

## Cryptogonimidae (Trematoda, Digenea) from Fishes of Japanese and Adjacent Waters

Masaaki Machida

Department of Zoology, National Museum of Nature and Science,  
3–23–1 Hyakunincho, Shinjuku-ku, Tokyo, 169–0073 Japan  
Meguro Parasitological Museum, 4–1–1 Shimomeguro, Meguro-ku, Tokyo, 153–0064 Japan

**Abstract** Eighteen species of cryptogonimid digeneans (Trematoda) were obtained from fishes of Japanese and adjacent waters. Two new genera are proposed: *Mehravermis* gen. nov. for *M. velasquezae* sp. nov. and *Opistognathotrema* gen. nov. for *O. philippinense* sp. nov. Ten new species are described: *Latuterus karemlal* sp. nov. from *Lutjanus gibbus* (Lutjanidae), *Metadena plectorhinchi* sp. nov. from *Plectorhinchus gibbosus* (Haemulidae), *M. pterocaesionis* sp. nov. from *Pterocaesio diagramma* (Caesionidae), *Mehravermis velasquezae* sp. nov. from *Opistognathus* sp. (Opistognathidae), *Opistognathotrema philippinense* sp. nov. from *Opistognathus* sp., *Siphoderina akamachi* sp. nov. from *Etelis coruscans* (Lutjanidae) and *Pristipomoides sieboldii* (Lutjanidae), *S. marangsi* sp. nov. from *Lutjanus quinquelineatus*, *S. nemipteri* sp. nov. from *Nemipterus virgatus* (Nemipteridae), *S. ryukyuensis* sp. nov. from *Lutjanus kasmira* and *L. quinquelineatus*, and *S. xenocephali* sp. nov. from *Xenocephalus elongatus* (Uranoscopidae). Eight previously known species are recorded: *Metadena lutiani* (Yamaguti, 1942), *M. rooseveltae* (Yamaguti, 1970), *M. sheni* Miller et Cribb, 2008, *Perlevilobus platycephali* (Shen, 1989), *Neometadena ovata* (Yamaguti, 1952), *Siphoderina elongata* (Gu et Shen, 1979), *S. onaga* (Yamaguti, 1970) and *S. ulaula* (Yamaguti, 1970).

**Key words:** Digenea, Cryptogonimidae, new genus, new species, marine fish, Japan, Palau, Philippines, Indonesia.

This paper deals with 18 species of the family Cryptogonimidae (Trematoda, Digenea) from fishes of Japanese and adjacent waters. Digeneans obtained were washed in saline, fixed in AFA under slight pressure, stained with Heidenhain's hematoxylin and mounted in Canada balsam. The specimens are deposited in the National Museum of Nature and Science, Tokyo (NSMT) and the Meguro Parasitological Museum (MPM). Measurements are given in millimeters unless otherwise indicated.

### *Latuterus karemlal* sp. nov.

(Fig. 1)

*Type host.* *Lutjanus gibbus* (Forsskål) (Lutjanidae).

*Site.* Upper intestine.

*Type locality.* Palau, western Caroline Is.,

11-VIII-1994.

*Specimens.* Holotype and 6 paratypes, NSMT-PI 4671.

*Etymology.* The specific name *karemlal* is from the Palauan local name of the host.

*Description.* Based on seven specimens. Body oval, 0.87–1.38 long by 0.70–1.16 wide; length/width ratio 1.1–1.3. Tegument with fine spines. Oral sucker subterminal, 0.09–0.18×0.16–0.27, without circumoral spines; prepharynx 0.04–0.10 long; pharynx well-developed, 0.10–0.13×0.12–0.22; esophagus 0.01–0.09 long, bifurcating midway between suckers or closer to acetabulum; caeca voluminous, arcuate, terminating near posterior end of body. Acetabulum 0.07–0.11×0.08–0.14, embedded in ventrogenital sac. Ventrogenital sac surrounded by circular muscle and provided anteriorly with glandular cells. Sucker ratio 1 : 0.45–0.51. Forebody 38–45% of body length.

Testes consisting of nine spherical or ovoid lobes; in holotype four lobes along right caecum, partly overlapping it, from postacetabular level to near posterior end of caecum, three lobes along left caecum, and the remaining two lobes situated one behind another between right and left lobes; in paratypes nine lobes gather together, without column, intercaecal, from postacetabular level to level of caecal termination. Seminal vesicle tubular, anterior or antero-lateral to acetabulum; pars prostatica 15–25  $\mu\text{m}$  long. Ventrogenital sac surrounded by circular muscle and provided anteriorly with glandular cells. Genital pore median, on anterior border of acetabulum.

Ovary with ten or so oval lobes, 0.13–0.24  $\times$  0.21–0.41 as a whole, usually posterior to acetabulum with seminal receptacle in between. Oviduct arising from mid-anterior edge of ovary, receiving short duct from seminal receptacle, giving off Laurer's canal, then joining vitelline reservoir before entering Mehlis' gland. Laurer's canal winding, opening dorsally near posterior border of acetabulum. Mehlis' gland submedian, just anterior to ovary. Seminal receptacle saccular, 0.11–0.20  $\times$  0.06–0.13, immediately posterior, posterolateral or occasionally dorsal to acetabulum. Uterus filling whole body except anterior, central and posterolateral region, extending posteriorly almost to end of body, connecting genital atrium by short metraterm. Eggs thin-shelled, 16–18  $\times$  9–10  $\mu\text{m}$ . Vitelline follicles in available space anterior to bifurcal level. Vitelline reservoir between acetabulum and ovary. Excretory vesicle Y-shaped; stem broad, bifurcating dorsal to ovary; arms wide, extending to prepharyngeal level; pore terminal.

*Remarks.* Two other species of *Latuterus* have been described from *Lutjanus bohar*: *Latuterus tkachi* Miller et Cribb, 2007 from the Great Barrier Reef and *L. maldivensis* Miller et Cribb, 2007 from Maldives. The present new species differs from both in that: an esophagus is distinct, the posterior extent of the testes lies at the level of the caecal termination, an ovary consists of ten or so lobes, and a uterus almost reaches the posterior end of the body.

***Metadena lutiani*** (Yamaguti, 1942)

(Fig. 2)

*Siphoderina lutiani* Yamaguti, 1942: 375–376, fig. 24.

*Pseudosiphoderoides lutiani*: Yamaguti 1971: 238.

*Metadena lutiani*: Miller and Cribb 2008a: 63–64.

*Material.* Four specimens from the intestine of *Lutjanus bohar* (Forsskål) (Lutjanidae), Palau, western Caroline Is., 1-VIII-1980, NSMT-PI 2395; and 3 specimens from the intestine of *L. bohar*, Koniya, Kagoshima Pref., 3-III-1991, NSMT-PI 4128.

*Description of NSMT-PI 2395.* Body ovoid, 1.67–1.98 long by 1.10–1.28 wide; length/width ratio 1.4–1.6. Tegument spinose. Dermal gland scattered all over, densely in anterior half of body. Oral sucker 0.14–0.19  $\times$  0.20–0.22, without circumoral spines; prepharynx 0.05 long; pharynx 0.11–0.13  $\times$  0.12–0.15; esophagus 0.06–0.09 long; caeca passing ventral to testes, terminating near middle of posttesticular region. Acetabulum 0.11–0.13  $\times$  0.13–0.15, embedded in ventrogenital sac, whose mouth is usually covered with glandular cells. Sucker ratio 1 : 0.65–0.70. Forebody 25–30% of body length. Testes globular or subglobular, symmetrical, near middle of hindbody; right testis 0.31–0.43  $\times$  0.32–0.49; left testis 0.32–0.42  $\times$  0.29–0.54. Posttesticular space 21–30% of body length. Seminal vesicle broad tubular, almost straight or curved, bipartite, extending posteriorly near anterior border of ovary. Pars prostatica very small, whose distal end connects metraterm to form short genital atrium. Genital pore median, on anterior edge of ventrogenital sac. Ovary consisting of a dozen or more lobes, 0.27–0.34  $\times$  0.35–0.40, equatorial or slightly postequatorial. Oviduct arising from central region of ovary, running forward, receiving short duct from seminal receptacle near anterior margin of ovary, branching Laurer's canal at the same point where the duct from seminal receptacle is received, then turning backward to join vitelline reservoir, entering Mehlis' gland. Seminal receptacle saccular, tapering posteriorly, 0.25  $\times$  0.11–0.15, between acetabulum and ovary. Laurer's canal opening middorsally near posterior margin of ovary. Uterus reaching posteriorly to

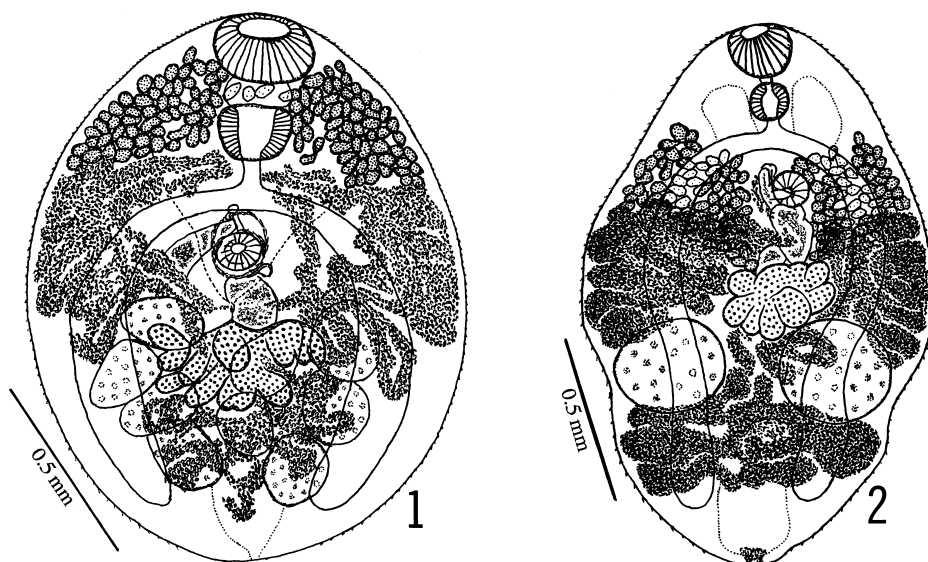


Fig. 1. *Latuterus karemlal* sp. nov. Entire worm, ventral view (holotype, NSMT-PI 4671).

Fig. 2. *Metadena lutiani* (Yamaguti, 1942). Entire worm, ventral view (NSMT-PI 2395).

level of caecal termination. Eggs  $16\text{--}18 \times 10\text{--}11 \mu\text{m}$ . Vitelline follicles filling most area from esophageal level to ovarian level. Excretory vesicle Y-shaped, stem very wide, bifurcating in ovarian zone; arms extending to oral sucker; pore terminal.

*Measurements of NSMT-PI 4128.* Body 2.55–2.83 long by 1.30–1.54 wide; length/width ratio 1.7–2.1. Oral sucker  $0.21\text{--}0.23 \times 0.25\text{--}0.30$ ; prepharynx  $0.07\text{--}0.10$  long; pharynx  $0.13\text{--}0.15 \times 0.14\text{--}0.21$ ; esophagus  $0.06\text{--}0.07$  long; caeca terminating near or slightly beyond middle of posttesticular space. Acetabulum  $0.14\text{--}0.21 \times 0.15\text{--}0.17$ . Sucker ratio 1 : 0.55–0.62. Forebody 26–30% of body length. Right testis  $0.55\text{--}0.65 \times 0.47\text{--}0.50$ ; left testis  $0.57\text{--}0.62 \times 0.40\text{--}0.50$ . Ovary  $0.32\text{--}0.40 \times 0.42\text{--}0.55$ . Seminal receptacle  $0.26\text{--}0.34 \times 0.21\text{--}0.27$ . Eggs  $18\text{--}21 \times 9\text{--}11 \mu\text{m}$ .

*Remarks.* Yamaguti (1942) described this species based on a single macerated specimen from *Lutjanus vaigiensis* of Japan; I therefore re-described the species as above on my non-macerated specimens. My specimens differ somewhat from the original description. Yamaguti (1942) stated that his specimen 1.0 long, had an irregularly indented ovary, and an excretory vesicle

branching just behind the intestinal bifurcation. My specimens are much larger, have a lobed ovary, and excretory vesicles bifurcating in the ovarian zone. Because of his only specimen (MPM Coll. No. 23196) in poor condition, shape of the ovary and branching position of the excretory vesicle cannot be confirmed. My specimens show that the distinctive features of *Metadena lutiani* are: the body is ovoid; the testes are globular, arranged symmetrically; the ovary is lobate; and the vitelline follicles fill most area from the esophageal level to the ovarian level.

#### *Metadena roosevelti* (Yamaguti, 1970)

*Pseudosiphonoides roosevelti* Yamaguti, 1970: 105, fig. 147.

*Metadena roosevelti*: Miller and Cribb 2008a: 63–64.

*Material.* Three specimens from the pyloric caeca of *Pristipomoides argyrogrammicus* (Valenciennes) (Lutjanidae), Ishigaki-jima, Okinawa Pref., 15-III-1975, NSMT-PI 1372a; 1 specimen from the pyloric caeca of *P. argyrogrammicus*, Nago, Okinawa Pref., 8-VI-1991, NSMT-PI 4178; and 6 specimens from the pyloric caeca of *P. argyrogrammicus*, Palau, western Caroline Is.,

16-VIII-1994, NSMT-PI 4694.

**Brief description and remarks.** Body 2.82–3.98 long by 1.32–1.78 wide; length/width ratio 2.0–2.5. Oral sucker 0.19–0.25×0.23–0.33. Prepharynx 0.04–0.09 long. Pharynx 0.12–0.21×0.12–0.19. Esophagus 0.10–0.24 long. Acetabulum 0.16–0.23×0.17–0.27. Sucker ratio 1 : 0.74–0.96. Forebody 31–38% of body length. A longitudinal series of two or three horizontally elongate slits (0.08–0.12 long) is observed in front of the acetabulum. Many glandular cells are attached to the slits, whose anterior or posterior margin is provided with irregular-shaped protuberances. Testes slightly diagonal. Right testis 0.32–0.52×0.45–0.56; left testis 0.33–0.55×0.35–0.56. Posttesticular space 22–30% of body length. Ovary with 2–11 incisions, 0.17–0.29×0.46–0.59. Seminal receptacle 0.26–0.59×0.12–0.33. Eggs 19–22×9–10  $\mu\text{m}$ . This species was initially described by Yamaguti (1970) from *Rooseveltia brighami* (= *Pristipomoides zonatus*) of

Hawaii. Yamaguti (1970) stated that “in front of the acetabulum a longitudinal series of 3–4 (usually 3) transversely elongated cuticular pads, whose anterior and posterior margins are incised into 3–5 minute rounded papillae” Actually the “pads” are protuberances on the margins of the slits as described above. The slits seem to be secretory in function.

***Metadena sheni* Miller et Cribb, 2008**

(Figs. 3–4)

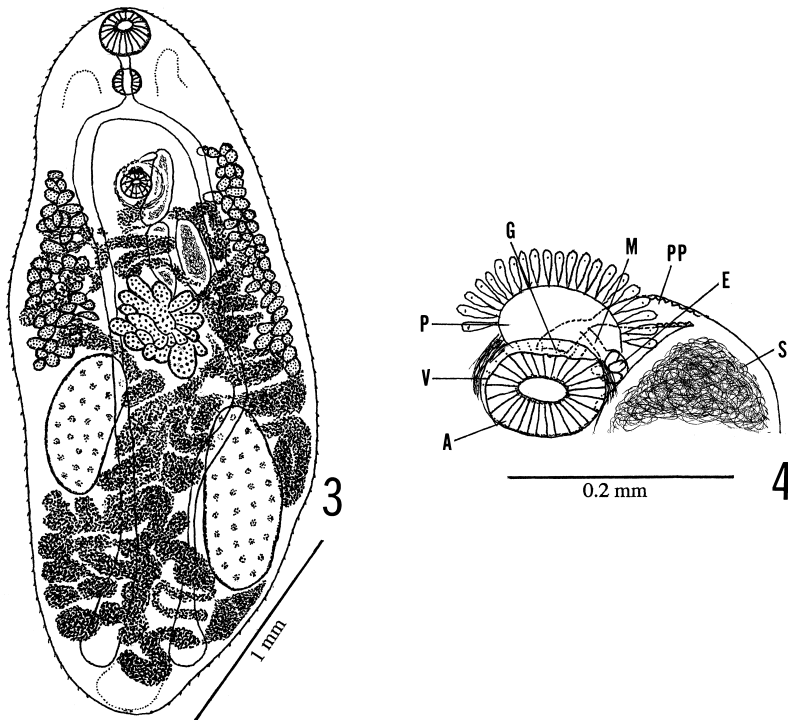
*Siphoderoides lutiani* Shen, 1990: 88–89, fig. 83.

*Metadena lutiani* (Shen, 1990), preoccupied by *M. lutiani* (Yamaguti, 1942).

*Metadena sheni* Miller et Cribb, 2008a: 63–64.

**Material.** Ten specimens from the pyloric caeca and upper intestine of *Lutjanus vitta* (Quoy et Gaimard) (Lutjanidae), Nago, Okinawa Pref., 19-V-1993, NSMT-PI 4395.

**Description.** Body fusiform with rounded



Figs. 3–4. *Metadena sheni* Miller et Cribb, 2008.—3. Entire worm, ventral view (NSMT-PI 4395). 4. Terminal genitalia, ventral view. Abbreviations: A, acetabulum; E, egg; G, genital pore; M, metraterm; P, pad; PP, pars prostatica; S, seminal vesicle; V, ventrogenital sac.

ends, 2.22–3.23 long by 0.91–1.28 wide; length/width 2.3–3.1. Tegument spinose. Dermal gland developed in anterior half of body and exterior to testicular region. Oral sucker subterminal,  $0.14\text{--}0.21 \times 0.16\text{--}0.26$ , without circumoral spines. Prepharynx  $0.05\text{--}0.15$  long. Pharynx  $0.08\text{--}0.13 \times 0.08\text{--}0.14$ . Esophagus  $0.02\text{--}0.10$  long, bifurcating midway between suckers. Caeca passing almost along interior sides of testes, terminating near posterior end of body. Acetabulum  $0.09\text{--}0.12 \times 0.11\text{--}0.14$ , embedded in ventrogenital sac, which is covered anteriorly with bowl-shaped pad  $53\text{--}56 \times 89\text{--}128 \mu\text{m}$ . The pad surrounded anteriorly by glandular cells. Sucker ratio 1 : 0.44–0.72. Forebody 21–30% of body length. Testes longitudinally elongate, diagonal, sometimes anterior edge of fore testis in contact with ovary; right testis  $0.55\text{--}0.79 \times 0.32\text{--}0.50$ ; left testis  $0.48\text{--}0.85 \times 0.30\text{--}0.38$ . Seminal vesicle swollen, bipartite, almost straight or curved, extending to ovary. Pars prostatica very small, joining metraterm to form genital atrium. Genital pore median, near anterior edge of acetabulum. Ovary consisting of 15–30 lobes,  $0.27\text{--}0.50 \times 0.42\text{--}0.57$  as a whole, 39–49% of body length from anterior end. Oviduct arising from central region of ovary, running forward, receiving short duct from seminal receptacle, giving off Laurer's canal at the same point where the duct from seminal receptacle is received, then turning backward, joining vitelline reservoir, entering Mehlis' gland. Seminal receptacle saccate,  $0.25\text{--}0.35 \times 0.12\text{--}0.25$ , immediately anterior to ovary. Laurer's canal opening middorsally near posterior margin of ovary. Uterus extending near posterior end of body. Metraterm very short. Eggs  $17\text{--}19 \times 10\text{--}11 \mu\text{m}$ . Vitelline follicles predominantly exterior and dorsal to caeca, extending from midway between intestinal bifurcation and acetabulum or nearer acetabulum to anterior edge of posterior testis. Excretory vesicle Y-shaped, bifurcating near level of posterior border of ovary; arms extending near prepharynx or oral sucker; pore terminal.

*Remarks.* This species resembles the above-mentioned *Metadena lutiani*, but differs from it by having a fusiform body; testes longitudinally

elongate, extracaecal, arranged diagonally; and vitelline follicles predominantly lying dorsal and exterior to caeca, not extending inward. Shen (1990) initially described this species from *Lutjanus erythopterus* of Hainan Island, China. His description was somewhat insufficient; I therefore redescribe it based on my specimens.

*Metadena plectorhynchi* sp. nov.

(Figs. 5–6)

*Type host.* *Plectorhynchus gibbosus* (Lacepède) (Haemulidae).

*Site.* Intestine.

*Type locality.* Nago, Okinawa Pref., 2-XII-1996.

*Specimens.* Holotype and 19 paratypes, NSMT-PI 4993.

*Etymology.* The specific name *plectorhynchi* is derived from the generic name of the host.

*Description.* Based on 20 specimens. Body oval,  $0.99\text{--}1.57$  long by  $0.53\text{--}0.79$  wide; length/width ratio 1.6–2.2. Tegument spinose. Dermal gland developed in forebody. Oral sucker  $71\text{--}107 \times 122\text{--}166 \mu\text{m}$ ; prepharynx  $25\text{--}64 \mu\text{m}$  long; pharynx subglobular,  $89\text{--}122 \times 87\text{--}115 \mu\text{m}$ ; esophagus short,  $25\text{--}64 \mu\text{m}$  long, bifurcating near anterior end of middle third of forebody; caeca relatively wide, passing ventral to testes, terminating near posterior end of body. Acetabulum  $64\text{--}92 \times 66\text{--}89 \mu\text{m}$ , embedded in shallow ventrogenital sac. Forebody 53–62% of body length. Sucker ratio 1 : 0.48–0.62. In front of the acetabulum is a longitudinal series of three small glandular pits, whose orifice is  $10\text{--}25 \mu\text{m}$  wide. Anteriormost pit at a distance of  $92\text{--}192 \mu\text{m}$  from anterior edge of acetabulum.

Testes spherical to ovoid, symmetrical, a short distance posterior to acetabulum; right testis  $0.15\text{--}0.21 \times 0.12\text{--}0.19$ ; left testis  $0.12\text{--}0.22 \times 0.13\text{--}0.21$ . Posttesticular space 15–32% of body length. Seminal vesicle tubular, largely preacetabular, beginning from acetabular level, first running forward, straight, swollen, then turning backward, gradually slender, highly convoluted, finally uniting pars prostatica  $25\text{--}50 \times 32\text{--}52 \mu\text{m}$ .

Genital pore median, on anterior edge of ventro-genital sac.

Ovary median, 4–8 lobes,  $0.11\text{--}0.23 \times 0.18\text{--}0.29$ , partly overlapping testes ventrally. Oviduct arising from near center of ovary, giving off Laurer's canal just before connecting seminal receptacle, joining vitelline reservoir, entering Mehlis' gland. Laurer's canal opening dorsally near mid-anterior border of ovary. Seminal receptacle  $65\text{--}148 \times 60\text{--}115 \mu\text{m}$ , immediately anterodextral to acetabulum. Uterus filling available space of hindbody, then passing sinistral to acetabulum, joining genital atrium by short metraterm  $15\text{--}18 \mu\text{m}$  long. Eggs thick-shelled,  $19\text{--}23 \times 10\text{--}12 \mu\text{m}$ . Vitelline follicles rather ramified, between some distance posterior to intestinal bifurcation and postacetabular level. Excretory vesicle Y-shaped, bifurcating in ovarian zone to form arms extending to near oral sucker; pore terminal.

*Remarks.* This species differs from all others in *Metadena* by having an acetabulum consistently posterior to the midbody, and a midventral longitudinal row of three small glandular pits in front of the acetabulum.

*Metadena pterocaesionis* sp. nov.

(Figs. 7–8)

*Type host.* *Pterocaesio diagramma* (Bleeker) (Caesionidae).

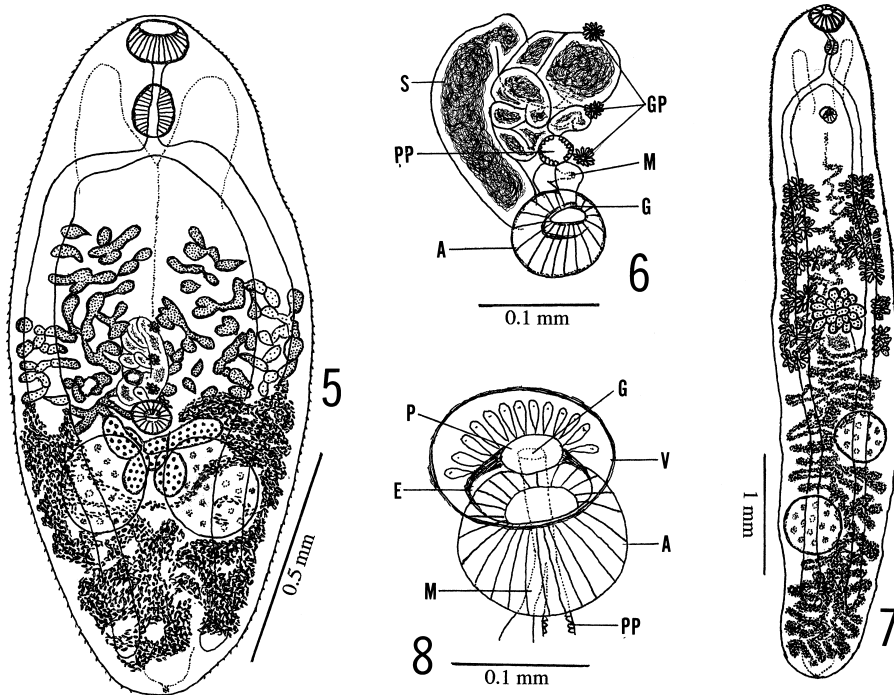
*Site.* Pyloric caeca and upper intestine.

*Type locality.* Nago, Okinawa Pref., 26-XI-1996.

*Other locality.* Koniya, Kagoshima Pref., 20-XI-1989.

*Specimens.* Holotype and 5 paratypes, NSMT-PI 4964; 1 paratype, NSMT-PI 3806.

*Etymology.* The specific name *pterocaesionis* is derived from the generic name of the host.



Figs. 5–6. *Metadena plectorhynchi* sp. nov. —5. Entire worm, ventral view (holotype, NSMT-PI 4993). 6. Terminal genitalia, ventral view.

Figs. 7–8. *Metadena pterocaesionis* sp. nov. —7. Entire worm, ventral view (holotype, NSMT-PI 4964). 8. Terminal genitalia, ventral view. Abbreviations: A, acetabulum; E, mouth of embedded acetabulum; G, genital pore; GP, glandular pit; M, metraterm; P, pad; PP, pars prostatica; S, seminal vesicle; V, ventro-genital sac.

*Description.* Based on seven specimens. Body elongate, 4.19–5.65 long by 0.78–1.14 wide; length/width ratio 4.4–5.8. Tegument with fine spines. Dermal gland scattered all over. Oral sucker 0.20–0.24×0.29–0.33, without circumoral spines; prepharynx 0.05–0.10 long; pharynx 0.11–0.15×0.11–0.14; esophagus 0.07–0.15 long, bifurcating midway between suckers; caeca narrow, passing ventral to testes, terminating near middle of posttesticular space. Acetabulum 0.09–0.13×0.10–0.16, embedded in ventrogenital sac. Sucker ratio 1:0.36–0.49. Forebody 15–19% of body length.

Testes globular, diagonal in middle of posterior half of body; right testis 0.19–0.50×0.32–0.66; left testis 0.25–0.49×0.33–0.68. It is not fixed which side of testis is anterior. Posttesticular space 15–24% of body length. Seminal vesicle long slender, slightly winding, maybe bipartite, beginning from some distance anterior to ovary; pars prostatica 50–64×22–33 μm; uniting metraterm to form short genital atrium. Mouth of embedded acetabulum provided anteriorly with small pad. The pad enclosed anteriorly by glandular cells. Genital pore opening dorsal to the pad.

Ovary with 13–20 lobes, 0.29–0.46×0.34–0.60 as a whole, median, equatorial. Oviduct arising from center of ovary, running anterodigonally, receiving short duct from seminal receptacle, giving off Laurer's canal at the same point where the duct from seminal receptacle is received, turning posterodigonally, joining vitelline reservoir, then entering Mehlis' gland. Seminal receptacle saccular, 0.12–0.56×0.06–0.30, posterodorsal to ovary. Laurer's canal opening middorsally near posterior margin of ovary. Uterine coils descending to near posterior end of body, then ascending, passing ventral to seminal vesicle. Eggs 17–20×9–10 μm. Vitellaria consisting of 7–10 bunches of follicles on each side, sometimes partly confluent, extending from a level between acetabulum and ovary to a level between ovary and anterior testis. Excretory vesicle Y-shaped, bifurcating posterior to ovary; arms reaching pharyngeal or prepharyngeal level; pore

terminal.

*Remarks.* Oshmarin *et al.* (1961) described *Disacanthus longus* as a new genus and species from *Pristipomoides thypus* (*typus?*) (Lutjanidae) in the Gulf of Tonkin. Yamaguti (1971) reduced *Disacanthus* to a junior synonym of *Pseudosiphoderoides* and transferred *D. longus* to the genus *Pseudosiphoderoides* as *P. longus*. Miller and Cribb (2008a) proposed *Pseudosiphoderoides* to a junior synonym of *Metadena* and placed *P. longus* in *Metadena* as *M. longa*. Yamaguti (1970) described *Pseudosiphoderoides opakapaka* (now *Metadena opakapaka*) from *Pristipomoides microlepis* of Hawaii. He did not compare his species with *M. longa*. Both species are from fishes of *Pristipomoides* and there is no significant difference between the two. I consider *M. opakapaka* synonymous with *M. longa*. *M. longa* is the only one in *Metadena* to possess an elongate body. The present new species is the second with an elongate body, but differs from *M. longa* in having a more anterior acetabulum, longer distance between the acetabulum and ovary, caeca passing ventral to the testes, a seminal receptacle dorsoposterior to the ovary, the anterior extent of the vitelline follicles lying midway between the acetabulum and ovary, and smaller eggs.

#### *Perlevilobus platycephali* (Shen, 1989)

*Paraisocoelium platycephali* Shen, 1989: 153–154, fig. 1.  
*Perlevilobus platycephali*: Miller and Cribb 2008a: 67.

*Material.* Three specimens from the pyloric caeca of *Inegocia guttata* (Cuvier) (Platycephalidae), Palawan, the Philippines, 12-XI-1988, NSMT-PI 3564.

*Measurements and remarks.* Body 2.64–3.79 long by 0.45–0.53 wide; length/width ratio 5.5–8.3. Oral sucker 0.14–0.15×0.13–0.16; prepharynx 0.03–0.05 long; pharynx 0.05–0.06×0.06–0.07; esophagus 0.19–0.32 long. Acetabulum 0.07–0.09×0.10. Sucker ratio 1:0.65–0.77. Forebody 36–40% of body length. Anterior testis 0.18–0.31×0.24–0.26; posterior testis 0.23–0.35×0.22–0.27. Posttesticular space

22–30% of body length. Ovary 0.16–0.20×0.21–0.22. Seminal receptacle 0.10–0.14×0.16–0.24. Eggs 16–19×9–10 μm. This species was originally described by Shen (1989) from *Platycephalus indicus* (Platycephalidae) in Jiaozhou Bay, China. My specimens agree fairly well with the original description. They have an ovoid to funnel-shaped oral sucker, and a slightly lobed to distinctly trilobed ovary. The anterior extent of the vitelline follicles lies between the intestinal bifurcation and acetabulum.

Genus *Mehravermis* nov.

*Diagnosis.* Body linguiform, spinose. Dermal gland densely developed in forebody. Eyespot pigment present. Oral sucker subterminal, without circumoral spines. Prepharynx relatively short. Pharynx moderately developed. Esophagus short. Caeca reaching near posterior extremity. Acetabulum smaller than oral sucker, a little anterior to midbody. Testes globular, smooth, diagonal, partly overlapping caeca, anterior to middle of hindbody. Seminal vesicle long, tubular, convoluted anterior to acetabulum; pars prostatica distinct. Distal end of pars prostatica uniting metraterm to form short genital atrium. Genital pore median, near anterior edge of acetabulum. Ovary acinous, almost midbody, partly overlapping anterior testis. Egg without filament. Seminal receptacle saccate, between acetabulum and ovary. Laurer's canal opening dorsally in ovarian zone. Uterus extending to near posterior end of body. Vitelline follicles almost confluent, extending from near intestinal bifurcation to posterior testis. Excretory vesicle Y-shaped, arms reaching near intestinal bifurcation. Parasitic in marine teleosts.

Type and only species: *Mehravermis velasquezae* sp. nov.

*Remarks.* *Mehravermis* closely resembles *Mehrailla* Srivastava 1939, but differs from it by having globular testes arranged diagonally, a seminal vesicle largely anterior to the acetabulum, vitelline follicles that extend from near the

intestinal bifurcation to the posterior margin of the rear testis, and eggs without a filament. *Mehrailla* is found in a stromateid fish off India, whereas *Mehravermis* occurs in an opistognathid off the Philippines.

*Mehravermis velasquezae* sp. nov.

(Figs. 9–10)

*Type host.* *Opistognathus* sp. (Opistognathidae).

*Site.* Intestine.

*Type locality.* Palawan, the Philippines, 12-XI-1988.

*Specimens.* Holotype and 9 paratypes, NSMT-PI 3558a.

*Etymology.* The name *Mehravermis* indicates the close relationship of this genus with *Mehrailla* Srivastava, 1939, and *velasquezae* is named in honor of the late Prof. Carmen C. Velasquez in recognition of her contributions to the field of trematodology.

*Description.* Based on 10 specimens. Body linguiform, rounded anteriorly, tapering posteriorly, 1.95–3.25 long by 0.95–1.23 wide; length/width ratio 2.1–2.8. Tegument spinose. Dermal gland densely developed in forebody. Eyespot pigment present. Oral sucker subterminal, rounded, 0.20–0.28×0.27–0.32, without spines; prepharynx 0.03–0.13 long; pharynx 0.08–0.12×0.13–0.22; esophagus short, 0.01–0.08 long, bifurcating nearer oral sucker than acetabulum; caeca wide, reaching near posterior end of body. Acetabulum small, 0.09–0.11×0.10–0.13, embedded in weakly developed ventrogenital sac. Sucker ratio 1:0.36–0.42. Forebody 35–44% of body length.

Testes globular, diagonal, anterior to midline of hindbody; right testis usually posterior to left testis, 0.20–0.33×0.30–0.36; left testis 0.23–0.30×0.24–0.34. Posttesticular space 25–38% of body length. Seminal vesicle tubular, long, extending from near or well into acetabular level to midway between intestinal bifurcation and acetabulum; largely preacetabular; sinuous; connecting pars prostatica 0.07–0.18×0.07–0.18,



immediately anterior to acetabulum. Distal end of pars prostatica joining metraterm to form short genital atrium. Genital pore median, near anterior edge of acetabulum.

Ovary acinous,  $0.16\text{--}0.33 \times 0.44\text{--}0.55$ , a short distance posterior to acetabulum, partly overlapping anterior testis. Oviduct arising from center of ovary, running forward, giving off Laurer's canal just before uniting short duct from seminal receptacle, turning backward, joining vitelline reservoir, entering Mehlis' gland. Seminal receptacle saccular,  $0.12\text{--}0.18 \times 0.15\text{--}0.21$ , between acetabulum and ovary. Laurer's canal short, curved, opening dorsally near center of ovary. Uterus forming transverse coils, reaching near posterior end of body, then running forward dextral or sinistral to ovary. Metraterm very short. Eggs  $21\text{--}23 \times 12\text{--}13 \mu\text{m}$ . Vitellaria ramiform, almost confluent from midway between intestinal bifurcation and acetabulum to posterior margin of rear testis. Excretory vesicle Y-shaped; arms reaching near intestinal bifurcation; pore terminal.

*Remarks.* This species closely resembles *Mehrailla ovocaudatum* Srivastava, 1939 (type and only species of the genus), but differs from it by having round testes that are diagonal, a seminal vesicle largely anterior to the acetabulum, vitelline follicles intruding to the median line, and eggs without a filament.

#### Genus *Opistognathotrema* nov.

*Diagnosis.* Body linguiform, spinose. Dermal gland developed in anterior half of body. Eyespot pigment present. Oral sucker large; orifice surrounded by sphincter latero-posteriorly. Prepharynx short. Pharynx well-developed. Esophagus short. Caeca passing outside of testes, opening through separate ani near posterior end of body. Acetabulum smaller than oral sucker, at anterior 1/3 of body length. Testes globular, diagonal, almost middle of hindbody. Seminal vesicle tubular, bipartite, largely in acetabular zone. Pars prostatica distinct, immediately anterior to acetabulum. Distal end of pars prostatica joining

metraterm to form short genital atrium. Genital pore median, near anterior edge of acetabulum. Ovary acinous, near midbody. Uterus extending from acetabulum to posterior end of body. Seminal receptacle saccate, between acetabulum and ovary. Laurer's canal opening near center of ovary. Vitelline follicles extending along caeca from midway between acetabulum and ovary to middle of posttesticular space. Excretory vesicle Y-shaped, arms reaching near intestinal bifurcation. Parasitic in marine teleosts.

Type and only species: *Opistognathotrema philippinense* sp. nov.

*Remarks.* *Opistognathotrema* differs from closely related *Mehraermis* by possessing an oral sucker with sphincter, caeca opening through separate ani at the posterior end of the body, a seminal vesicle largely lateral or dorsal to the acetabulum, and vitelline follicles in lateral fields extending from a level midway between the acetabulum and ovary to the midlevel of the posttesticular space.

#### *Opistognathotrema philippinense* sp. nov.

(Figs. 11–12)

*Type host.* *Opistognathus* sp. (Opistognathidae).

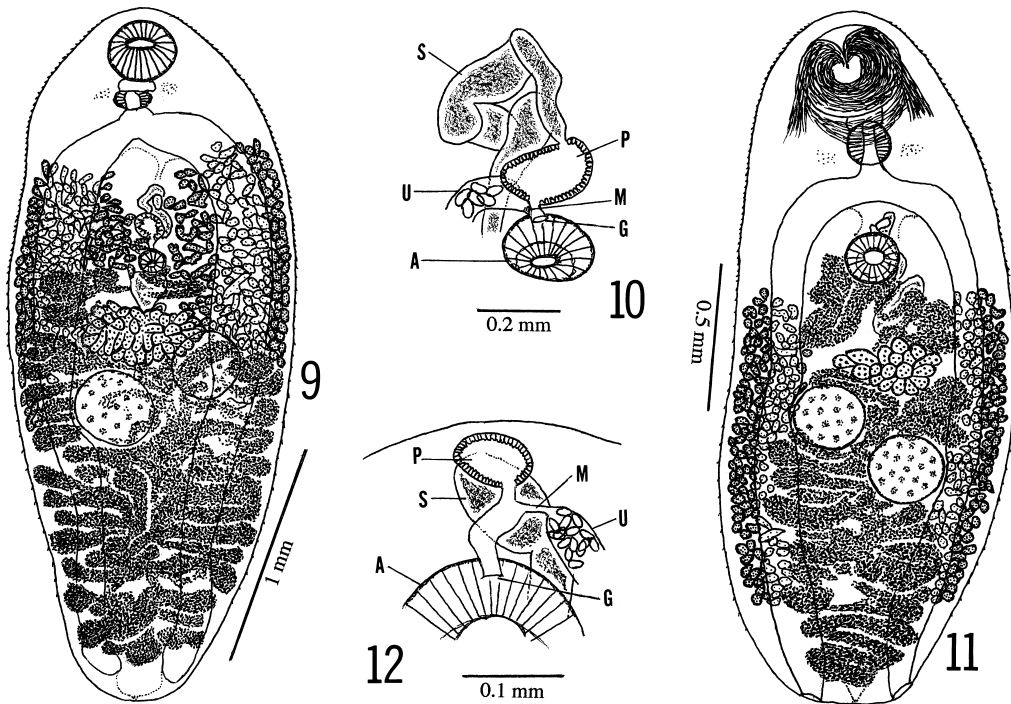
*Site.* Intestine and rectum.

*Type locality.* Palawan, the Philippines, 12-XI-1988 and 22-VIII-1990.

*Specimens.* Holotype, NSMT-PI 3558b and 9 paratypes, NSMT-PI 3558b and 3960.

*Etymology.* The name *Opistognathotrema* is derived from the generic name of the host, and *philippinense* indicates the type locality.

*Description.* Based on 10 specimens. Body linguiform with rounded ends, 1.87–2.95 long by 0.80–1.05 wide; length/width ratio 2.2–2.8. Tegument spinose. Dermal gland developed in anterior half of body. Eyespot pigment present. Oral sucker subterminal,  $0.27\text{--}0.35 \times 0.33\text{--}0.44$ , orifice surrounded by well-developed sphincter latero-posteriorly. Prepharynx 0.03–0.10 long; pharynx  $0.10\text{--}0.15 \times 0.14\text{--}0.21$ ; esophagus short, up to 0.06 long; caeca broad, passing outside of



Figs. 9–10. *Mehravermis velasquezae* gen. et sp. nov. — 9. Entire worm, ventral view (holotype, NSMT-PI 3558a). 10. Terminal genitalia, ventral view.

Figs. 11–12. *Opistognathotrema philippinense* gen. et sp. nov. — 11. Entire worm, ventral view (holotype, NSMT-PI 3558b). 12. Terminal genitalia, ventral view. Abbreviations: A, acetabulum; G, genital pore; M, metraterm; P, pars prostatica; S, seminal vesicle; U, uterus.

testes, opening through separate ani at posterior end of body. Acetabulum  $0.14\text{--}0.19 \times 0.16\text{--}0.21$ , embedded in weakly developed ventrogenital sac. Sucker ratio  $1 : 0.41\text{--}0.52$ . Forebody 28–39% of body length.

Testes globular, diagonal; right testis usually behind left one,  $0.16\text{--}0.32 \times 0.18\text{--}0.33$ ; left testis  $0.15\text{--}0.28 \times 0.17\text{--}0.31$ . Posttesticular space 28–35% of body length. Seminal vesicle tubular, usually constricted into two portions, beginning from postacetabular level, passing lateral or dorsal to acetabulum, then connecting saccate pars prostatica  $55\text{--}90 \times 30\text{--}50 \mu\text{m}$ , which lies in front of acetabulum. Distal end of pars prostatica joining metraterm to form short genital atrium. Genital pore median, near anterior edge of acetabulum.

Ovary acinous,  $0.17\text{--}0.29 \times 0.30\text{--}0.46$ , near midbody, attached to or partly overlapping anterior testis. Oviduct arising from center of ovary,

running forward, joining short duct from seminal receptacle, giving off Laurer's canal, turning backward, uniting vitelline reservoir, entering Mehlis' gland. Seminal receptacle saccular,  $0.12\text{--}0.29 \times 0.09\text{--}0.20$ , between acetabulum and ovary. Laurer's canal slightly curved, opening dorsally near center of ovary. Uterus descending between testes, reaching near posterior end of body, then ascending between testes again, ventral to ovary and seminal receptacle, finally lateral to acetabulum. Metraterm up to  $40 \mu\text{m}$  long. Eggs  $19\text{--}22 \times 11\text{--}12 \mu\text{m}$ . Vitelline follicles extending along caeca from about midway between acetabulum and ovary to middle of posttesticular space. Excretory vesicle Y-shaped; arms extending to near intestinal bifurcation; pore terminal.

*Remarks.* This species was found with the above-mentioned *Mehravermis velasquezae* from an unidentified *Opistognathus* species. It differs

from the related *M. velasquezae* by possessing an oral sucker with sphincter, caeca opening through separate ani at the posterior end of the body, an acetabulum lying a short distance posterior to the intestinal bifurcation, a seminal vesicle largely lateral or dorsal to the acetabulum, and vitelline follicles extending into the lateral fields from a level midway between the acetabulum and ovary to the midlevel of the posttesticular space.

***Neometadena ovata* (Yamaguti, 1952)**

*Paracryptogonimus ovatus* Yamaguti, 1952: 173–175, fig. 4.

*Neoparacryptogonimus ovatus*: Hafeezullah 1975: 54.

*Neometadena ovata*: Miller and Cribb 2008a: 65–66.

**Material.** One specimen from the intestine of *Lutjanus monostigma* (Cuvier) (Lutjanidae), Palawan, the Philippines, 8-XI-1988, NSMT-PI 3539; 1 specimen from the intestine of *L. argentimaculatus* (Forsskål), Palawan, 11-XI-1988, NSMT-PI 3554; and 8 specimens from the intestine of *L. argentimaculatus*, Palawan, 12-XI-1988, NSMT-PI 3561.

**Measurements.** Body 1.52–2.63 long by 1.02–1.55 wide; length/width ratio 1.5–1.8. Oral sucker 0.17–0.24×0.23–0.36 with 64–83 circumoral spines. Circumoral spines 14–16 µm long. Pharynx 0.14–0.21×0.16–0.28. Acetabulum 0.19–0.28×0.20–0.30. Sucker ratio 1:0.80–1.10. Forebody 24–33% of body length. Right testis 0.23–0.40×0.16–0.36; left testis 0.17–0.37×0.17–0.34. Posttesticular space 25–36% of body length. Ovary 0.13–0.26×0.37–0.55. Eggs 16–19×9–10 µm. This species was originally described by Yamaguti (1952) from an unknown marine fish of Macassar (=Ujung Pandang), Indonesia.

***Siphoderina elongata* (Gu et Shen, 1979)**

(Fig. 13)

*Paracryptogonimus elongatus* Gu et Shen, 1979: 347–348, fig. 6.

*Siphoderina elongata*: Miller and Cribb 2008a: 68–69.

**Material.** Five Specimens from the intestine of *Nemipterus* sp. (Nemipteridae), Palawan, the

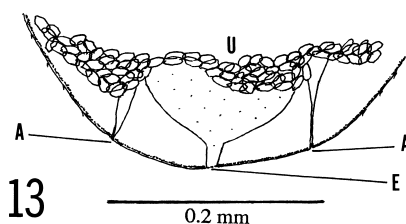


Fig. 13. *Siphoderina elongata* (Gu et Shen, 1979). Posterior end of body, showing ani on either side of excretory pore, ventral view (NSMT-PI 5187). Abbreviations: A, anus; E, excretory pore; U, uterus.

Philippines, 8-XI-1988, NSMT-PI 3535; 4 specimens from the pyloric caeca of *Nemipterus* sp., Lombok, Indonesia, 20-I-1994, NSMT-PI 5174; and 1 specimen from the pyloric caeca of *Nemipterus* sp., Lombok, 23-I-1994, NSMT-PI 5187.

**Brief description of NSMT-PI 3535.** Body 2.77–3.17 long by 0.55–0.66 wide; length/width ratio 4.4–5.8. Tegument spinose. Eyespot pigment present. Oral sucker 0.17–0.21×0.22–0.24, with 25–27 circumoral spines. Prepharynx 0.06–0.14 long. Pharynx 0.10–0.11×0.10–0.13. Esophagus 0.02–0.09 long. Caeca passing exterior to testes, opening through separate ani near posterior end of body. Acetabulum 0.10–0.12×0.11–0.13, embedded in ventrogenital sac. Mouth of ventrogenital sac provided with semicircular pad anteriorly. Glandular cells attached to the pad. Sucker ratio 1:0.48–0.53. Forebody 20–24% of body length. Right testis 0.33–0.40×0.15–0.21; left testis 0.33–0.39×0.15–0.20. Posttesticular space 15–17% of body length. Seminal vesicle tubular, bipartite. Ovary 0.22–0.29×0.25–0.33, 41–46% of body length from anterior end. Seminal receptacle 0.22–0.30×0.13–0.16, anterior to ovary. Eggs 16–18×10–11 µm.

**Measurements of NSMT-PI 5174 and 5187.** Body 3.45–5.49 long by 0.72–1.03 wide; length/width ratio 4.4–5.4. Oral sucker 0.21–0.26×0.19–0.24, with prominent 25–27 circumoral spines. Prepharynx up to 75 µm long. Pharynx 0.08–0.13×0.09–0.10. Esophagus 0.02–0.09 long. Acetabulum 0.12–0.15×0.13–0.16, embedded in ventrogenital sac. Sucker ratio 1:0.60–0.71.

Forebody 12–17% of body length. Right testis 0.56–0.90×0.32–0.40; left testis 0.52–0.70×0.30–0.39, anterior to right testis. Posttesticular space 17–22% of body length. Ovary 0.28–0.35×0.56–0.75, 32–41% of body length from anterior end. Seminal receptacle 0.24–0.58×0.13–0.43. Eggs 17–19×9–10  $\mu\text{m}$ .

*Remarks.* Gu and Shen (1979) originally described this species from *Nemipterus virgatus* of Hainan Island, China. My specimens were found from the same genus of host, but somewhat differ from the original description. They have a larger sucker ratio, the posterior extent of the vitelline follicles lying between the level of anterior and middle of the fore testis, and caeca opening through separate ani near the posterior end of the body. Gu and Shen (1979) did not mention ani in their description. The presence of ani is a distinctive feature of this species.

***Siphoderina onaga* (Yamaguti, 1970)**

*Paracryptogonimus onaga* Yamaguti, 1970: 102–103, fig. 143.

*Siphoderina onaga*: Miller and Cribb 2008a: 68–69.

*Material.* Two specimens from the pyloric caeca of *Etelis coruscans* Valenciennes (Lutjanidae), Nago, Okinawa Pref., 9-VI-1988, NSMT-PI 3448.

*Brief description and remarks.* Body 11.2–12.5 long by 3.55–3.65 wide; length/width ratio 3.2–3.4. Dermal glands developed in anterior part of body. Oral sucker 0.37–0.49×0.49–0.52, with 49 circumoral spines; prepharynx 0.12–0.24 long; pharynx 0.18–0.21×0.22–0.23; esophagus 0.40–0.55 long, bifurcating midway between pharynx and acetabulum; caeca passing along outer margins of testes, ending a short distance from posterior end of body. Acetabulum 0.39–0.45×0.44–0.48. Sucker ratio 1:0.90–0.91. Forebody 19–22% of body length. Testes elliptical, with lateral depressions, situated diagonally in middle of hindbody; right testis anterior, 2.18–2.63×0.78–0.88; left testis 2.45–2.83×0.75–0.95. Posttesticular space 20–24% of body length. Ovary acinous, 0.84–0.97×0.92–1.14,

38–41% of body length from anterior end of body. Seminal receptacle 1.03–1.18×0.50–0.63. Eggs 21–26×8–10  $\mu\text{m}$ . Vitellaria consisting of several rosette-shaped clusters, extending along caeca from a short distance posterior to acetabulum to anterior border of front testis. Excretory arms reaching near posterior margin of oral sucker. This species was initially described by Yamaguti (1970) from *Etelis carbunculus* of Hawaii. His specimens were 2.2 to 6.9 long by 0.9 to 2.0 wide. With the exception of being considerably larger worms with correspondingly larger organs, my specimens agree well with the original description such as the number of circumoral spines, an acetabulum slightly smaller than the oral sucker, elongate testes, the distribution of vitellaria, egg size, etc.

***Siphoderina ulaula* (Yamaguti, 1970)**

*Paracryptogonimus ulaula* Yamaguti, 1970: 103, fig. 144.

*Siphoderina ulaula*: Miller and Cribb 2008a: 68–69.

*Material.* Six specimens from the pyloric caeca of *Pristipomoides argyrogrammicus* (Valenciennes) (Lutjanidae), Nago, Okinawa Pref., 8-VI-1991, NSMT-PI 4178; and 7 specimens from the pyloric caeca of *P. argyrogrammicus*, Nago, 5-X-1994, NSMT-PI 4740.

*Measurements.* Body 3.40–5.25 long by 1.65–2.30 wide; length/width ratio 1.9–2.8. Oral sucker 0.11–0.24×0.18–0.36, with 44–57 circumoral spines. Prepharynx 0.04–0.13 long. Pharynx 0.10–0.13×0.11–0.18. Esophagus 0.11–0.27 long. Acetabulum 0.15–0.21×0.18–0.26. Sucker ratio 1:0.56–1.16. Forebody 19–25% of body length. Right testis 0.64–0.84×0.53–0.70. Left testis 0.65–0.99×0.53–0.75. Posttesticular space 30–40% of body length. Ovary 0.41–0.62×0.65–0.88. Eggs 20–24×10–12  $\mu\text{m}$ . This species was initially described by Yamaguti (1970) from *Etelis marshi* (Lutjanidae) of Hawaii.

***Siphoderina akamachi* sp. nov.**

(Fig. 14)

*Type host.* *Etelis coruscans* Valenciennes

(Lutjanidae).

*Other host.* *Pristipomoides sieboldii* (Bleeker) (Lutjanidae).

*Site.* Pyloric caeca and upper intestine.

*Type locality.* Koniya, Kagoshima Pref., 8-III-1991.

*Other locality.* Nago, Okinawa Pref., 7-XII-1995; 29-XI-1996.

*Specimens.* Holotype and 6 paratypes, NSMT-PI 4153; 5 paratypes, NSMT-PI 4804; 3 paratypes, NSMT-PI 4983.

*Etymology.* The specific name *akamachi* is from the Japanese local name of the host.

*Description.* Based on 15 specimens. Body elongate, 3.75–5.70 long by 1.03–1.40 wide, broad anteriorly and almost rounded posteriorly; length/width ratio 3.4–4.9. Tegument thick, with fine spines. Dermal glands developed all over. Cephalic glands gathering around oral sucker and midway between suckers. Oral sucker 0.15–0.27×0.26–0.41, with 62–68 circumoral spines;

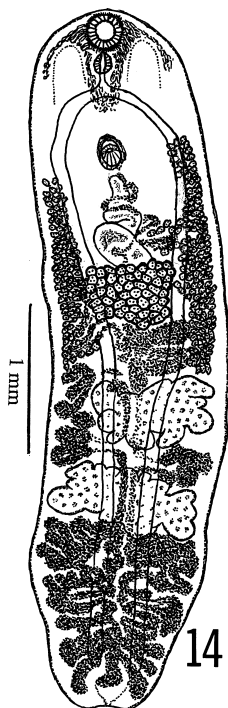


Fig. 14. *Siphoderina akamachi* sp. nov. Entire worm, ventral view (holotype, NSMT-PI 4153).

prepharynx 0.03–0.15 long; pharynx 0.13–0.17×0.12–0.17; esophagus 0.07–0.15 long, bifurcating midway between pharynx and acetabulum; caeca narrow, passing ventral to testes, terminating a short distance from posterior end of body. Acetabulum 0.13–0.18×0.13–0.19, embedded in ventrogenital sac. Ventrogenital sac surrounded by glandular cells. Forebody 17–24% of body length. Sucker ratio 1 : 0.40–0.58.

Testes with shallow and deep incisions, usually wider than long, tandem, slightly separated; anterior testis 0.36–0.67×0.79–1.14; posterior testis 0.44–0.68×0.71–1.00. Posttesticular space 19–32% of body length. Seminal vesicle a wide sinuous tube, indistinctly bi- or tri-partite, extending from anterior edge of ovary to a short distance posterior to acetabulum; pars prostatica 25–50  $\mu$ m long, near posterior border of acetabulum. Genital pore immediately in front of acetabulum.

Ovary acinous, 0.34–0.60×0.54–0.75, pre-equatorial. Oviduct arising from center of ovary, ascending, uniting duct from seminal receptacle, dividing Laurer's canal, turning backward, receiving vitelline reservoir, entering Mehlis' gland. Seminal receptacle 0.35–0.68×0.15–0.29, tapering posteriorly to connect oviduct, immediately anterior to ovary, in contact with posterior portion of seminal vesicle. Laurer's canal long, descending, opening mid-dorsally near posterior border of ovary. Uterus reaching near posterior end of body, then ascending laterad to ovary and ventrad to seminal vesicle; metraterm 50  $\mu$ m long. Eggs thin-shelled, 18–21×8–10  $\mu$ m. Vitelline follicles partly rosette-shaped, largely in extracaecal fields, from acetabular level to near anterior margin of fore testis. Excretory vesicle Y-shaped, bifurcating just posterior to ovary; arms reaching sides of oral sucker or prepharynx; pore terminal.

*Remarks.* Velasquez (1961) described *Pseudallacanthochasmus grandispinus* as a new genus and species from an unidentified species of *Lutjanus* off the Philippines. Miller and Cribb (2008b) reduced *Pseudallacanthochasmus* to a junior synonym of *Siphoderina* and *P. grandispinus* was placed in *Siphoderina* as *S. grandispinus*. The present new species is most similar to *S.*

*grandispinus*, but differs from it by having an oral sucker with 62 to 68 circumoral spines, transversely elongate testes with incisions, an acinous ovary, vitelline follicles extending in the lateral fields from the acetabular level to the anterior margin of the fore testis, and larger eggs.

***Siphoderina marangsi* sp. nov.**

(Figs. 15–16)

*Type host.* *Lutjanus quinquelineatus* (Bloch) (Lutjanidae).

*Site.* Pyloric caeca.

*Type locality.* Palawan, the Philippines, 17-XI-1988.

*Specimens.* Holotype and 14 paratypes, NSMT-PI 3600.

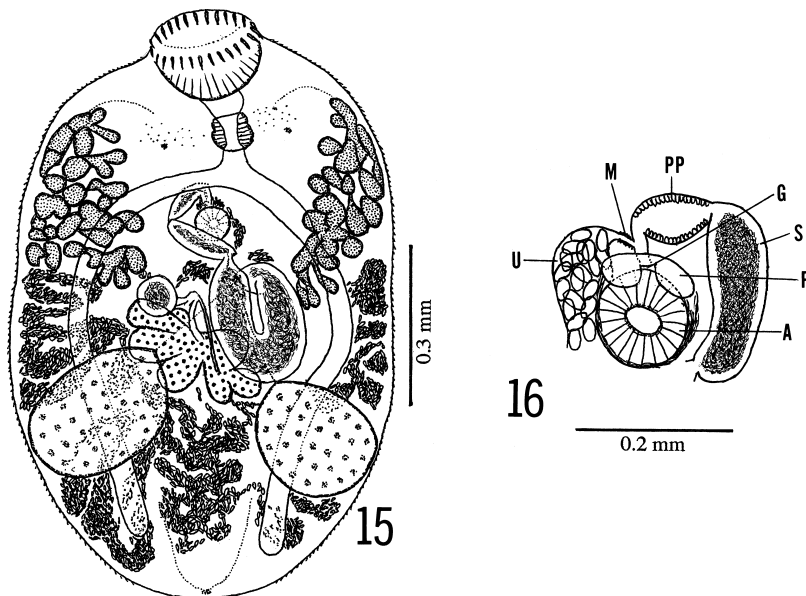
*Etymology.* The specific name *marangsi* is from the Philippine local name of the host.

*Description.* Based on 15 specimens. Body oval, 0.80–1.17 long by 0.47–0.82 wide; length/width ratio 1.2–1.8. Tegument with fine spines. Dermal gland sparsely scattered in forebody. Eyespot pigment dispersed near pharyngeal level. Oral sucker usually cup-shaped, 0.11–0.19 ×

0.15–0.23, with 23–28 circumoral spines. Circumoral spines prominent, slender, 33–39 × 7–9  $\mu\text{m}$ . Prepharynx 0.02–0.08 long; pharynx globular, 0.05–0.07 × 0.06–0.11; esophagus 0.02–0.10 long, bifurcating midway between pharynx and acetabulum; caeca passing ventral to testes, terminating near posterior end of body. Acetabulum 0.04–0.08 × 0.05–0.08, embedded in ventrogenital sac. Sucker ratio 1:0.31–0.47. Forebody 32–42% of body length.

Testes almost ovoid, symmetrical, near middle of hindbody; right testis 0.20–0.35 × 0.14–0.31; left testis 0.20–0.33 × 0.13–0.31. Posttesticular space 14–25% of body length. Seminal vesicle tubular, convoluted, extending from ovarian to bifurcal level. At a short distance anterior to acetabulum, distal end of seminal vesicle uniting small bulbous pars prostatica 37–50 × 25–40  $\mu\text{m}$ , which joins metraterm to form short genital atrium. Ventrogenital sac provided anteriorly with seed leaf-like pad. Genital pore median, near anterior edge of acetabulum.

Ovary with 5–8 lobes, 0.10–0.23 × 0.14–0.32, median, between anterior portions of testes. Oviduct arising from center of ovary, running



Figs. 15–16. *Siphoderina marangsi* sp. nov. — 15. Entire worm, dorsal view (holotype, NSMT-PI 3600). 16. Terminal genitalia, ventral view. Abbreviations: A, acetabulum; G, genital pore; M, metraterm; P, pad; PP, pars prostatica; S, seminal vesicle; U, uterus.

forward to receive duct from seminal receptacle, then backward, giving off Laurer's canal, receiving vitelline reservoir, entering Mehlis' gland. Seminal receptacle subglobular,  $0.07\text{--}0.17 \times 0.05\text{--}0.13$ , submedian, between acetabulum and ovary. Laurer's canal opening middorsally at mid- to postovarian level. Uterus filling most of available space of hindbody; metraterm  $15\text{--}20\ \mu\text{m}$  long. Vitelline follicles in lateral fields, extending from pharyngeal to preovarian level. Eggs  $16\text{--}19 \times 8\text{--}10\ \mu\text{m}$ . Excretory vesicle Y-shaped, bifurcating near postovarian level; broad arms extending to near prepharyngeal level; pore terminal.

*Remarks.* The present new species is distinguishable from all others in *Siphoderina* by combination of the oval body, the oral sucker with prominent 23 to 28 circumoral spines, the ovary consisting of five to eight lobes, and the vitelline follicles in the lateral fields, extending from the pharyngeal level to the preovarian level.

*Siphoderina nemipteri* sp. nov.

(Figs. 17–18)

*Type host.* *Nemipterus virgatus* (Houttuyn) (Nemipteridae).

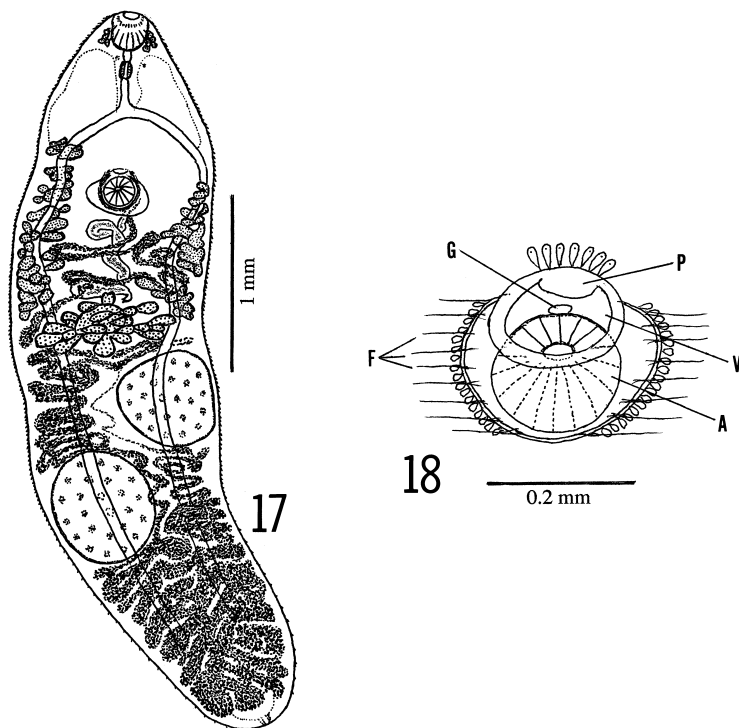
*Site.* Intestine.

*Type locality* Owase, Mie Pref., 16-X-1986.

*Specimens.* Holotype and 9 paratypes, NSMT-PI 3299.

*Etymology.* The specific name *nemipteri* is derived from the generic name of the host.

*Description.* Based on 10 specimens. Body elongate, 2.08–4.00 long by 0.59–1.08 wide; length/width ratio 3.4–4.9. Tegument with fine spines. Dermal gland densely developed in forebody. Eyespots at prepharyngeal-pharyngeal level. Oral sucker cup- or barrel-shaped, retractable,  $0.14\text{--}0.24 \times 0.15\text{--}0.23$ . Circumoral spines indistinct, maybe 28–35 in number. Cephalic glands converging at the base of oral sucker; their ducts extending anteriorly, opening



Figs. 17–18. *Siphoderina nemipteri* sp. nov. — 17. Entire worm, ventral view (holotype, NSMT-PI 3299). 18. Terminal genitalia, ventral view. Abbreviations: A, acetabulum; F, transversal fiber; G, genital pore; P, pad; V, mouth of ventrogenital sac.

between circumoral spines. Prepharynx up to 0.11 long. Pharynx 0.05–0.11×0.05–0.10. Esophagus 0.05–0.15 long. Intestinal bifurcation midway between suckers. Caeca narrow, passing ventral to testes, ending near middle of posttesticular space. Acetabulum 0.11–0.17×0.12–0.20, embedded in ventrogenital sac. Ventrogenital sac with semicircular pad anteriorly and thick wall latero-posteriorly. The pad provided anteriorly with glandular cells. The wall 0.03–0.12 thick in lateral side, enclosed by glandular cells and connecting lateral body margin by transversal fibers. Sucker ratio 1:0.81–0.95. Forebody 20–27% of body length.

Testes subglobular, diagonal or occasionally tandem; anterior testis 0.27–0.65×0.30–0.71, posterior testis 0.30–0.90×0.38–0.70, in middle of hindbody. Posttesticular space 18–29% of body length. Seminal vesicle tubular, convoluted, extending posteriorly near ovary; distal end of seminal vesicle uniting small pars prostatica which joins metraterm to form short genital atrium. Genital pore median, on anterior edge of acetabulum.

Ovary acinous, usually 20–30 small lobes surrounding a central large lobe, 0.19–0.38×0.42–0.78 as a whole, 29–46% of body length from anterior end. Oviduct arising from anterior border of central lobe, running anterosinistrally, branching Laurer's canal, receiving duct from seminal receptacle at the same point where Laurer's canal branches, then passing anterodextrally, connecting vitelline reservoir, entering Mehlis' gland. Laurer's canal convoluted, opening middorsally in ovarian zone. Seminal receptacle transversely elongate, 0.20–0.38×0.05–0.15, immediately anterior to ovary. Uterus filling available space of hindbody. Eggs slender, thin-shelled, 18–22×8–10 μm; two specimens with larger eggs 26–28×10–12 μm. Vitelline follicles usually in lateral fields, occasionally intruding inward, extending from a level midway between intestinal bifurcation and acetabulum to ovarian level. Excretory vesicle Y-shaped; arms reaching near prepharynx or oral sucker; pore terminal.

*Remarks.* The present new species is most

similar to *Siphoderina elongata* (Gu et Shen, 1979) from the same genus of host *Nemipterus*, but differs from it by having an oral sucker with 28 to 35 circumoral spines, a ventrogenital sac with thick wall, caeca ending blindly near the middle of the posttesticular space, and vitelline follicles extending from a level midway between the intestinal bifurcation and acetabulum to the ovarian level.

*Siphoderina ryukyuensis* sp. nov.

(Fig. 19)

*Type host.* *Lutjanus kasmira* (Forsskål) (Lutjanidae).

*Other host.* *L. quinquelineatus* (Bloch).

*Site.* Intestine.

*Type locality.* Koniya, Kagoshima Pref., 21-XI-1989.

*Other localities.* Ishigaki-jima, Okinawa Pref., 12-III-1973 and Nishinoomote, Kagoshima Pref., 26-XI-1974.

*Specimens.* Holotype, NSMT-PI 3811; and 7 paratypes, NSMT-PI 1365, 1754 and 3811.

*Etymology.* The specific name *ryukyuensis* is from the locality, the Ryukyu Archipelago.

*Description.* Based on eight specimens. Body fusiform with rounded ends, 1.57–2.55 long by 0.65–1.15 wide; length/width ratio 2.0–2.8. Eyespot pigment in pharyngeal region. Dermal gland scattered in anterior half of body. Oral sucker 0.12–0.20×0.14–0.21, with 19–25 circumoral spines; prepharynx 0.02–0.12 long; pharynx 0.07–0.12×0.08–0.11; esophagus 0.01–0.11 long; caeca usually passing interior sides of testes, terminating near posterior end of body. Acetabulum 0.07–0.11×0.08–0.12, embedded in ventrogenital sac. Sucker ratio 1:0.49–0.61. Forebody 23–33% of body length.

Testes longitudinally elongate, sometimes with one to three depressions or incisions on exterior surface, symmetrical or occasionally slightly diagonal; right testis 0.34–0.65×0.13–0.31; left testis 0.33–0.58×0.15–0.33. Posttesticular space 13–25% of body length. Seminal vesicle bipartite, saccate, extending posteriorly anterior bor-



der of ovary; pars prostatica  $28-40 \times 22-30 \mu\text{m}$ ; genital pore median, near anterior edge of acetabulum.

Ovary acinous,  $0.22-0.35 \times 0.25-0.44$ , near midbody. Oviduct arising from center of ovary, receiving duct from seminal receptacle, giving off Laurer's canal, joining vitelline reservoir, entering Mehlis' gland. Seminal receptacle  $0.12-0.34 \times 0.03-0.14$ , between acetabulum and ovary. Laurer's canal opening near posterior border of ovary. Uterus running posteriorly along left caecum, reaching near caecal ends, extending anteriorly along right caecum, both sides of ovary, connecting metraterm. Eggs  $17-21 \times 9-10 \mu\text{m}$ . Vitelline follicles in lateral fields, extending from a level between intestinal bifurcation and acetabulum to near anterior edge of testes. Excretory vesicle Y-shaped, bifurcating in ovarian region; arms reaching to oral sucker; pore terminal.

*Remarks.* The present new species can be distinguished from all others in *Siphoderina* by

combination of the fusiform body; the oral sucker with 18 to 25 circumoral spines; the longitudinally elongate testes arranged symmetrically or occasionally a little diagonally; the acinous ovary; and the vitelline follicles in the lateral fields, extending from a level between the intestinal bifurcation and acetabulum to near the anterior edge of the testes.

*Siphoderina xenocephali* sp. nov.

(Fig. 20)

*Type host.* *Xenocephalus elongatus* (Temminck et Schlegel) (Uranoscopidae).

*Site.* Intestine.

*Type locality.* Suruga Bay, 16-X-1973, 19-24-III-1974.

*Specimens.* Holotype and 8 paratypes, MPM Coll. No. 18234 and 18476.

*Etymology.* The specific name *xenocephali* is derived from the generic name of the host.

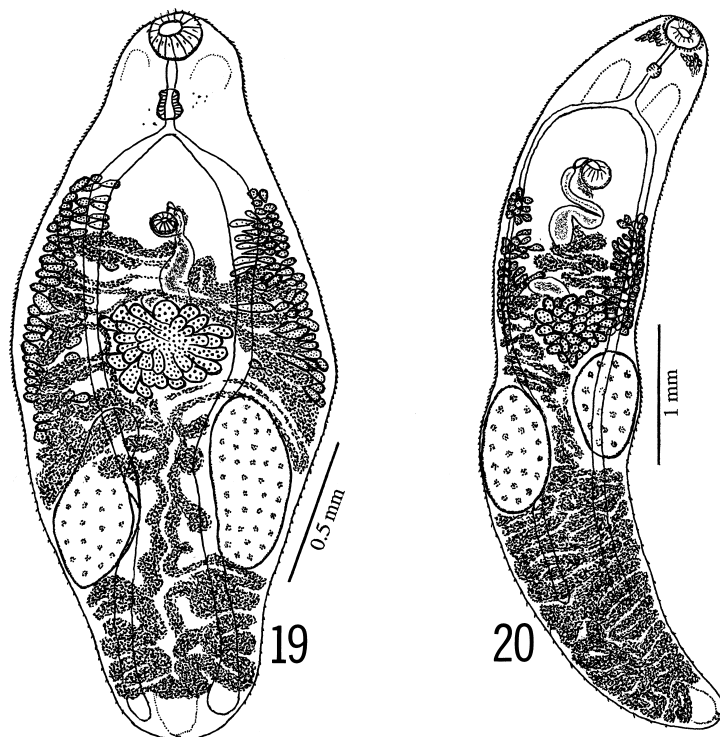


Fig. 19. *Siphoderina ryukyensis* sp. nov. Entire worm, ventral view (holotype, NSMT-Pl 3811).

Fig. 20. *Siphoderina xenocephali* sp. nov. Entire worm, ventral view (holotype, MPM Coll. No. 18234).

**Description.** Based on nine specimens. Body elongate, rounded anteriorly and tapering posteriorly, 3.13–5.71 long by 0.87–1.25 wide; length/width ratio 3.2–5.4. Tegument spinose. Dermal gland densely developed in anterior half of body. Oral sucker subterminal, 0.14–0.24×0.21–0.29, with 44–51 circumoral spines. Cephalic glands surrounding oral sucker, their ducts extending anteriorly, opening between circumoral spines. Prepharynx 0.03–0.17 long; pharynx 0.07–0.09×0.10–0.12; esophagus 0.06–0.29 long, bifurcating midway between suckers or closer to acetabulum; caeca narrow, terminating near middle of posttesticular space. Acetabulum 0.15–0.21×0.15–0.22, embedded in ventrogenital sac. Ventrogenital sac surrounded by glandular cells and circular muscle. Sucker ratio 1 : 0.70–0.85. Fore-body 15–23% of body length.

Testes globular or subglobular, diagonal; right testis 0.42–0.90×0.28–0.56; left testis 0.46–0.78×0.36–0.54. It is not fixed which side of testis is anterior. Posttesticular space 31–43% of body length. Seminal vesicle tubular, sinuous, bipartite, extending posteriorly midway between acetabulum and ovary or near ovary. Pars prostatica 80–90 μm long, whose distal end unites metraterm to form short genital atrium. Genital pore median, on anterior edge of ventrogenital sac.

Ovary acinous, 0.30–0.46×0.53–0.74, attaching anterior edge of fore testis, lying 31–43% of body length from anterior end. Oviduct arising from center of ovary, running forward, joining short duct from seminal receptacle and giving off Laurer's canal, then curving backward to receive vitelline reservoir, entering Mehlis' gland. Seminal receptacle saccate, 0.11–0.26×0.25–0.40, immediately anterior to ovary. Laurer's canal opening middorsally near posterior border of ovary. Uterus forming transverse loops, descending between testes, reaching near posterior end of body, then ascending between testes again, lateral to ovary, mid-region between ovary and acetabulum. Metraterm very short. Eggs 19–23×9–11 μm. Vitelline follicles in lateral fields, between postacetabular level and midlevel of ovary. Excretory vesicle Y-shaped, bifurcating immedi-

ately behind ovary; arms extending pharyngeal level; pore terminal.

**Remarks.** The present new species is most like *S. onaga* (Yamaguti, 1970) from *Etelis coruscans*, but differs from it by having caeca terminating near the middle of the posttesticular space; a much longer posttesticular space; and vitelline follicles not forming bunch-like clusters. The figure of *S. onaga* illustrated by Yamaguti (1970, Fig. 143A) shows the posttesticular space at a ratio of 19% of the body length.

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