obtained from the gills of *Clarias lazera* Cuvier and Valenciennes from the Congo; he mentioned similar metacercariae in *Clarias* sp. from Lake Nyasa, Malawi. Manter and Pritchard (1969) briefly redescribed the metacercaria from *Clarias* sp. from Ruanda, declaring *Clinostomoides ophicephalus* (Tubangui and Masilungan, 1944) Agarwal, 1959, and *C. dollfusi* Agarwal, 1959, synonymous with this species. Our specimens differ from Prudhoe's account only in regard to the lack of spines on the anterior end of the body. It differs from both descriptions in regard to the presence of eye spots or its pigment, gland cells around the prepharynx and pharynx, and a Y-shaped posterior testis (in two worms); the submedian dextral position of the genital pore; the terminal

part of the uteroduct ascending the uterine sac dorsally for a short distance before opening into it; and the union of the excretory arms at the anterior margin of the oral sucker.

Nephrocephalus bagri-incapsulatus
(Wedl, 1861) Dollfus, 1930
Metacercaria (Fig. 2)

Host: *Clarias senegalensis* Cuvier and Valenciennes (Clariidae).

Habitats: Encysted in mesenteries, stomach wall, liver, fat bodies, kidneys, body cavity.

Dates: 16, 19 April 1964.

Specimens deposited: USNM Helm. Coll. No. 71634.

Description (based on 22 metacercariae, eight measured): Body elongate, widest at acetabular level or just preacetabular, extremities round, tegument unspined, 4,200-8,100 long by 1,270-1,870 wide. Eye spots or pigment granules present in some worms. Gland cells filling forebody. Oral sucker subterminal ventral, transversely elongate, 310-430 by 360-690; acetabulum round to longitudinally or transversely elongate, in anterior body half, position variable and depending upon age of metacercaria as growth of hindbody is greater than that of forebody, 830-1,070 by 890-1,250; sucker length ratio 1:2.50-2.10, width ratio 1:1.78-2.47. Prepharynx very short, often not apparent; pharynx muscular, frequently overlapping oral sucker dorsally, 120-220 by 120-150; esophagus very short, often not apparent; caecal bifurcation just postpharyngeal; caeca relatively wide, usually ascending sides of oral sucker before descending to posterior extremity.

Testes two, smooth to slightly lobed, tandem, intercaecal, median to dextro- or sinistromedian, near posterior extremity, round to longitudinally, transversely or diagonally elongate; anterior testis 150-177 by 87-110; posterior testis 110-242 by

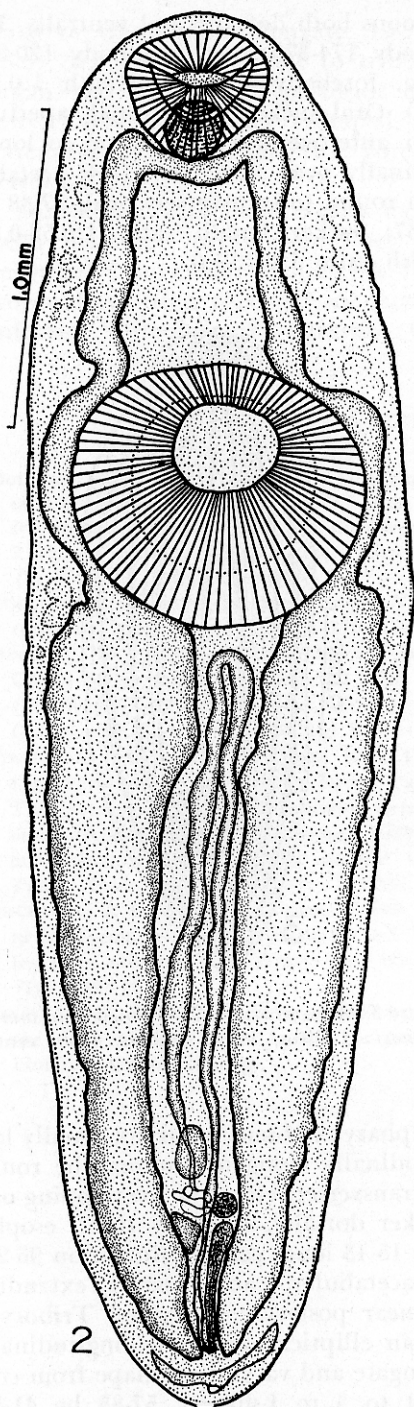


Figure 2. Metacercaria of *Nephrocephalus bagri-incapsulatus* (Wedl, 1861) Dollfus, 1930, dorsal view.

75-121. Vas efferens emerging from posterior margin of anterior testis and anterior margin of posterior testis, uniting at ovarian level or postovarian to form vas deferens; latter extending posteriorly to enter cirrus sac. Cirrus sac thick walled, muscular, intercaecal but may overlap caecum, dextral, straight or crescent shaped with sinistral curvature, 280-380 by 70-100, commencing opposite ovary or posterior testis, descending to dextromedian genital atrium and pore located just anterior to caecal ends and 160-440 from posterior extremity; containing a coiled, tubular seminal vesicle at proximal end, a short, slightly dilated, cell lined pars prostatica, prostate cells, and a long, tubular, sinuous, muscular cirrus.

Ovary smooth, intertesticular, intercaecal but may overlap caecum, usually dextral but may be median or sinistral, may be in tandem with testes, round to longitudinally or transversely elongate, 70-188 by 70-100. Oviduct thick walled, emerging from median surface of ovary, becoming much coiled and surrounded by compact Mehlis' gland. Laurer's canal present. Vitellaria absent. Uteroduct slightly sinuous, ascending on left to near acetabulum before looping posteriorly as uterine sac; latter slightly sinuous, descending on right of uteroduct and cirrus sac; metraterm short, thick walled, muscular, transversely oriented, opening into genital atrium.

Excretory bladder Y-shaped, stem very short, arms much longer and extending short distance anterolateral to caecal ends; primary ducts ascending extracaecally to sides of oral sucker, branches ramifying to all parts of body; pore sub-terminal dorsal.

Discussion: This species was described by Wedl (1861) from metacercariae from *Bagrus* sp. (Bagridae) from the Nile in Egypt. Dollfus (1929) described a metacercaria from *Clupisudis* (= *Heterotis*) *niloticus* (Ehrenberg) (Osteoglossidae)

from Cameroon as *Distoma coelomato-plocion*, but (1930) identified it as synonymous with *Distoma bagri-incapsulatus* Wedl, 1861, *Nephrocephalus sessilis* Odhner, 1902, from *Crocodilus niloticus* Laurenti (Crocodilidae) from the Nile in Sudan, and *Opisthophallus fuhrmanni* Baer, 1923, from an antelope (an error) from Sudan. Because the metacercaria has been poorly described and illustrated we are redescribing it. Dollfus (1929) erroneously described the uteroduct and uterine sac as part of the excretory system, showing it with a common stem and an anterior loop rather than as noted by us.

Young laboratory hatched *Crocodilus niloticus* were fed five cysts each and after 14 days were sacrificed; a single immature worm was recovered.

Family Proterodiplostomatidae

Pseudoneodiplostomum thomasi
(Dollfus, 1935) Dubois, 1936
Metacercaria (Fig. 3)

Host: *Clarias senegalensis* Cuvier and Valenciennes (Clariidae).

Habitats: Encysted in fat bodies, kidneys, mesenteries, ovary, small intestine wall.

Date: 24 October 1964.

Specimens deposited: USNM Helm. Coll. No. 71635.

Description (based on 44 worms, 12 measured): Body 330-651 long by 186-230 wide, elongate to oval depending on state of expansion or contraction of body, widest near anterior extremity in elongate forms and just preacetabular in oval forms, narrowest posterior to tribocytic organ, sometimes shoulderlike elevations present on each side of oral sucker, anterior extremity usually round, posterior truncate; tegument with longitudinal striations dorsally and ventrally, laterally appearing scalloped; seven narrow bundles of longitudinal muscles usually cons-

picuous both dorsally and ventrally. Forebody 174-370 long, hindbody 120-250 long, forebody-hindbody length 1:0.56-0.80. Oral sucker subterminal, aperture near anteroventral end, round to longitudinally oval, 40-53 by 37-44; acetabulum round to transversely oval, 27-38 by 31-37; sucker length ratio 1:0.58-0.86, width ratio 1:0.70-1.0.

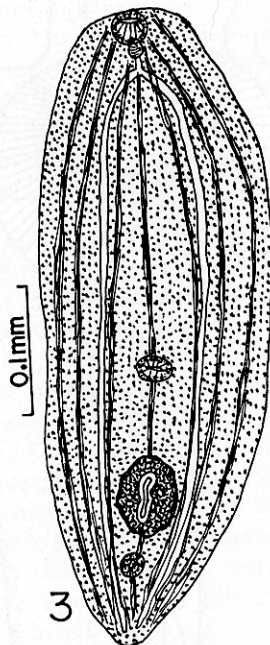


Figure 3. Metacercaria of *Pseudoneodiplostomum thomasi* (Dollfus, 1935) Dubois, 1936, ventral view.

Prepharynx absent; pharynx usually longitudinally elongate but may be round or transversely elongate, overlapping oral sucker dorsally, 19-32 by 16-22; esophagus 15-43 long; caecal bifurcation 96-250 preacetabular; caeca narrow, extending to near posterior extremity. Tribocytic organ elliptical, aperture longitudinally elongate and varying in shape from crescent to 3 to I-shaped, 57-85 by 41-52, lying 3-63 postacetabular. Single reproductive fundement round to longitudi-

nally or transversely elongate, 19-37 by 23-31, lying 0-19 posterior to tribocytic organ and 27-73 from posterior extremity. Excretory bladder V-shaped, arms extending to sides of pharynx; pore sub-terminal dorsal.

Discussion: This metacercaria has not been described previously. They were recovered from creamy white cysts. Adult worms have been reported in naturally infected *Osteolaemus tetraspis* Cope

(Crocodilidae) from the Congo, *Crocodilus cataphractus* Cuvier from Gabon, and *C. niloticus* from Madagascar and Ghana; the Ghana report is by Fischthal and Thomas (1968) from Nungua Lake.

Young laboratory hatched *Crocodilus niloticus* were each fed 300 cysts. After 14 days they were sacrificed and three adult and one immature worms were recovered from the small intestine; two control animals were negative.

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