

Seven Species of Opecoelid Digeneans (Trematoda) from Fishes of Southern Japan, Palau and the Philippines

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Abstract Seven species of opecoelid digeneans (Trematoda) are described from mainly marine fishes of southern Japan, Palau and the Philippines. One new genus is proposed: *Heterochoanostoma* gen. nov. for *H. shirodai* sp. nov. Four new species are described: *Choerodonicola renko* sp. nov. from *Dentex abei* (Sparidae) of southern Japan, *Coitocaecum kuhliae* sp. nov. from *Kuhlia rupestris* (Kuhliidae) of Palau, *Neochoanostoma crassum* sp. nov. from *Gymnocranius griseus* (Lethrinidae) of Palau, and *Heterochoanostoma shirodai* sp. nov. from *Gymnocranius euanus* (Lethrinidae) of southern Japan. Three previously known species are recorded: *Macvicaria crassigula* (Linton, 1910) from *Argyrops bleekeri* (Sparidae) of the Philippines and southern Japan, *Macvicaria longicirrata* (Manter, 1963) from *Balistapus undulatus* (Balistidae) of Palau, and *Podocotyloides stenometra* Pritchard, 1966 from *Heniochus varius* (Chaetodontidae) of Palau.

Key words: Digenea, Opecoelidae, new genus, new species, fish, Japan, Palau, Philippines.

Introduction

This paper deals with seven species of the family Opecoelidae (Trematoda, Digenea) from fishes of southern Japan, Palau and the Philippines. Host fishes were obtained from the local fish markets or fishermen. The digeneans collected were washed in saline, fixed in alcohol-formalin-acetic acid solution (AFA) under slight pressure, stained with Heidenhain's hematoxylin, cleared in creosote and mounted in Canada balsam. The specimens are deposited in the National Museum of Nature and Science, Tsukuba (NSMT) and the Meguro Parasitological Museum, Tokyo (MPM). Measurements are given in millimeters unless otherwise indicated, with the range followed by measurements of the holotype in parentheses.

Choerodonicola renko sp. nov.

(Figs. 1–3)

Type host. *Dentex abei* (Sparidae).

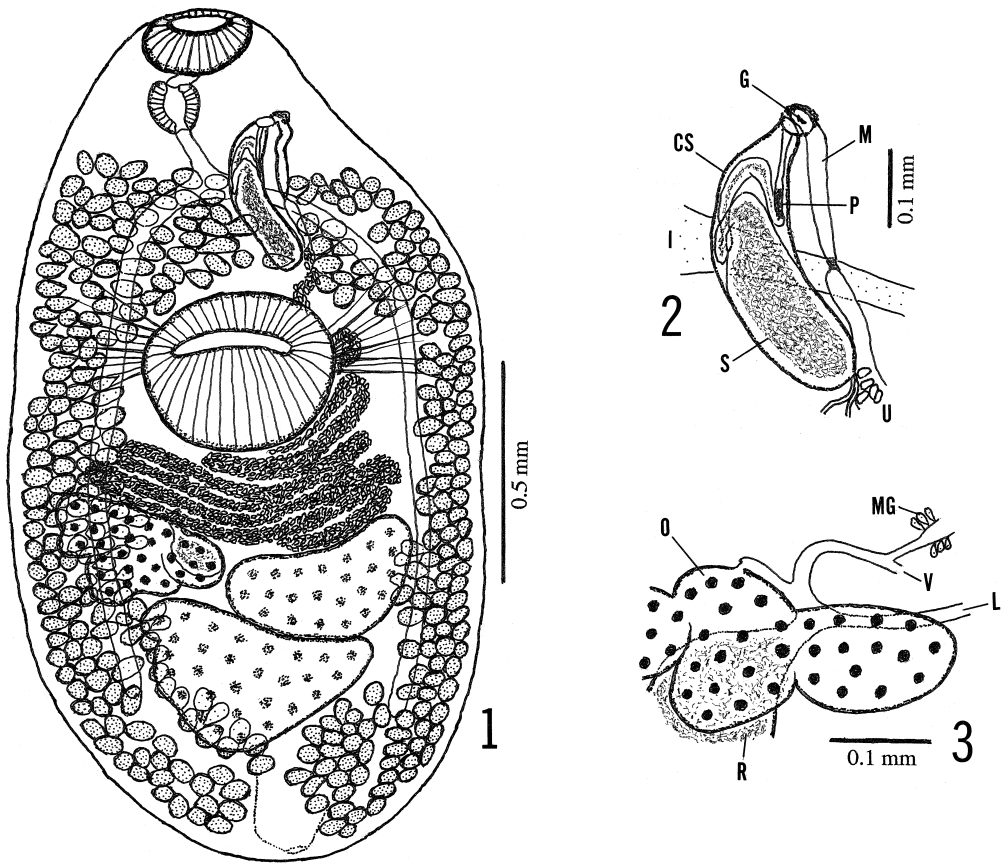
Site. Intestine.

Type locality. Nago, Okinawa Pref., Japan, 10–VI-1988.

Specimens. Holotype, NSMT-PI 3452 and 9 paratypes, NSMT-PI 3452 and 4201.

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

Description. Based on ten specimens. Body ovoid, 1.57–2.43 (1.93) long by 0.85–1.15 (1.08) wide. Body width 45–56 (56)% of body length. Tegument smooth. Oral sucker rounded, 0.14–0.25 (0.16) × 0.21–0.27 (0.25); prepharynx 0.03–0.08 (0.04) long; pharynx 0.09–0.15 (0.12) × 0.09–0.17 (0.12); oesophagus 0.04–0.22 (0.09) long, bifurcating midway between suckers; caeca extending in zone of posterior testis or slightly beyond. Acetabulum 0.31–0.48 (0.32) × 0.40–0.52 (0.45), with radial muscle bundles laterally.



Figs. 1–3. *Choerodonicola renko* sp. nov. — 1, Holotype, ventral view (NSMT-PI 3452); 2, terminal genitalia, ventral view; 3, ovarian complex, ventral view. Abbreviations: CS, cirrus sac; G, genital pore; I, left caecum; L, Laurer's canal; M, metraterm; MG, Mehlis' gland; O, ovary; P, pars prostatica; R, seminal receptacle; S, internal seminal vesicle; U, uterus; V, common vitelline duct.

Sucker ratio 1:1.8–2.0 (1.8). Forebody 40–48 (42)% of body length.

Testes ovoid, sometimes with irregular surface, wider than long, diagonal, continuous, in middle third of hindbody; anterior testis $0.14\text{--}0.26$ (0.20) $\times$ $0.30\text{--}0.60$ (0.45); posterior testis $0.15\text{--}0.30$ (0.30) $\times$ $0.33\text{--}0.58$ (0.54). Posttesticular space 11–17 (12)% of body length. Vasa efferentia not joining each other. Cirrus sac claviform, straight, sometimes arcuate or S-shaped, $0.30\text{--}0.66$ (0.38) $\times$ $0.07\text{--}0.11$ (0.09), extending a short distance anterior to acetabulum; internal seminal vesicle elongate saccular proximally, tubular, thick-walled, down- and upward loops distally; pars prostatica tubular; ejaculatory duct short.

Genital atrium shallow. Genital pore sinistral, at pharyngeal level.

Ovary three or four lobed, $0.13\text{--}0.29$ (0.22) $\times$ $0.34\text{--}0.45$ (0.40), dextral or anterodextral to anterior testis, in contact with anterior testis and sometimes posterior testis. Ovary lying 62–70 (62)% of body length from anterior end of body. Seminal receptacle ovoid, $0.14\text{--}0.25$ (0.15) $\times$ $0.05\text{--}0.16$ (0.10), dorsal to ovary. Laurer's canal running transversely, opening middorsally between acetabulum and anterior testis. Mehlis' gland anterosinistral to ovary. Uterus with six to eight transverse coils, usually intercaecal, anterior to ovary and fore testis, then passing along left side of acetabulum. Metraterm $0.19\text{--}0.36$

(0.19) long, parallel to cirrus sac. Eggs numerous, small, collapsed, $22\text{--}24 \times 13\text{--}16\mu\text{m}$. Vitelline follicles extending from pharyngeal-oesophageal level to posterior end of body, confluent in forebody and posttesticular space. Excretory vesicle tubular, terminating in testicular zone; pore terminal.

Remarks. Cribb (2005) erected *Choerodonicola*, with *Plagioporus choerodontis* (Yamaguti, 1934) from a labrid fish of Japan as the type species, to include plagioporine species having unusually small eggs less than $30\mu\text{m}$ long. Cribb (2005) transferred two other species to this genus: *Plagioporus calotomi* (Yamaguti, 1934) from a scarid fish of Japan and *Plagioporus paci-*

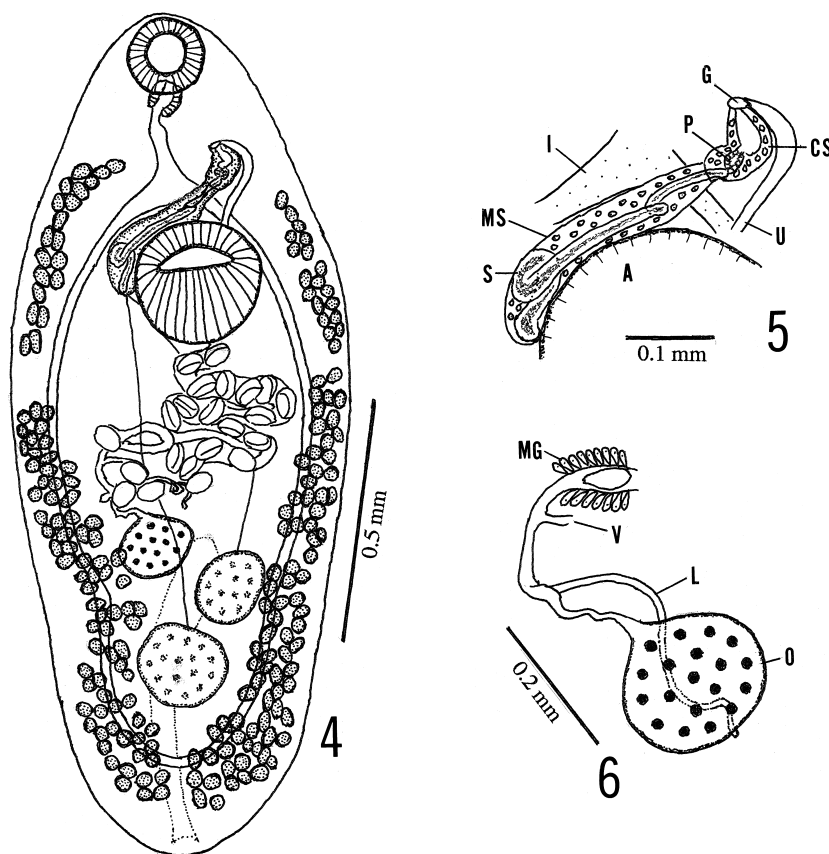
ficus Yamaguti, 1938 from pinguipedid fishes of Japan. The present new species differs from all three by having an ovary with three or four lobes. *Choerodonicola choerodontis* has a transversely elongated ovary with uneven anterior and irregularly indented posterior surface. Both *C. calotomi* and *C. pacificus* have a subglobular, unlobed ovary.

***Coitocaecum kuhliae* sp. nov.**

(Figs. 4–6)

Type host. Freshwater *Kuhlia rupestris* (Kuhliidae).

Site. Intestine.



Figs. 4–6. *Coitocaecum kuhliae* sp. nov. — 4, Holotype, ventral view (NSMT-PI 4685a); 5, terminal genitalia, ventral view; 6, ovarian complex, ventral view. Abbreviations: A, acetabulum; CS, cirrus sac; G, genital pore; I, caecum; L, Laurer's canal; MG, Mehlis' gland; MS, membranous sac; O, ovary; P, pars prostatica; S, external seminal vesicle; U, uterus; V, common vitelline duct.

Type locality. Palau, the western Caroline Is., 13-VIII-1994.

Specimens. Holotype and 9 paratypes, NSMT-PI 4685a.

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

Description. Based on 10 specimens. Body spindle-shaped, tapering anteriorly and rounded posteriorly, 1.04–2.18 (1.70) long by 0.68–0.93 (0.69) wide. Body width 40–54 (40)% of body length. Tegument smooth. Oral sucker subterminal, 0.12–0.15 (0.14) $\times$ 0.14–0.17 (0.17); prepharynx short, up to 38 μ m long; pharynx subglobular, 0.07–0.09 (0.08) $\times$ 0.07–0.08 (0.08); oesophagus 0.09–0.23 (0.12) long, bifurcating a little anterior to acetabulum; caeca forming cyclocoel near middle of posttesticular region. Acetabulum 0.25–0.33 (0.26) $\times$ 0.27–0.32 (0.28). Sucker ratio 1:1.8–2.1 (1.8). Forebody 26–55 (31)% of body length.

Testes ovoid, diagonal, separated or contiguous; left testis anterior, 0.12–0.24 (0.18) $\times$ 0.12–0.31 (0.13); right testis 0.13–0.29 (0.19) $\times$ 0.19–0.27 (0.20). Posttesticular space 6–22 (18)% of body length. Vasa efferentia not joining each other. External seminal vesicle tubular, sinuous, narrow distally, enclosed in thin membranous sac, extending midacetabular level. Cirrus sac small, ovoid, 79–110 (89) $\times$ 56–79 (56) μ m, sinistral to oesophagus; containing small internal seminal vesicle, pars prostatica 18–30 (18) $\times$ 18–26 (26) μ m and short ejaculatory duct. Genital pore sinistral, at level slightly posterior to pharynx.

Ovary ovoid, 0.08–0.19 (0.13) $\times$ 0.16–0.23 (0.17), dextral to midline, posterior to equatorial level, lying 54–74 (63)% of body length from anterior end of body. Oviduct arising from midanterior border of ovary, running forward, giving off Laurer's canal, joining common vitelline duct, turning left to enter Mehlis' gland. Laurer's canal running backward or transversely, opening middorsally near post- or preovarian level. Mehlis' gland anterior to ovary. Uterus preovarian; metraterm slightly longer than cirrus sac. Eggs 58–66 $\times$ 40–46 μ m. Vitelline follicles extending from oesophageal level to posterior

end of body, confluent in posttesticular region. Excretory vesicle tubular, extending to ovarian zone; pore terminal.

Remarks. Bray (1987) divided species of *Coitocaecum* into five groups based on features of vitelline distribution and seminal vesicle size. The present new species belongs to his Group A, in which species have uninterrupted vitelline fields extending into the forebody, and the external seminal vesicle not reaching posterior to the acetabulum. The group contains 19 species, of them three species have elongated oval bodies and diagonal testes; they are *C. diplobulbosum* Ozaki, 1929, *C. plagiorchis* Ozaki, 1929 and *C. leptoscari* Yamaguti, 1940. The most distinct feature of the present new species is a thin membranous sac surrounding the sinuous external seminal vesicle. Further, it can be distinguished from the three species as follows: *C. diplobulbosum* is a narrow worm (0.45–0.47 wide) with a small acetabulum (0.21 in diameter) and a rudimentary cirrus sac. *C. plagiorchis* has an equatorial acetabulum, vitelline follicles confluent in the forebody, and small eggs (45–54 by 34–38 μ m). *C. leptoscari* has a small cirrus sac (40 μ m in diameter), small eggs (54–57 by 33–36 μ m) and vitelline follicles not extending anteriorly to the intestinal bifurcation.

Macvicaria crassigula (Linton, 1910)

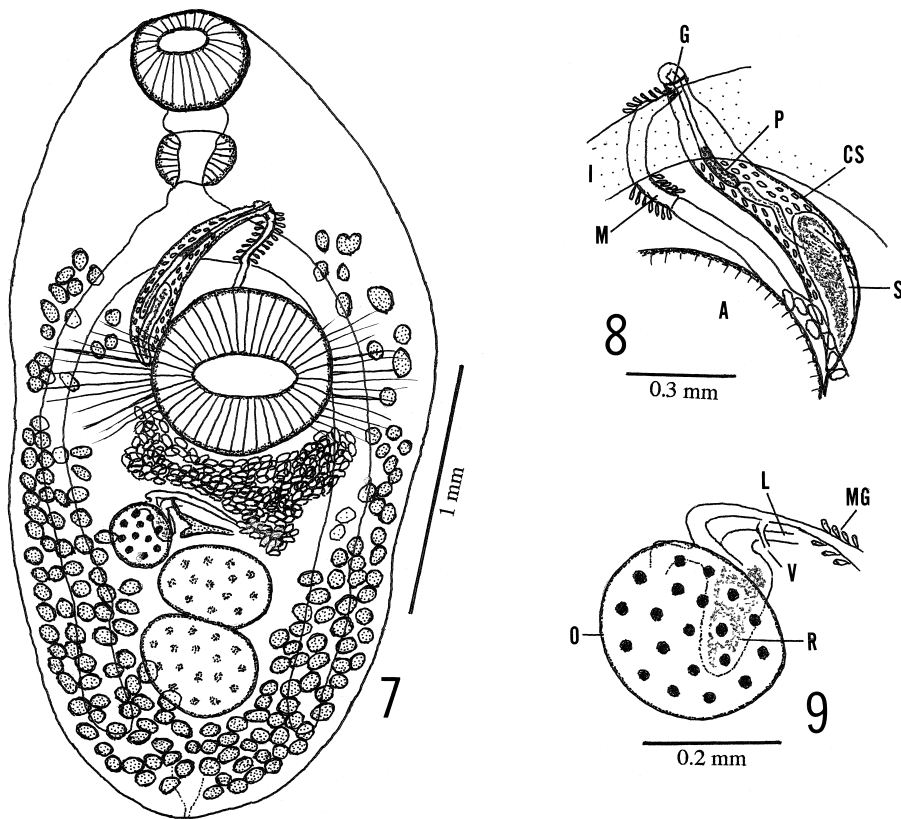
(Figs. 7–9)

Lebouria crassigula Linton, 1910: 38, fig. 60.

Macvicaria crassigula: Bartoli *et al.*, 1989: 177–184, figs. 7–20; Aken'Ova *et al.*, 2008: 25.

Material. Four specimens from the intestine of *Argyrops bleekeri* (Sparidae), Puerto Princesa, Palawan, the Philippines, 15-XI-1988, NSMT-PI 3577; and two specimens from the intestine of *Argyrops bleekeri*, Nago, Okinawa Pref., Japan, 28-II-2009, MPM Coll. No. 20651.

Description. Based on six specimens. Body elliptical, 2.08–3.88 long by 1.03–1.75 wide. Body width 45–54% of body length. Tegument smooth. Oral sucker subterminal, 0.27–0.43 $\times$



Figs. 7–9. *Macvicaria crassigula* (Linton, 1910). — 7, Entire worm, ventral view (NSMT-PI 3577); 8, terminal genitalia, dorsal view; 9, ovarian complex, ventral view. Abbreviations: A, acetabulum; CS, cirrus sac; G, genital pore; I, left caecum; L, Laurer's canal; M, metraterm; MG, Mehlis' gland; O, ovary; P, pars prostatica; R, seminal receptacle; S, internal seminal vesicle; V, common vitelline duct.

0.33–0.59; prepharynx 0.08–0.15 long; pharynx 0.20–0.28 × 0.26–0.46; oesophagus 0.07–0.16 long, bifurcating approximately midway between suckers; caeca ending near level of posterior border of rear testis or a short distance beyond it. Acetabulum 0.42–0.79 × 0.53–0.88, with radial muscle bundles laterally. Sucker ratio 1 : 1.5–1.6. Forebody 45–53% of body length. Testes rounded to ovoid, tandem, contiguous; anterior testis 0.23–0.35 × 0.32–0.54; posterior testis 0.24–0.40 × 0.36–0.50. Posttesticular space 8–15% of body length. Vasa efferentia not joining each other. Cirrus sac claviform, slightly arcuate, 0.42–0.89 × 0.12–0.22, extending midacetabular level. Internal seminal vesicle saccular distally, tubular, thick-walled, forming a single backward

loop proximally; pars prostatica 0.11–0.20 long; ejaculatory duct a narrow tube, sometimes slightly everted. Genital atrium small. Genital pore sinistral, at oesophageal level, just exterior to left caecum. Ovary rounded to ovoid, 0.16–0.38 × 0.22–0.38, just anterodextral to anterior testis; situated 61–73% of body length from anterior end of body. Oviduct arising from anterior border of ovary, connecting short duct from seminal receptacle, receiving common vitelline duct, entering Mehlis' gland. Laurer's canal originating from anterior edge of seminal receptacle, opening middorsally between acetabulum and anterior testis. Seminal receptacle 0.05–0.30 × 0.07–0.15, dorsal to ovary. Uterus between acetabulum and anterior testis, passing around right side or dorsal

to acetabulum to enter metraterm. Metraterm 0.23–0.40 long, surrounded by gland cells, with sphincter at distal end. Eggs $64\text{--}71 \times 41\text{--}46\ \mu\text{m}$. Vitelline follicles extending from bifurcal level to posterior end of body, confluent in posttesticular region; follicles sometimes densely distributed, reaching oesophageal level, almost confluent in forebody; follicles lying ventral and dorsal in hindbody, dorsal in area lateral to acetabulum and forebody. Excretory vesicle tubular, reaching to level of anterior testis; pore terminal.

Remarks. Aken'Ova *et al.* (2008) separated species of *Macvicaria* into five groups based on the distribution of the vitelline follicles, the size of the cirrus sac and the arrangement of the testes. My specimens belong to their Group B, in which species have lateral vitelline follicles continuous in the acetabular area, tandem testes and the cirrus sac not extending posterior to the acetabulum. The Group B contains 15 species, of them my specimens are most like *M. crassigula* (Linton, 1910). Bartoli *et al.* (1989) redescribed *M. crassigula* from ten species of mainly sparid fishes of the Mediterranean, Bermuda and the SW Indian Ocean, and showed considerable variation in this species. For example, the cirrus sac varies in size, with its posterior extent lying between the anterior border and midlevel of the acetabulum. The genital pore is described as "at about level of intestinal bifurcation, ventral to left caecum", but their Fig. 16 indicates it as lying at the post-oesophageal level, exterior to the left caecum as in my specimens. In the forebody, the vitelline follicles are sparsely or densely distributed, with their anterior extent varying from the genital pore level to just posterior to the oral sucker. The vitelline fields are confluent or not confluent in the forebody. Bartoli *et al.* (1989) considered such a variation to be related to the different nature of the hosts and *M. crassigula* to probably be a complex of several species. I place my specimens in *M. crassigula*, because they fall within the variation in this species.

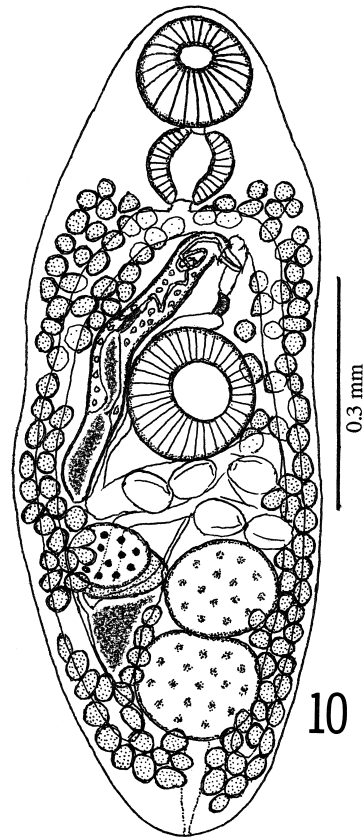


Fig. 10. *Macvicaria longicirrata* (Manter, 1963). Entire worm, ventral view (NSMT-PI 2459).

***Macvicaria longicirrata* (Manter, 1963)**

(Fig. 10)

Plagioporus longicirratus Manter, 1963: 108–109, figs. 21–22.

Macvicaria longicirrata: Aken'Ova *et al.*, 2008: 26.

Material. Ten specimens from the intestine of *Balistapus undulatus* (Balistidae), Palau, the western Caroline Is., 11–VII-1980, NSMT-PI 2459.

Description. Based on 10 specimens. Body 0.82–1.10 long by 0.32–0.39 wide. Body width 31–41% of body length. Oral sucker $0.12\text{--}0.14 \times 0.13\text{--}0.15$; prepharynx $18\text{--}33\ \mu\text{m}$ long; pharynx $0.08\text{--}0.10 \times 0.09\text{--}0.11$; oesophagus $10\text{--}36\ \mu\text{m}$ long; caeca ending near posterior border of rear testis. Acetabulum $0.15\text{--}0.18 \times 0.15\text{--}0.17$. Sucker ratio 1:1.1–1.2. Forebody 43–50% of body length.

Testes contiguous, almost tandem; anterior testis $0.11\text{--}0.14 \times 0.12\text{--}0.18$; posterior testis $0.09\text{--}0.15 \times 0.13\text{--}0.20$. Posttesticular space 10–13% of body length. Vasa efferentia not joining each other. Cirrus sac relatively thick-walled, $0.28\text{--}0.40 \times 0.05\text{--}0.06$, reaching postacetabular level to anterior border of ovary; internal seminal vesicle tubular, sometimes narrow in the middle, occupied nearly posterior half of cirrus sac; pars prostatica $40\text{--}50\mu\text{m}$ long; ejaculatory duct long, narrow, convoluted, often everted out of genital pore (up to 0.20 long); everted cirrus with fine spines. Genital pore slightly sinistral, just posterior to intestinal bifurcation. Ovary $0.07\text{--}0.10 \times 0.06\text{--}0.11$, anterodextral to anterior testis, lying 62–69% of body length from anterior end of body. Seminal receptacle $0.06\text{--}0.15 \times 0.04\text{--}0.08$, usually between ovary and anterior testis, partially overlapping them. Laurer's canal opening dorsally midway between acetabulum and anterior testis. Uterus pretesticular, with sphincter $22\text{--}55\mu\text{m}$ long at junction with metraterm. Metraterm saccate, $58\text{--}95 \times 20\text{--}35\mu\text{m}$, extending anterior to acetabulum. Two to seven eggs in uterus. Eggs thin-shelled, $73\text{--}79 \times 48\text{--}54\mu\text{m}$. Vitelline follicles extending from pharyngeal level to near posterior end of body. Excretory vesicle tubular, reaching to ovarian zone; pore terminal.

Remarks. This species was originally described by Manter (1963) from an unidentified triggerfish of Fiji. My specimens agree with the original description with two exceptions. First, the ejaculatory duct is a long, narrow, convoluted tube, often everts out of the genital pore. The everted cirrus is covered with fine spines. Second, the metraterm including a sphincter is short, ending anterior to the acetabulum, not extending to the posterior edge of the acetabulum or slightly beyond.

Bray (1985) suggested that *Macvicaria longicirrata* might be synonymous with *M. synagris* (Yamaguti, 1952). Aken'Ova *et al.* (2008), however, compared the descriptions and measurements of the two species and concluded them to be distinct.

***Neochoanostoma crassum* sp. nov.**

(Figs. 11–13)

Type host. *Gymnocranius griseus* (Lethrinidae).

Site. Intestine.

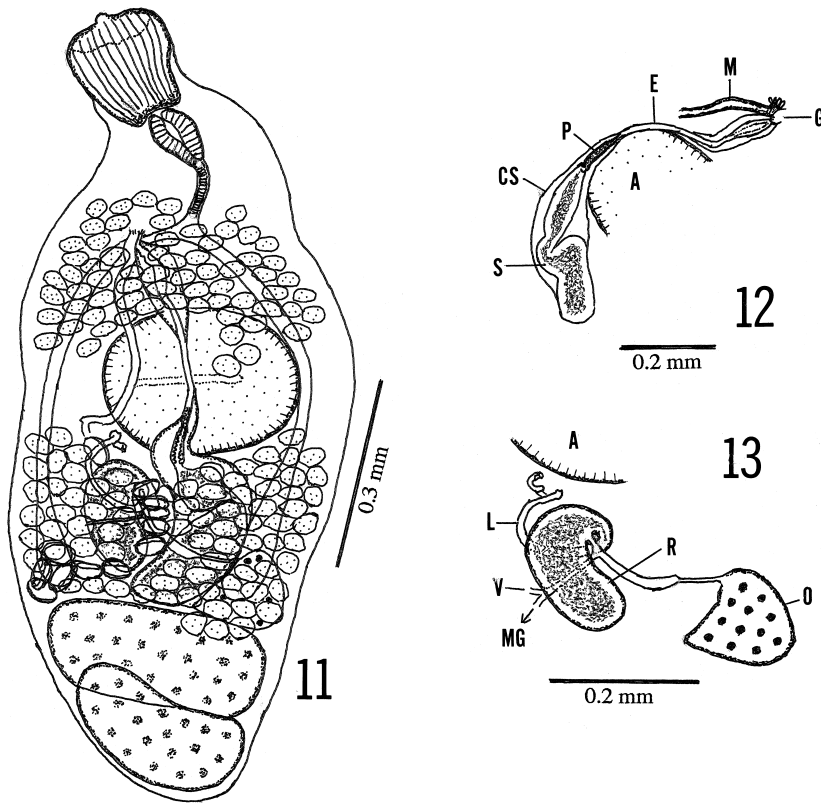
Type locality. Palau, the western Caroline Is., 16-VIII-1994.

Specimens. Holotype and 10 paratypes, NSMT-PI 4692.

Etymology. The specific name *crassum* is from the plump body of the worm.

Description. Based on 11 specimens. Body plump, with broadly pointed extremities, $0.97\text{--}1.34$ (1.21) long by $0.44\text{--}0.60$ (0.52) wide. Body width 37–55 (43)% of body length. Oral sucker terminal, funnel-shaped, $0.16\text{--}0.20$ (0.18) $\times$ $0.13\text{--}0.20$ (0.17); prepharynx unrecognizable or very short; pharynx $0.06\text{--}0.11$ (0.11) $\times$ $0.05\text{--}0.08$ (0.07), narrower posteriorly; oesophagus muscular, $0.07\text{--}0.17$ (0.09) long, bifurcating approximately midway between pharynx and acetabulum; caeca terminating near anterior border of fore testis. Acetabulum $0.19\text{--}0.25$ (0.24) $\times$ $0.26\text{--}0.34$ (0.34). Sucker ratio 1 : 1.6–2.4 (2.0). Fore-body 39–51 (47)% of body length.

Testes ovoid, wider than long, tandem or slightly diagonal, contiguous or partly overlapping, occupied posterior half of hindbody; anterior testis $0.12\text{--}0.28$ (0.16) $\times$ $0.25\text{--}0.37$ (0.36); posterior testis $0.14\text{--}0.21$ (0.17) $\times$ $0.23\text{--}0.37$ (0.28). Posttesticular space almost lacking. Vasa efferentia joining each other to form vas deferens midway between posterior end of cirrus sac and anterior testis. Cirrus sac long, almost straight or arcuate, with narrow middle region, $0.44\text{--}1.10$ (0.63) $\times$ $0.07\text{--}0.13$ (0.13), reaching to ovary or anterior testis. Internal seminal vesicle saccular, constricted and bent in the middle, narrow distally. Internal seminal vesicle usually situated posterior to acetabulum. Pars prostatica tubular, $0.06\text{--}0.15$ (0.08) long, lying near posterior border of acetabulum. Ejaculatory duct long, its proximal half passing in the narrow region of cirrus sac ($13\text{--}20\mu\text{m}$ wide) which is gradually thick distally. Ejaculatory duct lying dorsal and anterior to acetabulum. Genital atrium small. Genital



Figs. 11–13. *Nechoanostoma crassum* sp. nov. — 11, Holotype, dorsal view (NSMT-PI 4692); 12, terminal genitalia, dorsal view; 13, ovarian complex, dorsal view. Abbreviations: A, acetabulum; CS, cirrus sac; E, ejaculatory duct; G, genital pore; L, Laurer's canal; M, metraterm; MG, Mehlis' gland; O, ovary; P, pars prostatica; R, seminal receptacle; S, internal seminal vesicle; V, common vitelline duct.

pore sinistral, near bifurcal level.

Ovary ovoid or nearly triangular, $0.08\text{--}0.15$ (0.13) $\times$ $0.13\text{--}0.23$ (0.15), just anterodextral to anterior testis, lying $58\text{--}72$ (72)% of body length from anterior end of body. Oviduct arising from anterosinistral edge of ovary, running sinistrally, crossing dorsal to cirrus sac, connecting short duct from seminal receptacle, passing across seminal receptacle, receiving common vitelline duct on ventral or left side of seminal receptacle, entering Mehlis' gland. Seminal receptacle curved elliptical, $0.06\text{--}0.10$ (0.08) $\times$ $0.11\text{--}0.19$ (0.18), sinistral to ovary. Laurer's canal arising from anterodextral tip of seminal receptacle, convoluted, opening near postacetabular level. Uterus pretesticular; metraterm muscular, reaching mid- to postacetabular level, with sphincter

and a small bundle of gland cells just before entering genital atrium. Eggs $48\text{--}56 \times 33\text{--}36 \mu\text{m}$. Vitelline follicles extending from oesophageal level to pretesticular level or occasionally a level between testes. Dorsal and ventral follicles confluent in forebody; dorsal follicles confluent but ventral follicles lying laterally in hindbody. Excretory vesicle tubular, short, not reaching anterior border of posterior testis; pore terminal.

Remarks. Two other species of *Nechoanostoma* have been described from *Gymnocranius bitorquatus* of the Great Barrier Reef: *N. avidabira* Bray and Cribb, 1989 (type species) and *N. bariadiva* Bray and Cribb, 1989. Both species are narrow, elongate fusiform and closely resemble each other. According to Bray and Cribb (1989), the two species are distinguished on the

length of the eggs, the extent of the caeca and the vitelline distribution. *N. avidabira* has eggs 46 to 55 μm long, caeca reaching to the posterior testis and vitelline follicles lying the pharynx or anterior oesophagus in anterior extent, whereas *N. bariadiva* has eggs 54 to 70 μm long, caeca extending close to or alongside the anterior testis and vitelline follicles reaching the mid- or posterior oesophagus. The present new species differs from both by having a plump body; from *N. avidabira* by caeca ending near anterior border of fore testis; from *N. bariadiva* by possessing eggs 48 to 56 μm long.

***Heterochoanostoma* gen. nov.**

Diagnosis. Body plump, truncated anteriorly and rounded posteriorly. Tegument smooth. Oral sucker cup-shaped; pharynx well-developed; oesophagus relatively long, bifurcating immediately anterior to acetabulum; caeca unequal in length, left caecum longer, extending anterior border of diagonal testes. Acetabulum rounded, preequatorial. Testes ovoid, diagonal; right testis anterior and left testis close to posterior end of body. Cirrus sac long, thick-walled, reaching near middle of hindbody. Internal seminal vesicle having two types; one type has saccular proximal portion and complicated long tubular distal portion; the other has saccular proximal portion and short narrow distal portion. Pars prostatica tubular. Ejaculatory duct long. Genital pore sinistral, just post-bifurcal level. Ovary ovoid, almost midline, anterosinistral or sinistral to right testis. Seminal receptacle dorsal, overlapping ovary. Laurer's canal present. Uterus preovarian; metratrum saccular, extending posterior to acetabulum. Vitelline follicles in hindbody. Excretory vesicle tubular, not visible anteriorly beyond posterior testis. Parasitic in marine teleosts.

Type and only species: *Heterochoanostoma shirodai* sp. nov.

Remarks. *Heterochoanostoma* differs from closely related *Neochoanostoma* Bray and Cribb, 1989 as follows. *Heterochoanostoma* has tandem testes, the right testis lying anterior and the left

testis close to the posterior end of the body. The caeca extend to the anterior border of the testes, so that the right caecum consistently shorter than the left. The vitelline follicles are restricted in the hindbody, not extending to the forebody. *Neochoanostoma* has tandem testes. The caeca are equal in length, terminating at or just anterior to the level of the testes. The vitelline follicles reach into the forebody.

***Heterochoanostoma shirodai* sp. nov.**

(Figs. 14–16)

Type host. *Gymnocranius euanus* (Lethrinidae).

Site. Intestine.

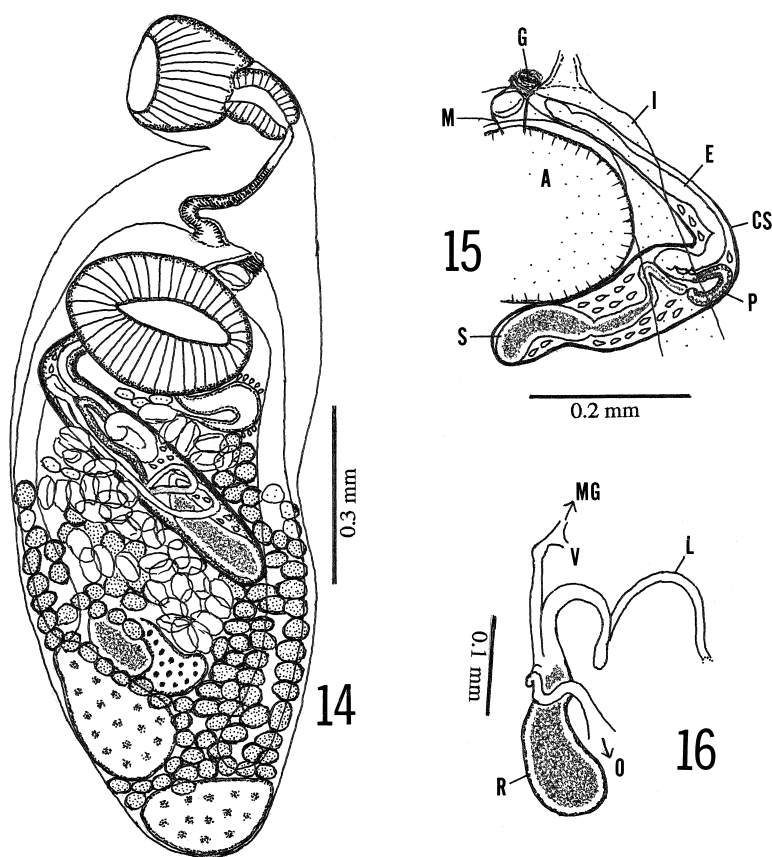
Type locality. Ogasawara Is., Tokyo Pref., Japan, 27-VI-1976.

Specimens. Holotype and 3 paratypes, NSMT-Pl 1956a.

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

Description. Based on four specimens. Body plump, truncate anteriorly, rounded posteriorly, 1.22–1.55 (1.55) long by 0.43–0.62 (0.51) wide. Body width 33–45 (33)% of body length. Tegument smooth. Oral sucker cup-shaped, 0.15–0.18 (0.18) $\times$ 0.17–0.20 (0.19); prepharynx unrecognizable; pharynx 0.10–0.13 (0.13) $\times$ 0.07–0.11 (0.10); oesophagus muscular, 0.19–0.34 (0.34) long, bifurcating a short distance anterior to acetabulum; caeca slightly bulbous at termination; right caecum shorter, extending anterior border of right testis; left caecum terminating near anterior border of left testis. Acetabulum slightly wider than long, 0.23–0.28 (0.25) $\times$ 0.29–0.34 (0.34). Sucker ratio 1:1.4–1.8 (1.8). Forebody 37–43 (39)% of body length.

Testes ovoid, diagonal, contiguous or separated; right testis anterior, 0.19–0.28 (0.28) $\times$ 0.16–0.19 (0.16); left testis close to posterior end of body, 0.10–0.23 (0.14) $\times$ 0.11–0.24 (0.23). Vasa efferentia joining each other to form vas deferens. Cirrus sac long, thick-walled, almost straight or curved, 0.65–0.93 (0.88) $\times$ 0.10–0.13 (0.11), reaching some distance posterior to acetabulum or nearly middle of hindbody; internal



Figs. 14–16. *Heterochoanostoma shirodai* gen. et sp. nov. — 14, Holotype, ventral view (NSMT-PI 1956a); 15, terminal genitalia, dorsal view; 16, ovarian complex, ventral view. Abbreviations: A, acetabulum; CS, cirrus sac; E, ejaculatory duct; G, genital pore; I, right caecum; L, Laurer's canal; M, metraterm; MG, Mehlis' gland; O, ovary; P, pars prostatica; R, seminal receptacle; S, internal seminal vesicle; V, common vitelline duct.

seminal vesicle saccular proximally, long tubular, extremely sinuous distally; sometimes the distal portion not so long, slightly curved as shown in Fig. 15; pars prostatica tubular; ejaculatory duct long tubular. Genital atrium small. Genital pore sinistral, at level of posterior end of oesophagus, just exterior to left caecum.

Ovary ovoid, $0.08\text{--}0.19$ (0.19) $\times$ $0.08\text{--}0.14$ (0.10), almost midline, anterosinistral or sinistral to right testis, lying $64\text{--}76$ (67)% of body length from anterior end of body. Oviduct arising from anterior edge of ovary, running forward, connecting anterior edge of seminal receptacle, receiving common vitelline duct, entering Mehlis' gland. Seminal receptacle dorsal, partly overlapping

ovary, $0.13\text{--}0.18$ (0.17) $\times$ $0.07\text{--}0.09$ (0.07). Laurer's canal arising from anterior edge of seminal receptacle, running transversely, winding, opening mid-dorsally between acetabulum and ovary. Uterus preovarian; metraterm saccular, $0.29\text{--}0.53$ (0.53) long, surrounded by gland cells, usually extending posterior to acetabulum, with sphincter just before entering genital atrium. Eggs thin-shelled, partly collapsed, $53\text{--}61 \times 38\text{--}44 \mu\text{m}$. Vitelline follicles extending from near posterior border of acetabulum to near posterior end of body; ventral and dorsal to caecal, ovarian and testicular zone, dorsal to uterine zone; in one specimen a small number of the follicles invading acetabular area. Excretory vesicle not visible

anteriorly beyond posterior testis.

Remarks. The present new species differs from closely related *Neochoanostoma crassum* (described above) by possessing diagonal testes, caeca unequal in length and vitelline follicles restricted in the hindbody.

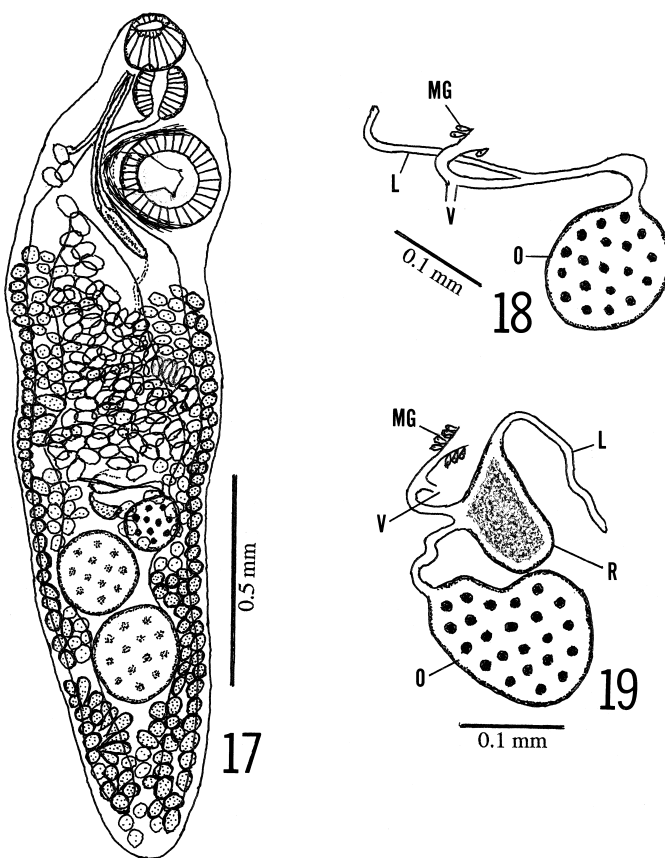
***Podocotyloides stenometra* Pritchard, 1966**

(Figs. 17–18)

Podocotyloides stenometra Pritchard, 1966: 191–192, fig. 14; Yamaguti, 1970: 81–82, fig. 75; Bray and Cribb, 1989: 435–438, fig. 2; Cribb, 2005: 476–477.

Material. Four specimens from the intestine of *Heniochus varius* (Chaetodontidae), Palau, the western Caroline Is., 12-VII-1980, NSMT-PI 2461.

Description. Based on four specimens. Body elongate, 1.43–2.09 long by 0.46–0.54 wide. Body width 23–33% of body length. Oral sucker 0.11–0.13 × 0.11–0.16; prepharynx up to 28 µm long; pharynx 0.12–0.14 × 0.11–0.14; oesophagus 0.06–0.20 long, bifurcating at pre- or midacetabular level; caeca extending near posterior end of body in three specimens, but unequal in length in one specimen, left caecum shorter, ending a little



Figs. 17–18. *Podocotyloides stenometra* Pritchard, 1966. — 17, Entire worm, ventral view (NSMT-PI 2461); 18, ovarian complex, ventral view. Abbreviations: L, Laurer's canal; MG, Mehlis' gland; O, ovary; V, common vitelline duct.

Fig. 19. *Podocotyloides petalophallus* Yamaguti, 1934. Ovarian complex, ventral view (paratype, MPM Coll. No. 23938). Abbreviations: L, Laurer's canal; MG, Mehlis' gland; O, ovary; R, seminal receptacle; V, common vitelline duct.

beyond posterior testis. Acetabulum pedunculate, $0.20\text{--}0.25 \times 0.21\text{--}0.25$. Sucker ratio 1:1.6–1.8. Forebody 19–27% of body length. Testes rounded, tandem or slightly diagonal, in contact or slightly separated, in posterior half of hind-body; anterior testis $0.16\text{--}0.22 \times 0.15\text{--}0.22$; posterior testis $0.19\text{--}0.24 \times 0.16\text{--}0.23$. Posttesticular space 17–22% of body length. Vasa efferentia not joining each other. Cirrus sac slender, arcuate, $0.41\text{--}0.48 \times 0.04\text{--}0.05$, extending near postacetabular level or slightly beyond it. Internal seminal vesicle slender, narrowing in distal half, $0.22\text{--}0.31 \times 0.03\text{--}0.04$; pars prostatica 50–70 μm long; cirrus 79–110 μm long. Genital pore submedian, near prepharyngeal level. Ovary spherical to ovoid, obliquely pretesticular, in contact with anterior testis or not, $0.10\text{--}0.15 \times 0.09\text{--}0.15$, lying 56–61% of body length from anterior end of body. Oviduct arising from anterior edge of ovary, running transversely, giving off Laurer's canal, receiving common vitelline duct, curving anterosinistrally, entering Mehlis' gland. Seminal receptacle lacking. Laurer's canal usually opening in ovarian zone. Uterus preovarian; metratrum slender, 0.12–0.17 long, with thin sphincter at distal end. Eggs $56\text{--}66 \times 38\text{--}45 \mu\text{m}$. Vitelline follicles extending from near postacetabular level to posterior end of body.

Remarks. The description of my specimens agrees fairly well with those of previous authors (Pritchard, 1966; Yamaguti, 1970; Bray and Cribb, 1989). In her original description, Pritchard (1966) incorrectly stated that "small seminal receptacle, dorsal to ovary." As Bray and Cribb (1989) pointed out, *Podocotyloides stenometra* has no seminal receptacle. In my specimens, no seminal receptacle is observed (Fig. 18). *Podocotyloides* was erected by Yamaguti (1934) with *P. petalophallus* as the type species. *Podocotyloides petalophallus* was obtained from *Plectorhynchus pictus* (Haemulidae) of Japan, and it has a distinct seminal receptacle as shown in Fig. 19 (paratype, MPM Coll. No. 23938). The absence of a seminal receptacle suggests that *P. stenometra* belongs in the subfamily Stenakrinae, not the Plagioporinae in which *Podocotyloides* is

included. Bray and Cribb (1989), however, placed this species in the Plagioporinae, because they believed *P. stenometra* to have common features with *Podocotyloides* and lack a seminal receptacle anomalously. I am provisionally following Bray and Cribb (1989), so when further study such as molecular or life cycle analysis is performed, *P. stenometra* may be placed in the proper status.

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