
This paper is the second in a series by the authors on the digenetic trematodes of marine fishes from Ghana. Specimens have been deposited in the U. S. National Museum Helminthological Collection as indicated. All measurements are in microns, unless otherwise noted.

Family Acanthocolpidae
*Stephanostomum casum* (Linton, 1910) McFarlane, 1934
HOST: *Lutjanus modestus* Blecker, red snapper (*Lutjanidae*).
HABITAT: Rectum.
LOCALITY: Tema, Ghana.


Digeneric Trematodes of Marine Fishes from Ghana: Families Acanthocolpidae, Bucephalidae, Didymozoidae

**Stephanostomum ghanensis** n. sp. (Figs. 1, 2)
HOST: *Trachinotus goreensis* Cuvier and Valenciennes, pampano (*Carangidae*).
HABITAT: Stomach.

Date: 22 December 1964.
Discussion: Our collection consists of two specimens from one host. Seven spines in the oral row of circumoral spines measure 72–93 by 17–22, while nine in the aboral row are 68–82 by 19–26. The body spines end just short of the posterior extremity. Fifteen eggs measure 66–74 by 42–47; they contain 8–16 cell embryos measuring 38–52 by 29–33. Our specimens compare favorably with specimens of *S. casum* in the U. S. National Museum Helminthological Collection from Florida (no. 8743), Massachusetts (no. 8211), North Carolina (no. 37101), and Puerto Rico (no. 39341).

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Localities: Iture, Ghana.
Date: 21 February 1966.


 Gonads tandem, contiguous, filling intercelcal space, may overlap ceca ventrally. Testes two, smooth; anterior testis 440 by 330, dorsally overlapping ovary 51; posterior testis 605 by 295; posttesticular space 955 long, also long in immature specimens. Cirrus sac winding, 700 (longitudinal extent) by 152 at seminal vesicle, commencing 425 postacetabular (three-fifths of distance from latter to ovary), just contacting vitellaria medianly. Internal seminal vesicle 375 (longitudinal extent) by 145, sacular, somewhat winding anteriorly. Pars prostatica short, just posterodorsal to acetabulum, surrounded by few prostate cells. Cirrus long, winding, proximal part spined. Cirrus sac uniting with metraterm at anterior margin of acetabulum, forming short genital atrium. Genital pore median, just preacetabular.

Ovary 218 by 232, smooth, lying 700 post-acetabular. Ootype complex dorsal to ovary. Uterus extensively coiled between acetabulum and ovary, slightly overlapping latter dorsally, sperm in proximal portion. Metraterm thick-walled, shorter than cirrus sac, spines not observed. Vitellaria extensive, commencing 340 postacetabular; follicles ventral, lateral and dorsal to ceca, invading intercelcal space dorsal to gonads but not confluent, filling posttesticular space except medianly, confluent dorsal to proximal half of uterus between anteriormost margin of vitellaria to just preovarian. Eggs yellow, thin-shelled, operculate, eight measuring 62–66 by 37–45, zygote undivided.

Excretory bladder long, narrow, extending to ovarian level, ducts reaching posterior lateral margins of oral sucker before turning back on themselves and running posteriorly at least to vitellaria (probably beyond), pore terminal.

Discussion: Our species could not be keyed to any species listed in the keys given by Manter and Van Cleave (1951) and Caballero (1952). The closest species appear to be S. sentum (Linton, 1910) Manter, 1947, and S. anisotremi Manter, 1940, but it differs from them in having a much longer posttesticular space, in the cirrus sac extending more than halfway to the ovary, and in the vitelline...
follies being confluent dorsal to the proximal half of the uterus; it differs further from S. anisotremi in having fewer circumoral spines.

**Stephanostomum megacephalum**
Manter, 1940

**Hosts:** Caranx hippos (L.), jack or horse mackerel (Carangidae); Myxus curvidens (Valenciennes), mullet (Mugilidae).

**Habitat:** Small intestine.

**Localities:** Cape Coast (Caranx), Tema (Myxus); Ghana.

**Date:** 27 April 1966 (Caranx).

**Specimens:** USNM Helm. Coll. No. 63332 (from Caranx); No. 63333 (Myxus).

**Discussion:** Our specimens readily keyed to *S. megacephalum* in the keys given by Manter and Van Cleave (1951) and Caballero (1952). This species has also been found in *Caranx hippos* from Tortugas (Florida) and Jamaica (West Indies). Our collection consists of four adults and one immature specimen, with 28–30 circumoral spines, from one *C. hippos*, and four adults, with 31–32 spines, from one *M. curvidens*. The circumoral spines in specimens from the latter host average smaller (46–75 by 7–11) than those originally described; we believe this to be host influenced.

**Stephanostomum trachinitoi** n. sp.

(Fig. 3)

**Host:** Trachinotus glaucus (L.), palomet (Carangidae).

**Habitat:** Small intestine.

**Locality:** Cape Coast, Ghana.

**Date:** 20 April 1966.

**Specimen:** USNM Helm. Coll. No. 63334 (holotype).

**Diagnosis** (based on single immature specimen): Body 1,344 by 210 (preacetabular), extremities round. Testes anterior to posterior testis level, extending anteriorly up to circumoral spines. Eyespots pigment abundant, scattered from oral sucker to midlength of oesophagus. Forebody 505 long, hindbody 745 long. Oral sucker 125 by 94, elongate, funnel-shaped. Circumoral spines numbering 80–84, in two alternating, uninterrupted rows, 5–7 by 4–5, oral spines smaller than aboral. Acetabulum 94 by 102, center at level of anterior two-fifths of body length. Sucker length ratio 1:0.75. Prepharynx 118 long, thick-walled, muscular; pharynx 60 by 54, oval, four-lobed anteriorly; oesophagus 184 long, lined with cells continuous with those of ceca, longer than prepharynx or pharynx; cecal bifurcation 12 preacetabular; ceca long, cell-lined, terminating 46 from posterior extremity, opening into excretory bladder.

Gonads tandem, 4–5 apart, filling interccal space, may overlap ceca ventrally. Testes two, smooth; anterior testis 115 by 93, posterior testis 115 by 103; posttesticular space 203 long. Cirrus sac 198 by 46, median, commencing 82 postacetabular, 48 previtellarian, 168 preovarian; containing small seminal vesicle, short pars prostatica surrounded by prostate cells, and long, spined cirrus. Cirrus sac uniting with metraterm preacetabular, forming short genital atrium. Genital pore median, just preacetabular.

Ovary 45 by 38, smooth, lying 250 postacetabular. Ootype complex anterodextral to ovary. Uterus with little coiling, ascending ventral to proximal part of cirrus sac. Metraterm 140 by 20, thick-walled, muscular, appearing spined, shorter than and dextral to cirrus sac, commencing 31 postacetabular. Vitellaria commencing 130 postacetabular, 120 preovarian; follicles very small, ventral, lateral and dorsal to ceca, invading interccal space slightly, filling posttesticular space.

Excretory bladder long, narrow, extending dorsally to midlength of anterior testis, pore terminal.

**Discussion:** This form could not be keyed to any species given in the keys by Manter and Van Cleave (1951) and Caballero (1952). The unique combination of characteristics prompted us to describe it as a new species even though immature. It differs from all species, except *S. multispinosum* Manter, 1940, in having 80–84 circumoral spines. The latter species differs in the oral sucker being cupuliform and smaller than the acetabulum, in having a pyriform pharynx and a short esophagus, in the vitellaria extending to the acetabulum, and in the cirrus sac extending a considerable distance postacetabular.
Family Bucephalidae

*Bucephaloides ghanensis* n. sp. (Fig. 4)

**Host:** *Scomberomorus tritor* (Cuvier and Valenciennes), Spanish mackerel or kingfish (*Scombridae*).

**Habitat:** Small intestine.

**Locality:** Iture, Ghana.

**Date:** 21 February 1966.

**Specimens:** USNM Helm. Coll. No. 63335 (holotype).

**Diagnosis** (based on one complete specimen, and one with previtellar body missing): Body 2,277 by 175 at ovarian level, elongate, narrow, extremities round. Tegment entirely spined. Anterior sucker 85 long, esophagus muscular, very short, directed dorso-lateral, funnel-shaped; pharynx 92 by 86, lying 1,110 from anterior extremity; esophagus muscular, very short, directed dorsally; intestine 500 by 46, very long, cell-lined, directed posteriorly to level of ovary or anterior testis.


Ovary 72–73 by 68–72, round, submedian dextral, lying 440 postpharyngeal and 1,622 from anterior extremity (holotype). Oviduct muscular, from posterodorsal margin of ovary, extending posteriorly dorsal to anterior testis. Vitelline follicles in narrow lateral fields, extending from postpharyngeally (53 in holotype) to level of ovary or anterior testis, follicles (right–left) numbering 16–16, 16–17; vitelline duct from each field extending posteriorly dorsal to ovary and anterior testis, uniting at posterior part of latter to form short common duct. Uterus with few coils, extending from ovarian level to posterior margin of genital atrium. Eggs few, thick-shelled, yellow-brown, operculate, 10 measuring 16–21 by 10–15; many abnormal eggs present.

Excretory bladder very long, narrow, commencing 232 from anterior sucker, 320 from anterior extremity; pore terminal.

**Discussion:** Our species most closely resembles *Bucephaloides philippinorum* Velasquez, 1959, from a sphyraenid fish from Luzon Island, Philippines, and *B. tenius* (Yamaguti, 1952) Hopkins, 1954, from a platycephalid fish from Celebes. Both these species differ from ours in having a much longer posttesticular space and cirrus sac, and in the uterus extending considerably previtellar and prepharyngeal. *B. tenius* differs further in having a much shorter intestine, a larger ovary which is about the same size as the testes, and the anterior tip of the excretory bladder being much nearer the pharynx.

**Prosorhynchus caudovatus** Manter, 1940 (Figs. 5a–c)

**Synonym:** *Prosorhynchus crucibulus* of Eckmann, 1932, nec Rudolphi, 1819.

**Hosts:** *Epinephelus goreensis* (Cuvier and Valenciennes), sea perch or grouper (Serranidae); *Lutjanus maltzani* (Steindachner), snapper (Lutjanidae).

**Habitats:** Small intestine, stomach.

**Locality:** Tena, Ghana.

**Date:** 18 December 1964.

**Specimens:** USNM Helm. Coll. No. 63336 (from *Epinephelus*); No. 63337 (*Lutjanus*).

**Measurements and some pertinent data** (based on two specimens from *E. goreensis*, and four from *L. maltzani*; five measured): Body 1,715–2,245 by 465–675, entirely spined; rhynchus 285–330 by 205–245, wedge-shaped; pharynx 77–100 by 95–120, wider than long; narrow esophagus may be present; intestine 222–435 by 125–170; testes 167–232 by 150–196, their position in relation to each other and to ovary showing considerable variation as illustrated in Figs. 5a–c; cirrus sac 655–760 by 143–170, thick-walled, muscular, may overlap posterior testis or may be entirely posttesticular; genital atrium 186–300 by 167–200; ovary 124–198 by 111–155, overlapping testis dorsally; ootype complex dorsal to testis; Laurer’s canal extending posteriorly beyond testis to dorsal surface of body; sperm
in proximal part of uterus, uterine coils may extend previtellarian; vitelline follicles in five specimens numbering (right–left) 8–12, 11–13, 11–14, 12–14, 14–14, usually in separate lateral fields, forming inverted U in two; vitelline reservoir small; eggs thick-shelled, operculate, yellow to yellow-brown, 20 measuring 32–43 by 21–25, usually with anopercular filament which may be up to 30 long, some with anopercular knob only; some abnormally shaped eggs present in all specimens.

Discussion: This species was originally described from *Epinephelus* sp. from the Suez. The extreme variation in the relative positions of the gonads raises some question regarding the assignment of some species to the genus *Neidhartia* Nagaty, 1937, as they are based on only one or a very few specimens. Had we encountered our specimen illustrated in Figure 5b by itself, we probably would have described it as a new species of *Neidhartia* rather than recognizing it as a variant of *Prosorhynchus caudovatus*. An anopercular process has been described for at least some of the eggs in several species of bucephalids: *Prosorhynchus bidontis* Dickerman, 1954, possesses a "knob"; *Bucephalus kathetostomae* (Manter, 1934) Manter, 1940, an "irregularly shaped cap"; *Bucephalus fragilis* Velasquez, 1959, a "pro-tuberance."

**Rhipidocotyle ghanensis** n. sp.

(Fig. 6)

*Host:* *Psettodes belcheri* Bennett (*Psettoto-dae*).

*Habitat:* Small intestine.

*Locality:* Tema, Ghana.

*Specimens:* USNM Helm. Coll. No. 63338 (holotype and two paratypes on same slide).

*Diagnosis* (based on five specimens; four measured): Body 1,770–2,510 by 290–450 at postvitellarian or testicular level, dorsoventrally flattened anterior to midlength of vitellarium, much rounded posteriorly, anterior extremity truncate, posterior round. Testument entirely spinous, anterior spines more scalenike. Anterior sucker 190–205 by 143–175, subterminal ventral, opening round to elongate oval, with seven-lobed polygonal hood measuring 82–107 by 220–242, lobes may show muscular papilla when extended. Mouth 1,060–1,670 from anterior extremity, well posterior to midlength of body, posterior to pharynx; latter 61–76 by 58–77, round to longitudinally elongate, at level of anterior testis; esophagus long, 97–152 by 42–58, muscular, passing anteriorly from pharynx to ovarian level; intestine 196–272 by 126–150, oval, conspicuously cell-lined, dor-somedian, extending very slightly anterodorsal before looping posteriorly, terminating anterior to or at pharyngeal level, may overlap median parts of ovary and anterior testis.


Ovary 138–182 by 116–129, pretesticular, lying 715–1,380 from anterior extremity. Oviduct muscular, from posterior or dextrolateral margin of ovary, extending posteriorly dorsal to anterior testis. Vitelline follicles in narrow lateral fields, extending from 505–840 from anterior extremity to ovarian level; follicles numbering (right–left) 8–14, 13–16, 13–17, 15–18 in four specimens, respectively; vitelline duct from each field extending long distance posteriorly, dorsal to ovary and anterior testis, uniting to form short common duct at overlap of anterior and posterior testes. Uterus extensive, extending from 495–640 from anterior extremity (previtellarian) to level of posterior margin of genital atrium or more posteriorly. Eggs numerous, yellow-brown, thick-shelled, operculate, 20 older ones measuring 23–27 by 16–18; younger eggs nearest ovary thin-shelled, larger and rounder.

Excretory bladder very long, narrow poste-riorly, considerably expanded anteriorly and filling most of body width, extending almost to anterior sucker to slightly overlapping latter dorsally; pore terminal.

Discussion: Our species appears closest to *Rhipidocotyle longleyi* Manter, 1934, from serranid and lutjanid fishes from Florida and
Japan, and to *R. laruei* Velasquez, 1959, from a psettodid fish from Luzon Island, Philippines. Both these species differ from ours in having the mouth near midbody length, lacking an esophagus or having only a very short one, and the excretory bladder extending anteriorly only to the level of the digestive tract. *R. longezi* differs further in the intestine extending both anterior and posterior to the mouth, and in possessing a papilla on the posterior margin of the genital pore. *R. laruei* differs further in the intestine extending anteriorly from the pharynx, having the gonads at midbody length, the cirrus sac comprising almost one-half of the body length, the seminal vesicle being coiled, and the uterus extending anteriorly only to the level of the anterior vitelline follicles.

**Family Didymozoidae**

Fischthal and Kuntz (1964) and Nikolaeva (1964, 1965) have reviewed previously described immature didymozoids in addition to describing some new ones. Subsequently, Fischthal and Kuntz (1965) reported *Torticaecum nipponicum* Yamaguti, 1942, from a colubrid snake from North Borneo, and Parukhin (1966) illustrated, without describing, "Didymozoidae gen. sp. larvae" from carangid fishes from the South China Sea; the latter form is *Torticaecum*-like.

**Immature Didymozoid B Fischthal and Kuntz, 1964**

**Hosts:** *Euthynnus alleteratus* (Rafinesque), false albacore or little tunny (*Scombridae*); *Brachydeuterus auritus* (Cuvier and Valenciennes), burrito (*Pomadasyidae*).

**Habitat:** Small intestine.

**Localities:** Tema (*E. alleteratus*), Cape Coast (*B. auritus*), Ghana.

**Dates:** 23 October, 17 December 1964; 6 December 1965.

**Specimens:** USNM Helm. Coll. No. 63339 (from *Euthynnus*); No. 63340 (*Brachydeuterus*).

**Discussion:** Two albacore harbored four and 12 specimens, respectively; one worm was recovered from the burrito. This immature didymozoid was originally described from *Euthynnus yaito* Kishinouye from Palawan Island, Philippines.

**Didymozoidae (Monilicaecum)**

**larvae I Nikolaeva, 1965**

**Hosts:** *Vomer setapinnis* (Mitchill), moonfish (*Carangidae*); *Brachydeuterus auritus* (Cuvier and Valenciennes), burrito (*Pomadasyidae*); *Scomberomorus tritor* (Cuvier and Valenciennes), Spanish mackerel or kingfish (*Scombridae*).

**Habitat:** Small intestine.

**Localities:** Cape Coast, Ghana.

**Dates:** 29 November, 6 December 1965; 4 March 1966.

**Specimens:** USNM Helm. Coll. No. 63341 (from *Vomer*); No. 63342 (*Brachydeuterus*); No. 63343 (*Scomberomorus*).

**Description** (based on three specimens; all measured): Body 1,748–2,030 by 213–280, elongate, anterior part narrow, gradually widening to rounded posterior extremity; body 7.2–8.8 times longer than wide. Forebody 395–452 long, hindbody 1,280–1,490 long. Body filled with vesicular parenchyma. Parenchymal glands conspicuous, filling entire body in zone beneath tegument. Oral sucker 156–167 by 61–66, 59–73 of it protruding from anterior body opening, elongate; composed of outer thin layer of longitudinal and inner thicker layer of circular muscles, and much greater inner area of vesicular parenchymatous cells, combined thickness of muscle layers 5–8. Acetabulum 73–99 by 80–93, muscular, center at level of anterior one-fourth of body length. Sucker length ratio 1:0.44–0.63. Distance between suckers 266–342, its ratio to body length being 1.5.9–6.6. Pharynx 22–27 by 23–27, round, inner part non-muscular and composed of vesicular cells, contiguous with center of posterior part of oral sucker; esophagus 186–276 long, sinuous, thick-walled, muscular, lumen much enlarged at distal end just before cecal bifurcation; latter 38–72 preacetabular; one cecum ascending very short distance before descent, ceca lined internally to acetabular level with very thick layer of amber-colored, large glands with free ends projecting into small lumen, length of glandular part of right cecum 120–127, left cecum 114–140, no nuclei visible in glands, walls 6–23 thick; indistinct, somewhat diffuse, large, very granular, multinucleate glands external to thick part of cec; 7–8 narrow, elongate chambers along postacetabular length of each cecum, most cham-
bers with amber-colored amorphous contents; ceca terminating subequally, one 114–191 from posterior extremity, other 275–360. No reproductive fundaments. Excretory bladder elongate, narrow, followed anteriorly as far as acetabulum, but probably extends preacetabular; pore terminal.

**Discussion:** This form was originally described from the small intestine of *Sardinops ocellata* (Clupeidae) and *Zeus faber* L. (Zeidae) from the Atlantic coast of Southwest Africa. We are referring our specimens to it even though some differences occur. Nikolaeva (1965) studied much smaller specimens than ours, but inasmuch as they are immature size alone may not be significant for differentiation. For the same reason and because of differences in the state of extension or contraction of the body following fixation, the ratios of width and of distance between suckers to body length are also unreliable as criteria for differentiation. Nikolaeva described a strongly muscular oral sucker for her specimens, but her illustration appears to show that the inner part is non-muscular. Should our interpretation of the illustration be incorrect, then our specimens represent a different species. The only other immature didymozoid with a glandular stomach-like structure at the cecal bifurcation is *Monilicaecum ventricosum* Yamaguti, 1942, from the flesh and body cavity of *Cololabis saira* (Brevoort) (Scomberesocidae) from the Japanese Pacific. The latter species differs from Didymozoidae (*Monilicaecum*) larvae I in having the stomach-like structure confined to the cecal bifurcation rather than extending posteriorly on the ceca to acetabular level, and in lacking glands external to the stomach. The presence of glands surrounding the anterior part of the digestive tract has not been noted for any other immature didymozoid; they have been described for adults of *Nematobothrium sardae* MacCallum and MacCallum, 1916, and species in the genera *Paragonopodasmus* Yamaguti, 1938; *Allonematobothrium* Yamaguti, 1965; *Metanematobothrioides* Yamaguti, 1965; *Nematobothrioides* Yamaguti, 1965; and *Neonematobothrium* Yamaguti, 1965.

**Immature Didymozoid D**
(Fig. 7)

**Host:** *Lagocephalus laevigatus* (L.), smooth puffer or globe-fish (*Tetraodontidae*).

**Habitat:** Small intestine.

**Locality:** Cape Coast, Ghana.

**Date:** 4 March 1966.

**Specimen:** USNM Helm. Coll. No. 63344.

**Description** (based on single specimen): Characteristics as for Didymozoidae (*Monilicaecum*) larvae I, except as noted below. Body 2,085 by 240, abruptly narrowing post-ceccally to papillalike termination; body 8.7 times longer than wide. Forebody 750 long, hindbody 1,245 long. Oral sucker 119 by 50, within body, combined thickness of muscle layers 4–5. Acetabulum 90 by 87, strongly muscular, center at level of anterior 38 per cent of body length. Sucker length ratio 1:0.76. Distance between suckers 615, its ratio to body length being 1:3.4. Pharynx 20 by 37, contiguous with entire width of truncated posterior end of oral sucker; esophagus 440 long; cecal bifurcation 148 preacetabular; ceca not ascending at beginning, winding, with very thick, amber-colored glands internally to acetabular level, length of glandular part of right cecum 205, left cecum 198, walls 10–22 thick; 15 distinct, isolated, large, multinucleate, agranular glands distributed dorsally and ventrally to thick parts of ceca, some glands bipartite, varying in size from 24 by 26 to 29 by 55; ceca continuing to within 90 of posterior extremity, with 10 enlarged chambers along postacetabular length of each cecum, chambers for short distance small and conspicuously cell-lined. Excretory bladder commencing prebifurcal, 130 posterior to oral sucker, arms postpharyngeal.

**Discussion:** This new form differs significantly from *Monilicaecum ventricosum* Yamaguti, 1942, and Didymozoidae (*Monilicaecum*) larvae I Nikolaeva, 1965, in having considerably more of the ceca internally lined with glands, a differently shaped pharynx, and an oral sucker distinctly longer than the acetabulum. It differs further from the latter form in that the ceca do not ascend the body before extending posteriorly, and in having a different type of gland external to the thick part of the ceca.

**Immature Didymozoid E**
(Fig. 8)

**Hosts:** *Scyris alexandrinus* (Geoffroy St. Hilaire), thread-fin horse mackerel; *Caranx africanus* Steindachner, African horse mackerel.
(Carangidae); Cynoscion macrognathus (Bleeker), large-mouth weakfish (Sciaenidae); Scomberomorus tritor (Cuvier and Valenciennes), Spanish mackerel or kingfish (Scombridae); Pomadasys jubelini (Cuvier and Valenciennes), burro; Brachydeuterus auritus (Cuvier and Valenciennes), burrito (Pomadasysidae); Psettodes bechleri Bennett (Psettodidae); Cynoglossus goreensis (Köpf), tongue soles (Cynoglossidae); Rhinobatus albomaculatus Norman, white-spotted guitarfish (Rhinobatidae); Pteroplatea micrura (Schneider), butterfly ray (Trygonidae).

HABITATS: Stomach, small intestine.
LOCALITIES: Tema, Cape Coast, Iture; Ghana.
DATES: 19 December 1964; 31 March, 2 April 1965; 21 February, 10 March 1966.
SPECIMENS: USNM Helm. Coll. No. 63345 (from Scyris); No. 63346 (Caranx); No. 63347 (Cynoscion); No. 63348 (Scomberomorus); No. 63349 (Pomadasys); No. 63350 (Brachydeuterus); No. 63351 (Psettodes); No. 63352 (Cynoglossus goreensis); No. 63353 (C. senegalensis); No. 63354 (Rhinobatus); No. 63355 (Pteroplatea).

DESCRIPTION (based on 19 specimens, 10 measured): Characteristics as for Didymozoidae (Monilicaecum) larvae I, except as noted below. Body 1,500–3,501 by 165–510, posterior extremity round; body 5.8–12.5 times longer than wide. Forebody 385–663 long, hindbody 1,015–2,830 long. Oral sucker 51–111 by 37–80, usually longitudinally elongate but may be round, entirely but weakly muscular. Acetabulum 100–222 by 98–218, center at level of anterior 17–29 per cent of body length. Sucker length ratio 1:1.71–2.52. Distance between suckers 270–542, its ratio to body length being 1:4.5–8.6. Pharynx 18–48 by 14–36, round to longitudinally elongate, entirely muscular, contiguous with center of posterior part of oral sucker; esophagus 191–404 long, straight or sinuous, lumen not much enlarged at distal end; cecal bifurcation 46–123 preacetabular, no glandular thickening of walls; ceca winding to within 27–190 of posterior extremity, each cecum with 12–16 chambers. Glands in compact mass externally surrounding posterior 78–189 of esophagus, cecal bifurcation and 53–140 of ceca (to acetabular level or nearly so). Excretory bladder commencing pre- to slightly postbifurcal.

DISCUSSION: The distribution of the glands external to the anterior part of the digestive tract is distinctive for this new form, differentiating it from all other known immature forms of the family. The distribution is somewhat similar to that reported for the adult of Nematobothrioides kalikali Yamaguti, 1965, from Hawaii; however, the latter lacks an acetabulum. The glands in specimens from the guitarfish and ray were sparser and more diffuse than those from the other hosts possibly because they, as selachians, are not suitable paratenic hosts.

Immature Didymozoid F (Fig. 9)
HOST: Cypsilurus heterurus (Rafinesque), flying-fish (Exocoetaeidae).
HABITAT: Small intestine.
LOCALITY: Tema, Ghana.
DATE: 2 June 1965.
DESCRIPTION (based on one complete specimen in dextrolateral view, hence measurements are length by depth; also, two fragments of postacetabular part of body of two other specimens): Characteristics as for Didymozoidae (Monilicaecum) larvae I, except as noted below. Body 3,597 by 116, very long. Forebody 515 long, hindbody 3,060 long. Oral sucker 45 by 39, entirely but weakly muscular, within body. Acetabulum 22 by 26, center at level of anterior 15 per cent of body length. Sucker length ratio 1:0.49. Distance between suckers 465, its ratio to body length being 1:7.7. Pharynx 27 by 21, entirely muscular; esophagus 252 long, lumen not enlarged distally; stomach at cecal bifurcation, 45 by 33, lying 150 preacetabular, lined internally with very thick, amber-colored glands; ceca 9–10 wide at exit from stomach, straight to short distance postacetabular, then sinuous with some small, elongate chambers, extending to within 32 of posterior extremity. Glands in compact mass external to stomach and ceca for distance of 1,045, terminating 620 postacetabular. Excretory bladder commencing prebifurcal, arms to 63 postpharyngeal.

DISCUSSION: The present new form appears closest to Monilicaecum ventricosum Yamaguti, 1942, but the latter differs in possessing non-
muscular elements in the oral sucker, in the retracted oral sucker being smaller than or the same size as the acetabulum, and in lacking glands external to the anterior part of the digestive tract. The distribution of the latter glands in our form is somewhat similar to that occurring in adults of Paragonopodasmius managatuwo Yamaguti, 1938, and Metanematobothrioidea opakapaka Yamaguti, 1965.

Immature Didymozoid G

(Fig. 10)

HOST: Larimus peli Bleeker (Sciaenidae).
HABITAT: Small intestine.
LOCALITY: Cape Coast, Ghana.
DESCRIPTION (based on single specimen): Characteristics as for Didymozoidae (Monilicaecum) larvae I, except as noted below.

Body. 1,350 by 360, 3.8 times longer than wide. Forebody 340 long, hindbody 815 long. Oral sucker 83 by 64, entirely but weakly muscular, within body. Acetabulum 195 by 200, center at level of anterior 32 per cent of body length. Sucker length ratio 1:2.35. Distance between suckers 260, its ratio to body length being 1:5.2. Pharynx 27 by 27, entirely muscular; esophagus 255 long, straight, lumen not enlarged distally; cecal bifurcation overlapping anteriormost part of acetabulum; ceca thick-walled, muscular at acetabular level for distance of 103, with outer thin longitudinal and inner thick circular muscle layers which are continuous with those of esophagus, walls 3–5 thick, lumen narrow; glands in compact mass external to muscular part of ceca; beyond latter ceca conspicuously cell-lined, with 12 chambers along length of each cecum, amber-colored material absent from chambers, terminating 125 from posterior extremity. Excretory bladder followed anteriorly as far as acetabulum, but probably extending precacetabular, pore terminal.

DISCUSSION: This new form differs from all known immature didymozoids in having the ceca muscular at their beginning.

Allonematobothrium ghanensis n. sp.

(Figs. 11a–c)

HOST: Epinephelus aeneus (Geoffroy St. Hilaire), sea perch or grouper (Serranidae).

HABITAT: Encysted in subepidermal tissue of buccal cavity.
LOCALITY: Tema, Ghana.
SPECIMENS: USNM Helm. Coll. No. 63358 (holotype, acetabulum prebifurcal); No. 63359 (paratypes).

DIAGNOSIS (based on fragments of seven specimens): Body very long, extremities round; anterior part of body (prebifurcal) wide, gradually becoming narrower postbifurcally, then gradually widening again to slightly greater width than prebifurcally; in one specimen 1,000 wide at pharyngeal level and 300 at distance 7,570 postbifurcal; in another 1.250 wide at pharyngeal level and 400 at distance 5,355 postbifurcal; may be up to 1,300 wide more posteriorly. Oral sucker 540–677 by 510–630, terminal, within body, well developed, muscular, 12–30 from anterior extremity. Acetabulum 80–105 long, 104–108 wide (in four), 65–70 deep (in three), transversely oval; in four lying 180 prebifurcal (1,010 posterior to oral sucker), 218 (625), 465 (915), and 795 (1,065), respectively; in three lying 180, 395, and 805 postbifurcal, respectively. Sucker length ratio 1:0.14–0.19. Pharynx 127–208 by 109–140, muscular, inverted bell-shaped, contiguous with postcerebral median part of oral sucker, overlapping latter 19–100; esophagus 900–2,350 long, straight to slightly sinuous, thick-walled, muscular; ceca very long, narrow, extending to posterior extremity. Glands surrounding pharynx, esophagus, and ceca for distance of 265–475.

Testes two, symmetrical, tubular, unbranched, sinuous, commencing posterior to genital junction, usually slightly subequal anteriorly, anteriormost extent 11.6–14.7 mm from anterior extremity of body. Vas efferens from anterior tip of each testis, slightly swollen. Vas deferens very long, ascending next to metraterm, distalmost end thick-walled, muscular for very short distance. Genital atrium short, relatively narrow, thick-walled, muscular, protruding from genital pore in one specimen. Genital pore median, ventral to approximate midlength of oral sucker.

Ovary median, tubular, unbranched, widening considerably, 18.5–28.7 mm in longitudinal extent (in three), commencing 1.2–7.4 mm posterior to anteriormost tip of testes, lying 12.8–21.6 mm from anterior extremity of body. Genital junction 40.1–43.7 mm from anterior

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extremity (in three); forming enlarged chamber 97–150 by 126–250 (in four), ovary emerging from anteromedian surface, single duct emerging from posteroomedian surface; latter duct receiving vitellarium 15–30 (in four) from its origin, winding to posterior extremity as uterus after receiving vitellarium. Latter tubular, winding considerably, commencing near posterior extremity, enlarging into vitelline reservoir 165–220 by 77–175 (in four) just before joining duct from genital junction. Seminal receptacle absent. Mehlis' four from its origin, winding to posterior extremity as uterus after receiving vitellarium. Latte r tubular, winding considerably, continuing posteriorly around uterus for distances of 1,805 and 2,275 in two, respectively, filling much of body width. Metraterm very long; especially thick-walled and muscular before entering genital atrium. Eggs numerous, yellow-brown, oval, 43 measuring 15–20 by 10–13. Excretory bladder elongate, narrow, sinuous, extending prebifurcal, arms extending anteriorly as far as level of posterior margin of oral sucker; pore terminal.

**Discussion:** Allonematobothrium epinepheli Yamaguti, 1965, the type and only species in the genus, was found encysted in pairs in the fins and underside of the operculum of Epi nophilus quernus Seale from Hawaii. Our form differs from the type species in possessing oval eggs, and a considerably larger oral sucker and slightly smaller acetabulum, and in the genital junction forming an enlarged chamber. In A. ghanensis four specimens had the acetabulum lying prebifurcal, and three postbifurcal. No other difference was noted between them. Therefore, in spite of the extensive variation in the position of the acetabulum (795 prebifurcal to 805 postbifurcal), we are listing them as a single species until such time as life history studies may determine otherwise. Yamaguti (1965) noted the acetabulum as being 250–800 postbifurcal in the seven specimens of A. epinepheli studied.

Examination of the holotype specimen of A. epinepheli (USNM Helm. Coll. No. 63526) has made it possible to slightly amplify Yamaguti's description. The oral sucker measures 245 by 257 and the acetabulum 115 by 196; sucker length ratio 1:0.47. The pharynx is 77 by 87, slightly overlapping the oral sucker dorsally; the anterior end is shaped like an inverted bell with the clapper protruding slightly, while the posterior end is broad and truncate. A vitelline reservoir is present; this is not indicated in a paratype illustrated (Fig. 10D) by Yamaguti. The Mehlis' gland is 1,060 long, whereas it is illustrated in the same paratype as being considerably shorter. Finally, the distalmost ends of the vas deferens and metraterm as well as the genital atrium are thick-walled and muscular as described for our species.

**Literature Cited**


