Academician K. I. Skrijabin. [Helminths of man, animals and plants, and their control.] (In Russian.)


Digenean Trematodes of Fishes from North Borneo (Malaysia)†

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The trematodes of this report were part of a collection of parasites made by the junior author while a member of the U. S. Naval Medical Research Unit No. 2, Taipei, Taiwan. Parasites were washed in saline, killed in hot water, and transferred immediately to FAA fixative. After 4–8 hours they were stored in 70% alcohol plus 2% glycerine. Staining was variable, and all were mounted in balsam. Measurements are in microns.

FAMILY ANGIODICTYIDAE

Hexangium sigani Coto and Ozaki, 1929

SYNONYMS: Hexangium affinum Tubangui and Masilingan, 1944; H. secundum Anmer-

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HOSTS: Siganus oramin, S. guttatus (Siganidae); Caesio erythrogaster (Lutjanidae).

HABITATS: Stomach and small intestine.

LOCALITY: Jesselton, North Borneo.

DATES: 29 August 1960 (C. erythrogaster); 30 September 1960 (Siganus spp.).

SPECIMENS: U.S.N.M. Helm. Coll. No. 60067 (three slides with one specimen each from S. oramin); No. 60068 (three slides with one specimen each from S. guttatus); No. 60069 (two slides with one specimen each from C. erythrogaster).

MEASUREMENTS OF EIGHT SPECIMENS: Body 3,004 to 4,602 by 982 to 1,427; preoral body 22 to 40 long; oral sucker 213 to 307 by 228 to 340; prepharynx 184 to 419 long; pharynx 144 to 265 by 147 to 206; right testis 430 to 644 by 414 to 537, distance to posterior body end 206 to 460; left testis 430 to 613 by 350 to 591, distance to posterior body end 305 to 721; cirrus sac 51 to 85 by 63 to 99; oral sucker to genital pore 133 to 331; ovary 166 to 262 by 180 to 269, distance to posterior body end 236 to 314; oral sucker to beginning of vitellaria 614 to 1,150; 30 eggs measuring 82 to 95 by 49 to 60.

DISCUSSION: Five specimens were collected from S. oramin, ten from S. guttatus, and two from C. erythrogaster; the latter two hosts represent new records. Fischthal and Kuntz (1964)
reviewed this species, noting its presence in a variety of fish hosts from Philippines, Celebes, Red Sea, and Madagascar.

**Family Bivesiculidae**

*Bivesicula claviformis* Yamaguti, 1934

**Host:** *Epinephelus fasciatus* (Serranidae).

**Habitat:** Small intestine.

**Locality:** Jesselton, North Borneo.

**Date:** 30 September 1960.

**Specimens:** U.S.N.M. Helm. Coll. No. 60070 (three specimens on two slides).

**Measurements and some pertinent data** (based on three specimens): Body 1,040 to 1,510 by 645 to 650; oral sucker and acetabulum lacking; pharynx 140 to 201 by 172 to 218; muscular esophageal swelling next to pharynx; testis 182 to 235 by 181 to 290; cirrus sac 242 to 336 by 201 to 266; internal seminal vesicle 88 to 160 by 77 to 167; ovary 136 to 142 by 125 to 194; vitelline follicles confluent anteriorly; 15 eggs (some partially collapsed) measuring 76 to 82 by 37 to 55.

**Discussion:** This form was described as the type species of the genus by Yamaguti (1934) from *Seriola quinquerradiata* (Carangidae) and *Parapristipoma trilineatum* (Pomadasyidae) from Japan. In the key to the species *Bivesicula* given by Skrabin and Sobolev (1961) our specimens keyed to *B. claviformis*. In the key given by Cable and Nahhas (1962) our specimens keyed to a choice between *B. claviformis* and *B. epinepheli* Yamaguti, 1938, but we could not make a definite allocation inasmuch as the characteristics presented were too variable. The widths of the cirrus sac and testis are dependent in great part upon the body size of the specimens studied, and *B. epinepheli* generally was represented by larger worms. Additionally, in Yamaguti’s illustrations of these species the cirrus sac overlapped the midlevel of the body, and its level could readily vary according to the extent of body contraction.

Le Zotte (1954) and Cable and Nahhas (1962) indicated that the oral sucker in *Bivesicula* actually was the pharynx, and the so-called pharynx a muscular swelling of the esophagus. Yamaguti (1934) noted a muscular esophageal swelling next to the pharynx in *B. claviformis* and (1938) separated a new species, *B. epinepheli* (from *Epinephelus akaza  from Japan*), from the latter in the position of the esophageal swelling next to the cecal bifurcation. The form described by Nagaty (1948) as *B. claviformis* from *Epinephelus fasciatatus* (syn. *Serranus f.*) from the Red Sea resembles *B. epinepheli* as described by Yamaguti (1938, 1939) in possessing an esophageal swelling next to the cecal bifurcation. However, the vitelline follicles are confluent anteriorly as for *B. claviformis*. Yamaguti (1958), Skrabin and Sobolev (1961), and Manter (1961) apparently accepted Nagaty’s allocation of his specimens. Examination of one of Manter’s (1961) specimens of *B. claviformis* from *Epinephelus merra* from Fiji (U.S.N.M. Helm. Coll. No. 39450) indicated similar characteristics as herein noted for Nagaty’s specimens. Whether *B. epinepheli* is a synonym of *B. claviformis* cannot be ascertained until the significance of the position of the esophageal swelling and the separation or confluence of the vitelline follicles anteriorly is determined from a study of a larger series of specimens; especially valuable would be a knowledge of their life histories.

**Family Hemiuridae**

*Eripleurus platycephali* (Yamaguti, 1934)

Manter and Pritchard, 1960 (Fig. 1)

**Synonyms:** *Ectenurus platycephali* Yamaguti, 1934; *Uteroovesiculurus platycephali* (Yamaguti, 1934) Skrabin and Guschanskaja, 1954.

**Host:** *Platycephalus indicus* (Platycephalidae).

**Habitats:** Stomach and small intestine.

**Locality:** Jesselton, North Borneo.

**Date:** 29 August 1960.

**Specimens:** U.S.N.M. Helm. Coll. No. 60071 (two slides).

**Measurements and some pertinent data** (based on two specimens mounted in lateral view; measurements are length by depth): Body 1,925 to 2,905 by 730 to 1,500; esoma retracted except for pointed tip in one; oral sucker 192 to 295 by 133 to 247, acetabulum 380 to 725 by 270 to 660, sucker length ratio 1 : 1.98 to 2.46; glandular pit lying dorsal to oral sucker or to latter and pharynx, 169 to 242 by 85 to 167, large gland cells in single layer with large vacuole displacing nucleus and cytoplasm against cell membrane; pharynx 92
to 133 by 82 to 143; testes (in smaller specimen) 245 in diameter; seminal vesicle (in one) 270 by 142, muscular, thick walled, dorsal to acetabulum; proximal portion of pars prostatica (in one) 210 by 18, distal portion inflated into vesicle 123 to 205 by 54 to 80 and surrounded by dense mass of prostate cells; hermaphroditic duct 315 to 460 by 19 to 27; sinus sac 230 to 336 by 70 to 111 proximally and 30 to 31 distally; ovary (in smaller specimen) 296 by 202; uterine vesicle 73 to 135 by 101 to 135; 15 eggs measuring 15 to 19 by 10 to 11.

Discussion: This species has been described by Yamaguti (1934, 1938) from the same host species from Japan. No mention was made of a dorsal, glandular pit. Velasquez (1962) reviewed the status of the genus.

Family Lepocreadiidae

*Apocreadium synagris* Yamaguti, 1953

Host: *Scolopsis margaritifer* (Pomadasyidae).

Habitat: Small intestine.

Locality: Jesselton, North Borneo.

Date: 30 September 1960.


Measurements and some pertinent data (based on two specimens): Body 3,711 to 4,417 by 1,235 to 1,327; spines apparently lost; preoral body distinct, 13 to 22 long; forebody 690 to 958, hindbody 2,569 to 3,014, ratio 1:3.15 to 3.72; posttesticular space 1,618 to 1,779, ratio to hindbody 1:1.59 to 1.69; eyespot pigment scattered between oral sucker and acetabulum; oral sucker 291 to 305 by 305 to 318; acetabulum 445 to 452 by 468 to 498, at level of about anterior body fourth; sucker length ratio 1:1.46 to 1.55; prepharynx 46 to 95 long; pharynx 141 to 144 by 155 to 176, three-lobed in front; esophagus 74 to 99 long; cecal bifurcation 81 to 191 preacetabular; anterior testis 335 to 357 by 328 to 379; posterior testis 372 to 480 by 324 to 335; acetabulum to anterior testis 276 to 399, to posterior testis 522 to 744; vasa efferentia opening side by side into seminal vesicle; latter 213 to 276 by 122 to 150, extending 132 to 147 postacetabular to overlap anteromedian part of ovary dorsally and midlength of seminal receptacle ventrally; ovary 246 to 283 by 283 to 296, 25 to 39 postacetabular; seminal receptacle 276 to 302 by 66 to 103, overlapping anteromedian part of ovary and posterior end of seminal vesicle dorsally; Laurer's canal present; vitellaria commencing at level of posterior margin of acetabulum, confluent posttesticular; vitelline reservoir distinct, transversely elongate, postovarian, 82 to 106 by 98 to 158; 8 partially collapsed eggs measuring 85 to 93 by 55 to 68; lymph vessels conspicuous laterally anterior to vitellaria, hidden where latter present.

Discussion: Yamaguti (1953) described this species from *Synagris taeniopterus* from Celebes. Our specimens showed a distinct preoral body, a definite vitelline reservoir, and eyespot pigment, and the testes lacked lateral indentations. Yamaguti indicated that the seminal vesicle extended to near the ovary, being separated from the latter by the seminal receptacle, whereas in our specimens the seminal vesicle overlapped both the ovary and seminal receptacle. Although Yamaguti noted and illustrated acetalubar and preacetabular vitelline follicles in some specimens, he stated that in others the follicles commenced postacetabular. Skrjabin (1959) reviewed the genus *Apocreadium* Manter, 1937, giving a key to the species which is not entirely workable for *A. synagris* inasmuch as it stated that the vitellaria commenced anterior to the acetabulum or at its level.

*Neoapocreadium malaysiae* n. sp. (Fig. 2)

Hosts: *Scolopsis margaritifer* (Pomadasyidae); *Scarus fasciatus* (Scaridae).

Habitat: Small intestine.

Locality: Jesselton, North Borneo.

Dates: 29 August 1960 (*S. fasciatus*); 30 September 1960 (*S. margaritifer*).

Specimens: U.S.N.M. Helm. Coll. No. 60073 (one slide of holotype and two with one paraphyle type each from *S. margaritifer*); No. 60074 (one paraphyle from *S. fasciatus*).

Diagnosis (based on four specimens, two measured): Body 2,449 to 3,160 by 744 to 1,211, width nearly uniform but varying with state of contraction, ends rounded, spined but most lost. Preoral body 11 to 16 long. Forebody 549 to 878, hindbody 1,577 to 1,864, ratio 1:2.12 to 2.87; posttesticular space 579 to 713, ratio to hindbody 1:2.55 to 2.61. Eyespot pigment scattered from oral sucker to acetabulum. Oral sucker 294 to 335 by 302 to 348, subterminal, with small oval opening. Acetabulum 323 to 418 by 320 to 449. Sucker

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Fig. 1. Erilepturus platycephali, dextrolateral view of dorsal glandular pit.
Fig. 2. Neoapocreadium malaysiae, ventral view of holotype.
Fig. 3. Mesocoelium scatophagi, dorsal view of holotype.
Fig. 4. Same. Terminal genitalia, dorsal view of holotype.

Testes two, smooth to slightly lobed, tandem, contiguous, usually longitudinally elongate but may be round or transversely elongate; anterior testis 313 to 316 by 313 to 482, lying 340 to 352 postacetabular; posterior testis 372 to 526 by 298 to 798, lying 499 to 621 postacetabular. Seminal vesicle 280 to 320 by 121 to 162, saccular, commencing 123 to 140 postacetabular, separated from ovary by seminal receptacle. Circus and circus sac absent. Genital pore median, just preacetabular. Ovary 161 by 179, median, posteroventral to esophageal leve. Vitellaria in lateral fields, commencing 222 to 276 preacetabular at esophageal level and extending to posterior extremity, confluent posttesticular and from acetabular to esophageal levels. Uterus with few coils lying pretesticular. Eggs few, nine measuring 85 to 101 by 55 to 70.

DISCUSSION: Neoapocreadium was erected by Siddiqi and Cable (1960) for three species of Apocreadium described by Sogandares (1959). It was characterized as having "a longitudinal slitlike mouth, a massive pharynx, wide ceca, and confluent vitelline fields in the forebody." Except for the shape of the mouth our specimens readily fit the generic diagnosis.

FAMILY MESOCOEILIDAE

Mesocoelium scatophagi n. sp. (Figs. 3, 4)

HOST: Scatophagus argus (Scatophagidae).

HABITAT: Small intestine.

LOCALITY: Jesselton, North Borneo.

DATE: 29 August 1960.


Testes two, smooth, symmetrical, posterior to but slightly overlapping acetabulum. Right testis 119 by 144, left testis 142 by 166. Vasa efferentia uniting to form short vas deferens. Cirrus sac 150 by 61, thin walled, overlapping acetabulum 65. Internal seminal vesicle bipartite, anterior chamber 52 by 33, posterior chamber 54 by 31. Prostatic vesicle 15 by 14, surrounded by prostate cells. Circus straight, slightly thick walled, muscular. Genital atrium small. Genital pore median, ventral to oral sucker, slightly posterior to sucker opening. Ovary 161 by 179, median, posteroventral to testes. Seminal receptacle 40 by 60, posteroventral to ovary. Vitelline reservoir small, posteroventral to ovary, ventral to seminal receptacle. Vitellaria in lateral fields, commencing at oral sucker level and terminating just short of cecal ends; follicles small, dorsal, lateral and ventral to ceca, more numerous preacetabular. Uterus filling hindbody, ventral to gonads, ascending on right. Metraterm thick walled, shorter than cirrus sac. Eggs numerous, operculate, ten measuring 33 to 41 by 21 to 25.

DISCUSSION: This is the first record of Mesocoelium Odhner, 1911, from a fish. Skrjabin and Morozov (1959), Cheng (1960), and Freitas (1963) reviewed the genus, noting the presence of all species in amphibians and reptiles. In the key to the 28 species recognized by Cheng (1960) our specimen keyed to M. megaloon Johnston, 1912, but it differs from the latter in the position of the genital pore,

Fig. 5. Hamacreadium interruptus, terminal genitalia, dorsal view.
Fig. 6. Heliacometra borneoensis, ventral view of holotype.
Fig. 7. Same. Terminal genitalia, ventral view of holotype.

C, cirrus; CS, cirrus sac; E, egg; GP, genital pore; M, metraterm; PC, prostate cells; PP, pars prostatica; PV, prostatic vesicle; SV, seminal vesicle; U, uterus.

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extent of the ceca and vitellaria, sucker length ratio, ovary size in relation to the testes, and in having a spined cuticle and a prominent hoodlike preoral lobe. In the key to the seven species recognized by Freitas (1963) our specimen keyed to M. monas (Rudolphi, 1819) Freitas, 1958, but it differs in having a prominent hoodlike preoral lobe. Freitas noted as synonyms of M. monas at least 19 species described from a wide variety of amphibians and reptiles from South America, Central America, North America, Africa, Asia, and Oceania. While much variation is evident in species of Mesocoelium we wonder whether the synonymy based solely on morphological characteristics of specimens from so many different hosts with so great a geographical distribution is entirely valid. It appears to us that the question of species validity cannot be answered satisfactorily until most life histories are elucidated.

Family Opecoelidae

Hamacreadium interruptus Nagaty, 1941


Hosts: Lethrinus microdon (Lethrinidae); Fluta alba (Fluitidae).

Habitat: Small intestine.

Locality: Jesselton, North Borneo.

Date: 29 August 1960.

Specimens: U.S.N.M. Helm. Coll. No. 60076 (six slides with one specimen each from L. microdon); No. 60077 (one specimen from F. alba).

Measurements and some pertinent data (based on 24 specimens from L. microdon and 1 from F. alba, 8 measured): Body 2,575 to 4,924 by 798 to 1,419; preoral body 6 to 26 long; forebody 767 to 1,442, hindbody 1,396 to 2,891; oral sucker 221 to 348 by 254 to 366, usually wider than long; acetabulum 412 to 591 by 435 to 721, wider than long; sucker length ratio 1:1.43 to 2.05; prepharynx 18 to 37 long; pharynx 147 to 202 by 166 to 228, wider than long; esophagus 110 to 243 in longitudinal extent; excretory bladder extending to just postbifurcal, bifurcal, or slightly prebifurcal, connecting to excretory pore by short, narrow canal bearing bulbous, muscular sphincter; testes smooth in 14, slightly lobed in 3, and anterior testis smooth while posterior slightly lobed in 3; anterior (left) testis 236 to 445 by 258 to 414; posterior (right) testis 287 to 544 by 261 to 368; acetabulum to anterior testis 210 to 537, to posterior testis 350 to 767; posttesticular space 760 to 1,580, ratio to body length 1:3.1 to 3.8; cirrus sac 331 to 614 (longitudinal extent) by 118 to 243, thin walled, commencing intercelly at level of anterior one-seventh to three-fifths of acetabulum from midline of latter to beyond its right margin, transverse to oblique in position, curving to left, containing a long seminal vesicle with single long loop near distal end, a short, slightly muscular, cell-lined pars prostatica surrounded by prostate cells, and a short, muscular, protrusible cirrus; distinct pars prostatica visible or not depending on particular mount; genital atrium shallow; genital pore 81 to 314 preacetabular, opening sinistrally from midway between body midline and cecum to midway between cecum and body margin, intercecal in 4, cecal in 9, extracecal in 7; ovary 177 to 376 by 221 to 335, usually wider than long, two-lobed in 1, three-lobed in 13, four-lobed in 6, 155 to 331 postacetabular; seminal receptacle present; Laurer's canal not observed; vitellaria commencing slightly prebifurcal in 10 and bifurcal in 10, extending 243 to 583 preacetabular, interrupted at acetabular level on both sides in 12, on left side only in 4, on right side only in 1, and uninterrupted on both sides in 3, lateral fields separate preacetabular but confluent posttesticular in 8 of 20 specimens; metraterm muscular, thick walled, shorter than cirrus sac; gland cells surrounding distal ends of metraterm and cirrus sac; 24 partially collapsed eggs measuring 54 to 68 by 32 to 41.

Discussion: Manter (1947) indicated a great similarity between Hamacreadium Lin-ton, 1910, and Plagioporus Stafford, 1904. He compared the two as follows: "As a rule Hamacreadium has a longer excretory vesicle than does Plagioporus but there is considerable variation among the described species and in some cases this character is not given. At pres-
ent, the genus *Hamacreadium* seems best distinguished by its diagonal testes together with a lobed ovary. In species of *Plagioporus* with a lobed ovary, the testes are tandem.

*Hamacreadium interruptus* was described by Nagaty (1941) from *Lethrinus mehsenoides* from the Red Sea, and distinguished from all known species of the genus by the "constant interrupted arrangement of the vitelline follicles." Nagaty and Abdel Aal (1962) described a new species, *H. lethriini*, from a single specimen from the same host species and locality; Lamothé (1962) noted that the latter was a homonym of *H. lethriini* Yamaguti, 1934, and renamed it *H. nagatyi*; Manter (1963), unaware of the latter change, renamed it *H. lenthrinum*. *H. nagatyi* was separated from *H. interruptus* by Nagaty and Abdel Aal in possessing a small oral sucker not occupying most of the body width, an oblique rather than a transverse cirrus sac, and vitellaria that were not interrupted. The variations in our specimens readily include the characteristics cited above for both these species. Therefore, we declare *H. nagatyi* a synonym of *H. interruptus*. We also declare *Plagioporus* (*Plagioporus* longivesicula described by Yamaguti (1952) from *Lethrinus* sp. from Celebes and transferred by Skrjabin and Koval (1958) to the subgenus *Paraplagioporus* Yamaguti, 1939, a synonym of *H. interruptus* inasmuch as it readily fits the descriptions of the latter species given by Nagaty (1941) and by us. The specimen from the freshwater host, *Fluta alba* (syn. *Monopterus a.*), could not be distinguished from the specimens, especially those with uninterrupted vitellaria, from the marine host, *Lethrinus microdon*. In view of the many variations noted for *Hamacreadium mutabile* Linton, 1910, by Nagaty (1941), Sogandares and Sogandares (1961), and Manter (1963), it may be that *H. interruptus* as herein defined is a synonym. However, before we can be certain direct comparisons and more significantly additional life history studies of these species are needed.

*Plagioporus* (*Plagioporus* isaitschikowi (Layman, 1930) Price, 1934

**Synonym:** *Lebouria isaitschikowi* Layman, 1930.

**Host:** *Lethrinus microdon* (Lethrinidae).

**Habitat:** Small intestine.

**Locality:** Jesselton, North Borneo.

**Date:** 29 August 1960.

**Specimens:** U.S.N.M. Helm. Coll. No. 60078 (two slides).

**Measurements and some pertinent data** (based on one specimen in ventral and one in lateral view): Body 1,466 to 1,767 long, 560 wide (in one); forebody 552 to 579, hindbody 668 to 897, preoral body 5 to 8, posttesticular space 199 to 307; oral sucker 125 to 144 long, 158 wide, 131 deep; acetabulum 246 to 291 long, 318 wide, 262 deep, at level of anterior 41 to 46 percent of body length; sucker length ratio 1 : 1.92 to 2.02; prepharynx 27 to 32 long; pharynx 75 to 77 long, 98 wide, 98 deep; esophagus 111 to 118 long; cecal bifurcation 166 to 194 preacetabular; testes overlapping slightly; anterior testis 188 to 214 long, 232 wide, 166 deep; posterior testis 239 to 243 long, 195 wide, 191 deep; acetabulum to anterior testis 92 to 177, to posterior testis 213 to 350; cirrus sac 389 to 391 in longitudinal extent, 49 wide, 44 deep, overlapping anterior portion of acetabulum 19 to 21; genital pore 368 to 372 preacetabular; ovary 122 to 134 long, 118 wide, 51 deep, zero to 92 postacetabular; seminal receptacle (in one) 90 long, 79 wide; vitellaria commencing just postpharyngeal, interrupted opposite acetabulum on both sides; 12 eggs measuring 63 to 70 by 33 to 37.

**Discussion:** Our specimens readily keyed to *P. isaitschikowi* in the keys to the species of *Plagioporus* given by Manter (1954) and Skrjabin and Koval (1958). This parasite has been reported from *Sebastodes schlegeli* from Peter the Great Bay by Layman (1930), *Sebastiscus albofasciatus* from Japan by Yamaguti (1938), and *Paralabrax clathratus* from California by Manter and Van Cleave (1951). Several authors, including Skrjabin and Koval (1958), list Yamaguti (1938) as having transferred this species from *Lebouria* Nicoll, 1909, to *Plagioporus*; initially this was done by Price (1934).

**Helicometra borneoensis** n. sp. (Figs. 6, 7)

**Host:** *Epinephelus fasciatus* (Serranidae).

**Habitat:** Small intestine.

**Locality:** Jesselton, North Borneo.

**Date:** 30 September 1960.

**Holotype:** U.S.N.M. Helm. Coll. No. 60079.
Diagnosis (based on single specimen): Body 2,248 by 750 (ovarian level), unarmed. Forebody 670, hindbody 1,292, posttesticular space 340. Oral sucker 196 by 215, acetabulum 286 in diameter, sucker length ratio 1:1.46. Prepharynx 12 long; pharynx 102 by 136; esophagus 250 long; cecal bifurcation just preacetabular; ceca extending posttesticular, terminating 150 (right) and 210 (left) from posterior extremity. Excretory bladder tubular, containing large, irregular concretion at level of cecal ends; pore subterminal dorsal.

Testes two, outline very slightly wavy, tandem, contiguous, mainly intercecral but may slightly overlap cecum ventrally, mostly in posterior body third but overlapping middle third. Anterior testis 204 by 290, posterior testis 258 by 365; acetabulum to anterior testis 525, to posterior testis 695. Vasa efferentia long, unifing to form very short vas deferens. Cirrus sac 485 in longitudinal extent by 84, sinistral bend preacetabular, commencing 85 anterior to posterior margin of acetabulum, containing tubular seminal vesicle with pronounced loop, a long, straight pars prostatica surrounded by prostate cells, and muscular, protrusible cirrus 103 by 33. Genital pore slightly sinistral, 80 postpharyngeal, 290 pre-acetabular. Ovary 162 by 225, smooth, intercecral, partly submedian to right, in tandem and contiguous with anterior testis, 363 postacetabular. Seminal receptacle present. Laurer's canal not seen. Ootype complex large, median to ovary, partly submedian to left. Vitelline follicles in eight pairs of separated lateral clusters lying dorsal to ceca, extending from cecal bifurcation to just beyond cecal ends, longitudinal ducts on each side connecting clusters, common vitelline duct dorsal. Uterus spiralling in diagonal coils between ovary and acetabulum. Metraterm thick walled, ascending from anterior margin of acetabulum. Seven eggs measuring 46 to 53 by 26 to 33, with unipolar filament.


Literature Cited


