

Digenean Trematodes from Halfbeaks and Needlefishes of Japan and Adjacent Waters

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Abstract Thirteen species of digenean trematodes are recorded from halfbeaks and needlefishes of Japan and adjacent waters. One new genus and three new species are named: *Hyporhamphitrema kamegaii* gen. & sp. nov. from *Hyporhamphus dussumieri* of Japan, *Bivesiculooides triangularis* sp. nov. (Bivesiculidae) from *Hyporhamphus quoyi* of the Philippines and *Brachyenteron japonicum* sp. nov. (Zoogonidae) from *Hemiramphus sajori* of Japan. *Hyporhamphitrema* differs from the related waretrematids by having a simple type of hermaphroditic sac which includes a hermaphroditic duct and distal ends of male and female ducts. A new family Hyporhamphitrematidae is proposed for *Hyporhamphitrema*. The following taxonomic changes are proposed: *Bucephalopsis southwelli* Nagaty, 1937, *B. lenti* Nagaty, 1937, *B. magnacetabulus* Nagaty, 1937, *B. tylosuris* Ozaki & Ozaki, 1952, *B. obpyri-formis* Gu & Shen, 1976, *B. ablennus* Gu & Shen, 1976 and *B. bennetti* (Hopkins & Sparks, 1958) of Gu & Shen, 1976, all from needlefishes, are synonymous with *B. karvei* Bhalerao, 1937.

Key words: digenean trematodes, halfbeaks, needlefishes, new family, new genus, new species, new synonymy, Japanese waters.

This paper deals with thirteen species of digenean trematodes, including one new family, one new genus and three new species, from halfbeaks (Hemiramphidae) and needlefishes (Belontiidae) of Japan and adjacent waters.

Digeneans collected were washed in saline, fixed in AFA under slight pressure, stained with Heidenhain's hematoxylin and mounted in balsam. The specimens are deposited in the National Science Museum, Tokyo (NSMT). Measurements are given in millimeters unless otherwise stated.

We thank Dr. T. Shimazu of the Nagano Prefectural College for advice on the waretrematids, and Dr. D. I. Gibson of the Natural History Museum, London, for providing information and lending a paratype specimen of *Chauhanotrema spiniacetabulum*. We are indebted to the following fishermen's cooperative associations and institutions for giving facilities for our field research: Takojima, Ishikawa Prefecture; Setouchi, Kagoshima Prefecture; Nago, Okinawa Prefecture; Crocodile Farming Institute, Palawan; and Marine Biological Section, University of San Carlos, Cebu.

Hyporhamphitrematidae fam. nov.

Body fusiform, spined. Oral sucker subterminal; prepharynx short; pharynx well-developed; esophagus bifurcating just posterior to acetabulum; caeca extending to midtesticular level. Acetabulum slightly smaller than oral sucker, in anterior part of middle third of body. Testis single, elliptical, in caudal third or half of body. Seminal vesicle dextral, extending from posterior to acetabulum to pharyngeal level. Hermaphroditic sac small, thin-walled, containing hermaphroditic duct and distal ends of male and female ducts, just anterior to acetabulum. Genital pore median, on anterior margin of acetabulum. Ovary dextral, pretesticular. Seminal receptacle absent; Laurer's canal present. Uterus pretesticular. Vitellaria elliptical to spatulate, extending from preacetabular level to posterior extremity. Excretory vesicle tubular; pore dorsal, near posterior extremity. Intestinal parasites of marine teleosts.

Type genus: *Hyporhamphitrema* gen. nov.

Hyporhamphitrema gen. nov.

Hyporhamphitrematidae. Body fusiform, spined. Oral sucker subterminal; prepharynx short; pharynx well-developed; esophagus long, bifurcating just posterior to acetabulum; caeca extending to midtesticular level. Acetabulum slightly smaller than oral sucker, in anterior part of middle third of body. Testis single, large, elliptical, in caudal third or half of body. Seminal vesicle saccular, dextral, extending from posterior to acetabulum to pharyngeal level. Male and female ducts joining at front edge of hermaphroditic sac. Hermaphroditic sac small, thin-walled, containing muscular hermaphroditic duct and distal ends of male and female ducts, immediately anterior to acetabulum. Genital pore median, on anterior margin of acetabulum. Ovary dextral, between acetabulum and testis. Seminal receptacle absent; Laurer's canal present. Uterus mostly left to midline, from sinistral to ovary to pharyngeal level. Vitellaria elliptical to spatulate, extending from preacetabular level to posterior extremity. Excretory vesicle tubular; pore non-terminal, on dorsal surface. Intestinal parasites of marine teleosts.

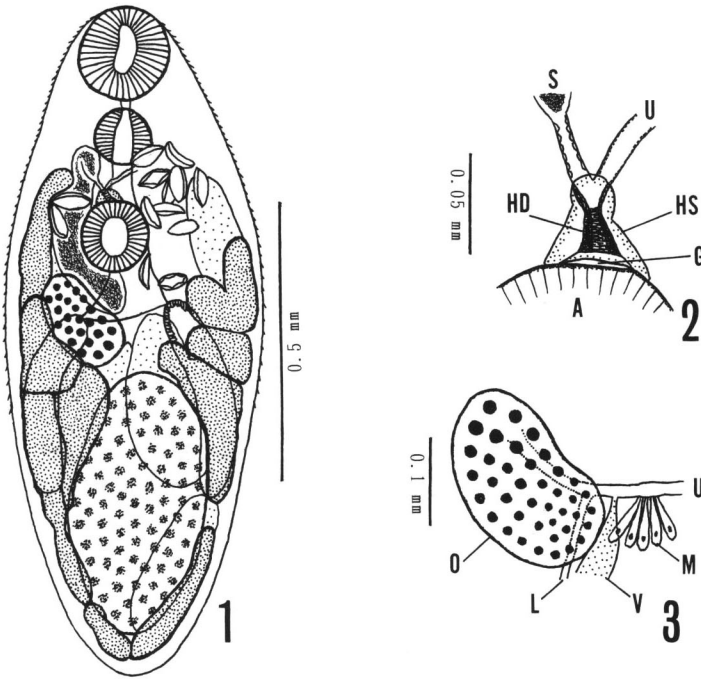
Type species: *Hyporhamphitrema kamegaii* sp. nov.

Hyporhamphitrema kamegaii sp. nov.

(Figs. 1–3)

Material. From intestine of *Hyporhamphus dussumieri* (Hemiramphidae), Nago, Okinawa Prefecture, Japan, 29–I–1990 (NSMT-PI 3842, 1 paratype) and intestine of *H. dussumieri*, Nago, 5–XII–1996 (NSMT-PI 5021, holotype & 5 paratypes).

Description. Based on 7 slightly macerated specimens. Body fusiform, 1.12–1.38 long by 0.40–0.48 wide. Tegument spinose, sparse posteriorly. Oral sucker sub-



Figs. 1–3. *Hyporhamphitrema kamegaili* gen. & sp. nov. — 1. Entire worm, ventral view (NSMT-PI 5021, holotype). 2. Terminal genitalia, ventral view. 3. Ovarian complex, ventral view. A, acetabulum; G, genital pore; HD, hermaphroditic duct; HS, hermaphroditic sac; L, Laurer's canal; M, Mehlis' gland; O, ovary; S, seminal vesicle; U, uterus; V, vitelline reservoir.

terminal, $0.14\text{--}0.19 \times 0.16\text{--}0.21$; prepharynx short, up to 0.06 long; pharynx $0.10\text{--}0.14 \times 0.09\text{--}0.12$; esophagus long, bifurcating just posterior to acetabulum; caeca lined with well-developed epithelia, extending to midtesticular level. Acetabulum $0.10\text{--}0.13 \times 0.11\text{--}0.16$. Sucker ratio 1 : 0.6–0.9. Forebody 29–35% of body length.

Testis single, large, elliptical, $0.42\text{--}0.54 \times 0.20\text{--}0.25$, in caudal third or half of body. Vasa efferentia two, arising from anterior edge of testis, entering seminal vesicle without uniting with each other. External seminal vesicle saccular, slightly arcuate, commencing from posterior to acetabulum, passing around right and slightly dorsal of acetabulum, and ending at right to pharynx with its distal portion turning posteriorly and becoming slender. Before joining right front edge of hermaphroditic sac, short, inconspicuous pars prostatica may be present. Hermaphroditic sac small, $0.04\text{--}0.06$ long, thin-walled, including muscular hermaphroditic duct and distal ends of male and female ducts, touching anterior margin of acetabulum. Genital pore median, on anterior border of acetabulum.

Ovary ovoid, $0.12\text{--}0.22 \times 0.10\text{--}0.18$, diagonal, posterodextral to acetabulum. Mehlis' glands left to ovary. Seminal receptacle absent; uterine seminal receptacle

present. Laurer's canal opening dorsally somewhat anterior to midtesticular level. Uterus extending from sinistral to ovary to pharyngeal level, mostly left to midline, joining left front edge of hermaphroditic sac. A small number of eggs (up to 18) in uterus. Partially collapsed eggs $63\text{--}69 \times 43\text{--}46 \mu\text{m}$. Vitellaria elliptical to spatulate, extending from preacetabular level to posterior end of body, confluent posterior to testis and sometimes posterior to acetabulum, partially overlapping gonads dorsoventrally. Excretory vesicle tubular, extending dorsal of testis to middle or anterior zone of testis; pore on middorsal, 0.05–0.06 away from posterior extremity.

Remarks. The present new genus resembles members of the Waretrematidae in the shape of digestive system and vitellaria, the presence of a testis, pretesticular position of ovary and uterus, the absence of a seminal receptacle, etc., but differs from them in a simple type of hermaphroditic sac including a hermaphroditic duct and distal ends of male and female ducts, and in tubular excretory vesicle with a middorsal pore. In waretrematids, the hermaphroditic sac is a complex type, containing internal seminal vesicle, pars prostatica, ejaculatory duct, metraterm and hermaphroditic duct, and the excretory vesicle is Y-shaped in principle, except for megasolenine and scorpionicoline members. A new family Hyporhamphitrematidae is proposed for the genus *Hyporhamphitrema*. The present new species is named for our colleague Shunya Kamegai who has been laid up with serious illness.

Zhukov (1972) described *Chauhanotrema indica* as a new genus and species from *Hemiramphus far* from India, and created a new subfamily Chauhanotrematinae for it in the family Waretrematidae. According to him, this species resembles the waretrematids in the structure of digestive system and vitellaria, the presence of a testis, and the position of a uterus, but differs from them in the absence of a hermaphroditic sac. We cannot understand why Zhukov placed this species in the Waretrematidae despite the absence of a hermaphroditic sac.

Later, Nahhas and Sey (1998) reported the second species of *Chauhanotrema*, *C. spiniacetabulum*, from *Hemiramphus marginatus* from the Arabian Gulf of Kuwait. They described the terminal genitalia as "cirrus sac absent; ... pars prostatica ... terminating short muscular cirrus; ... genital atrium small, thin-walled; and pore median, between pharynx and acetabulum," which, along with the presence of a testis, bear "superficial resemblance to members of the Haplospilichnidae." They also stated that *C. spiniacetabulum* differs from the haplospilichnids in having spiny acetabulum, double caeca and spiny tegument.

Our reexamination of a paratype specimen of *C. spiniacetabulum* (BM(NH) 1997.5.12) could not be determined whether the species has a hermaphroditic sac because of the specimen being thick and mounted laterally. Nahhas and Sey (1998) described that "excretory vesicle sac-like, small, excretory canal extending to near posterior level of ventral sucker" and that "a thick-walled tubular structure terminating on the dorsal side near the posterior end of the body...; it is not a Laurer's canal; its function is unknown." Our reexamination of their specimen showed their "excretory

vesicle" to be a mistake and their "thick-walled tubular structure" to be an excretory vesicle which is the same feature as found in our *Hyporhamphitrema kamegaiti*. We are hesitant as to whether *Chauhanotrema* is the same as *Hyporhamphitrema*. This problem will be settled by examining additional specimens of *Chauhanotrema*.

Family Haplospilachnidae

Schikhobalotrema acutum (Linton, 1910)

Material. Two specimens from intestine of *Tylosurus crocodilus crocodilus* (Belonidae), Mactan, Philippines, 26-X-1988 (NSMT-PI 3527); 1 specimen from intestine of *Hyporhamphus quoyi* (Hemiramphidae), Palawan, Philippines, 18-VIII-1990 (NSMT-PI 3930b); and 2 specimens from intestine of *Strongylura incisa* (Belonidae), Nago, Okinawa Prefecture, Japan, 12-III-1996 (NSMT-PI 4909).

Remarks. Our 5 specimens are: Body 1.60–1.88 long by 0.70–0.80 wide. Oral sucker 0.13–0.19×0.15–0.24. Papillae around oral sucker. Prepharynx 0.03–0.10 long. Some glandular cells around prepharynx. Pharynx 0.08–0.13×0.11–0.13. Acetabulum 0.31–0.39×0.31–0.38, with a pair of horn-like processes near posterior end of aperture. Sucker ratio 1 : 1.5–2.1. Forebody 36–48% of body length. Many glandular cells are observed in zone of genital pore and acetabulum. Testis 0.23–0.41×0.17–0.28. Posttesticular space 7–14% of body length. Genital pore usually at post-pharyngeal level. Ovary 0.16–0.18×0.08–0.16. Vitellaria irregular-shaped, extending anteriorly near or slightly anterior to acetabulum. Eggs 81–94×61–64 μm.

Our specimens agree fairly well with the redescription under the name of *Haplospilachnus acutus* by Manter (1937) except his specimens have slightly smaller eggs 73 to 85 by 51 to 56 μm.

Family Bivesiculidae

Bivesiculoides triangularis sp. nov.

(Fig. 4)

Material. From intestine of *Hyporhamphus quoyi* (Hemiramphidae), Palawan, Philippines, 10-XI-1988 (NSMT-PI 3548, 8 paratypes); intestine of *H. quoyi*, Palawan, 18-VIII-1990 (NSMT-PI 3930a, holotype & 2 paratypes); and intestine of *H. quoyi*, Palawan, 23-VIII-1990 (NSMT-PI 3964, 1 paratype).

Description. Based on 12 specimens. Body inverted triangular or obovate, 1.31–1.85 long by 0.98–1.45 wide. Width 61–82% of length. Tegument with fine spines. Eyespot pigments scattered in shoulder region. Mouth opening usually terminal. Prepharynx up to 85 μm long. Pharynx 0.07–0.09×0.06–0.11. Esophagus 0.05–0.17 long. Intestinal bifurcation just anterior to cirrus sac. Caeca terminating some distance anterior to posterior extremity.

Testis longitudinally elongated, irregular, slightly diagonally, to left of midline,

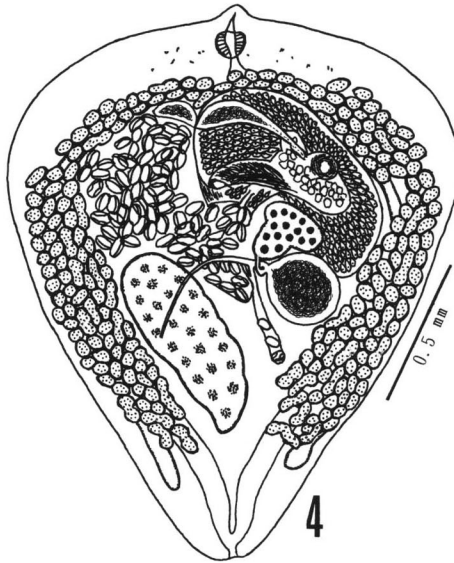


Fig. 4. *Bivesiculoides triangularis* sp. nov., dorsal view (NSMT-PI 3930a, holotype).

0.61–0.95×0.15–0.25, usually in posterior half of body. Vasa efferentia two, distal ends of the ducts inflated, uniting anterosinistral to cirrus sac to form very short inflated vas deferens. External seminal vesicle actually lacking. Cirrus sac large, elliptical, 0.34–0.72×0.39–0.64, just posterior to or partially overlapping caecal bifurcation and ovary ventrally, mostly right to midline. Internal seminal vesicle tubular, up to 0.31 long, running to right, joining broad pars prostatica which turns to left and connects with ejaculatory duct. Pars prostatica with a pair of diverticula and surrounded by numerous glandular cells. Genital pore median, 34–42% of body length from anterior extremity.

Ovary ovoid, slightly lobed, 0.12–0.24×0.13–0.25, immediately posterior to or partially overlapping cirrus sac dorsally, right to midline. Seminal receptacle 0.12–0.30×0.08–0.25, posterior or posterodextral to ovary. Laurer's canal slightly curved, opening dorsally near midtesticular level. Uterus descending near posterosinistral to ovary and filling space between cirrus sac and left caecum. Eggs thin-shelled, 58–69×39–46 μm . Vitelline follicles in association with caeca from esophageal level to near caecal termination, confluent anteriorly. Excretory vesicle V-shaped, arms reaching to esophageal level; pore terminal.

Remarks. Five other species of *Bivesiculoides* have been described: *B. atherinae* Yamaguti, 1938, *B. otagoensis* Manter, 1954, *B. posterotestis* Durio & Manter, 1968, *B. scari* Hafeezullah, 1971 and *B. fusiformis* Cribb, Bray & Barker, 1994. The present new species differs from them by having a triangular or obovate body, a testis sinistral and a cirrus sac mostly dextral to the midline. The latter two are common

features with the genus *Treptodemus*. The present new species, therefore, seems to link *Bivesculoides* with *Treptodemus*.

Treptodemus latus Manter, 1961

(Figs. 5–7)

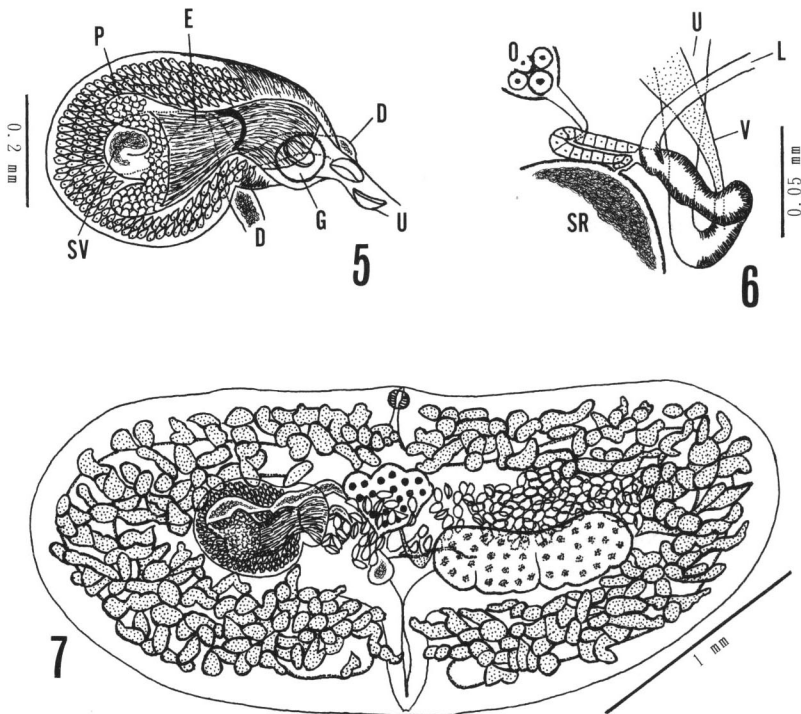
Material. From intestine of *Hemiramphus far* (Hemiramphidae), Nago, Okinawa Prefecture, Japan, 25–III–1988 (NSMT-PI 3363); intestine of *H. far*, Nago, 7–VI–1988 (NSMT-PI 3438); intestine of *H. far*, Mactan, Philippines, 26–X–1988 (NSMT-PI 3526); and intestine of *H. far*, Nago, 9–III–1996 (NSMT-PI 4884).

Remarks. Based on 10 specimens. Body flat, wider than long, 0.92–1.25 long by 1.60–2.02 wide. Width 140–195% of length. Tegument with fine spines. Eyespot pigments scattered around pharynx and esophagus. Pharynx 60–85×45–65 μm . Testis 0.30–0.46×0.35–0.55. Cirrus sac 0.37–0.55×0.33–0.50, containing saccular seminal vesicle 0.12–0.17×0.08–0.12 which lies dorsal to pars prostatica and partially ejaculatory duct; pars prostatica with a pair of diverticula, surrounded by glandular cells; and eversible broad ejaculatory duct (Fig. 5). Ovary occasionally lobed, 0.20–0.31×0.10–0.21. Oviduct with cubic epithelia proximally and cilia distally (Fig. 6). Seminal receptacle 0.11–0.22×0.12–0.27. Laurer's canal running to left and opening dorsally in posterodextral region of testis. Eggs 63–69×38–48 μm .

Manter's original description of this species was based on a single specimen from the halfbeak, probably *Hemiramphus* sp., from Fiji. His specimen is slightly smaller (0.711 long by 1.390 wide), but has a little larger eggs (72–74 by 43 μm , often collapsed, 36–43 μm wide).

Yamaguti (1971) created the family Treptodemidae to include a single species, *Treptodemus latus*. As pointed out by Manter (1961), this species is similar to members of the Bivesiculidae in fundamental structures except that *T. latus* has a very wide body which alters the positions of the internal organs. We agree with Manter that *T. latus* belongs in the family Bivesiculidae.

In addition, five specimens from the intestine of *Hemiramphus far* from Nago (NSMT-PI 4356; Fig. 7) have much wider bodies than the aforementioned specimens. They are: Body 1.30–1.58 long by 2.60–3.58 wide. Width 200–227% of length. Tegument with fine spines. Prepharynx up to 45 μm long. Pharynx 0.07–0.10×0.09–0.11. Esophagus 0.15 long. Testis 0.25–0.30×0.84–1.33, with one or two deep longitudinal incisions at posterior margin. Cirrus sac 0.40–0.64×0.54–0.68, including seminal vesicle 0.26–0.35×0.09–0.18, pars prostatica 0.20–0.28 long with a pair of diverticula, and ejaculatory duct 0.20–0.30 long. Ovary 0.27–0.54×0.27–0.44, indented anteriorly. Seminal receptacle 0.11–0.18×0.10–0.18, containing a small quantity of sperm. Eggs 68–74×43–54 μm . We are treating these specimens as a variation of *T. latus*.



Figs. 5–7. *Treptodemus latus* Manter, 1961. — 5. Terminal genitalia, ventral view. 6. Ovarian complex, ventral view. 7. Specimen with wide body, ventral view (NSMT-PI 4356). D, vas efferens; E, ejaculatory duct; G, genital pore; L, Laurer's canal; O, ovary; P, pars prostatica; SR, seminal receptacle; SV, internal seminal vesicle; U, uterus; V, vitelline reservoir.

Family Fellodistomidae

Tergestia laticollis (Rudolphi, 1819)

Material. From lower intestine of *Hemiramphus far* (Hemiramphidae), Nago, Okinawa Prefecture, Japan, 25–VI–1988 (NSMT-PI 3364); lower intestine and rectum of *H. far*, Nago, 7–VI–1988 (NSMT-PI 3437); intestine of *H. far*, Nago, 28–V–1992 (NSMT-PI 4305); and lower intestine of *H. far*, Nago, 9–III–1996 (NSMT-PI 4883).

Remarks. Our ten specimens are: Body 2.12–3.73 long by 0.53–0.70 wide. Oral sucker 0.14–0.20×0.19–0.26, with 12 to 13 oral lobes. Pharynx 0.25–0.31×0.10–0.14. Acetabulum 0.19–0.24×0.19–0.26. Sucker ratio 1:0.96–1.24. Forebody 21–29% of body length. Anterior testis 0.20–0.32×0.25–0.34 and posterior testis 0.22–0.37×0.24–0.35. Posttesticular space 28–33% of body length. Cirrus sac 0.54–0.78×0.12–0.15 (based on 6 specimens), containing saccular seminal vesicle 0.19–0.29 long, pars prostatica 0.22–0.42 long and eversible cirrus. Ovary 0.20–

0.26×0.13–0.21. Vitellaria extending from mid- or postacetabular level to midlevel of anterior testis or posterior level of rear testis. Eggs 16–18×10–13 μm .

Manter (1963) described *Tergestia clonacantha* as a new species from *Hemiramphus* sp. of Fiji. This species has 11 lobes with an indistinct, papilla-like pair on each side of the mouth. Our specimens have normal-shaped oral lobes, and slightly smaller eggs compared with those of *T. laticollis*. Odhner (1911) reported 21 to 23 by 15 μm for eggs of *T. laticollis*.

Family Monorchiidae

Lasiotocus baiosomus Kamegai, 1970

Material. From intestine of *Hyporhamphus sajori* (Hemiramphidae), Takojima, Ishikawa Prefecture, Japan, 7–V–1986 (NSMT-PI 3237b).

Remarks. Ten specimens are: Body 1.13–1.60 long by 0.51–0.71 wide. Eye-spot pigments scattered and glandular cells gathered in shoulder region. Oral sucker 95–145×130–175 μm . Pharynx 60–85×70–90 μm . Esophagus up to 70 μm long. Acetabulum 125–155×160–180 μm . Sucker ratio 1:0.9–1.3. Forebody 18–31% of body length. Uterine eggs are so numerous that testis and ovary (lobate) cannot be determined. Cirrus sac well-developed, reaching posteriorly near midbody or more posteriorly. Vitelline follicles extending from midpharyngeal or bifurcal level to anterior third of body or more posteriorly. Eggs 26–33×15–18 μm .

Kamegai (1970) described *Lasiotocus baiosomus* as a new species from *Hemiramphus sajori* (= *Hyporhamphus s.*) from Tsushima Islands in the Sea of Japan. His specimens are very small (body 0.29–0.68 long by 0.13–0.29 wide), but are almost the same in sucker ratio and egg size as ours. We could not determine the testis and ovary blocked with a large quantity of eggs in our specimens. We are provisionally placing our specimens in *L. baiosomus*. Additional collections may reveal our specimens to be conspecific with *L. baiosomus*.

Family Zoogonidae

Brachyenteron japonicum sp. nov.

(Fig. 8)

Material. From intestine of *Hemiramphus sajori* (Hemiramphidae), Takojima, Ishikawa Prefecture, Japan, 7–V–1986 (NSMT-PI 3237a, holotype & 7 paratypes).

Description. Based on 8 specimens. Body plump, slightly tapered anteriorly and broadly rounded at posterior extremity, 1.25–1.62 long by 0.67–0.83 wide. Tegument with minute spines, sparse posteriorly. Oral sucker subterminal, 0.09–0.11×0.13–0.16. Prepharynx up to 38 μm long. Pharynx 0.08–0.10×0.08–0.10. Esophagus 0.13–0.30 long, bifurcating just anterior to acetabulum. Caeca saccular, extending near midacetabular level or a little more posteriorly, not reaching beyond acetabulum.

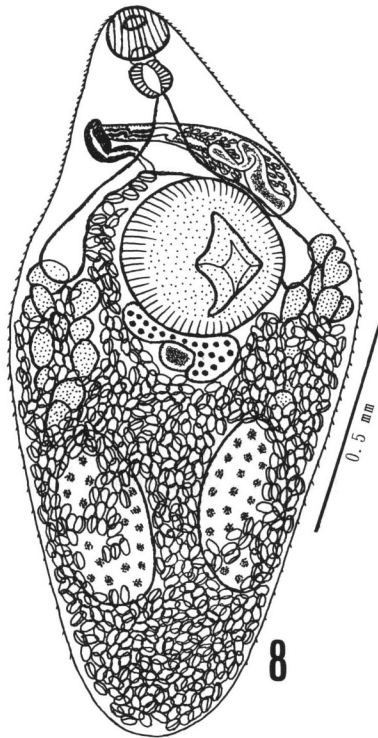


Fig. 8. *Brachyenteron japonicum* sp. nov., dorsal view (NSMT-PI 3237a, holotype).

Acetabulum $0.30\text{--}0.38 \times 0.33\text{--}0.39$, protrusible, covered with tegument except central part of aperture when specimen is fixed dorsoventrally. Sucker ratio 1 : 2.4–2.9. Forebody 32–39% of body length. Testes smooth, elongated, $0.29\text{--}0.50 \times 0.13\text{--}0.22$, symmetrical, near posterior border of acetabulum or almost middle of hindbody. Posttesticular space 11–19% of body length. Cirrus sac claviform, $0.34\text{--}0.48 \times 0.11\text{--}0.15$, slightly diagonal and arcuate, extending posteriorly a little anterior to or anterior region of acetabulum, containing tubular, Z-shaped seminal vesicle, prostatic vesicle $0.07\text{--}0.13$ long with prostatic cells, and long cirrus. Genital pore near or on left body margin at midesophageal level.

Ovary subglobular, $0.11\text{--}0.26 \times 0.19\text{--}0.28$, usually median, immediately posterior to acetabulum. Seminal receptacle $0.07\text{--}0.09$ in diameter, contiguous with posterior border of ovary. Laurer's canal opening dorsally somewhat posterior to ovary. Uterus filling hindbody; metraterm well-developed, $0.10\text{--}0.16$ long. Vitelline follicles in lateral groups, about 10 on each side, from lateral to acetabulum to anterior level of testes or more posteriorly, not beyond acetabulum anteriorly. Number of follicles cannot be determined because of a large quantity of eggs. Eggs relatively thick-shelled, $44\text{--}51 \times 25\text{--}28 \mu\text{m}$. Excretory vesicle not observed.

Remarks. The present new species is most like *Brachyenteron parexocoeti* Manter, 1947 from *Parexocoetus mesogaster* (Exocoetidae) of Florida in having a large protrusible acetabulum. However, differences are observed in that *B. parexocoeti* has an esophagus longer than the caeca, an acetabulum lying at the midbody, a cirrus sac located longitudinally, vitellaria extending beyond the acetabulum anteriorly, much smaller eggs 34 to 36 by 17 to 20 μm , etc.

Bray (1987) reduced *Cypseluritrematoides triangularis* Yamaguti, 1970 from Hawaii, *C. longicirratu*s Madhavi, 1979 from India and *C. minor* Gu & Shen, 1979 from China, all from flying fishes (Exocoetidae), to synonymy with *Brachyenteron parexocoeti*.

Steganoderma hemiramphi Manter, 1947

Material. From intestine of *Hemiramphus far* (Hemiramphidae), Nago, Okinawa Prefecture, Japan, 6-VI-1991 (NSMT-PI 4163).

Remarks. Five specimens are: Body 1.45–1.91 long by 0.50–0.60 wide. Oral sucker 0.13–0.16 \times 0.17–0.18. Prepharynx 25–35 μm long. Pharynx 0.11–0.13 \times 0.11–0.13. Caeca extending to a level beyond halfway between testes and posterior end of body. Acetabulum 0.24–0.28 \times 0.27–0.32. Sucker ratio 1 : 1.6–1.8. Forebody 32–36% of body length. Right testis 0.22–0.33 \times 0.14–0.24; left testis 0.20–0.29 \times 0.14–0.18. Cirrus sac slender, claviform, 0.30–0.41 \times 0.08–0.09, extending posteriorly a little anterior to or anterior region of acetabulum. Internal seminal vesicle saccular. Genital pore at or near left body margin, at pharyngeal level. Ovary 0.11–0.16 \times 0.13–0.26, slightly dextral, immediately posterior to acetabulum. Vitelline follicles in two lateral clusters, 9 on right and 12 on left, between acetabulum or ovary and anterior region of testes. Eggs 36–41 \times 20–26 μm .

This species was originally described by Manter (1947) from *Hemiramphus brasiliensis* of Florida. Later, Parukhin and Solonchenko (1967, cited from Bray (1987)) obtained it from the Red Sea and the Gulf of Aden (?). Our specimens agree fairly well with the original description by Manter (1947), except ours are slightly larger including sucker ratio and egg size. Manter's specimens are 0.937 to 1.444 long by 0.292 to 0.375 wide, with sucker ratio of 1 : 1.41 and eggs 34 to 39 by 17 to 20 μm .

Steganoderma nitens (Linton, 1898)

Material. Six specimens from intestine of *Tylosurus acus melanotus* (Belontiidae), Nago, Okinawa Prefecture, Japan, 24-III-1988 (NSMT-PI 3357); 10 specimens from intestine of *T. acus melanotus*, Nago, 28-III-1988 (NSMT-PI 3380); 2 specimens from intestine of *T. acus melanotus*, Nago, 24-I-1990 (NSMT-PI 3827); 19 specimens from intestine of *Tylosurus* sp., Palawan, Philippines, 20-VIII-1990

(NSMT-PI 3949b); and 1 specimen from intestine of *Ablennes hians* (Belonidae), Nago, 20-V-1992 (NSMT-PI 4266).

Remarks. *Steganoderma elongatum* Manter, 1947 and *Lecithostaphylus ahaaha* Yamaguti, 1970 were considered synonyms of *Steganoderma nitens* by Nahhas and Cable (1964) and Bray (1987). *S. nitens* seems to have vitellaria extending to the posttesticular region. Overstreet (1969), however, stated that three of 48 specimens of *S. nitens* he examined had a vitelline extension which did not lie posterior to the testes. Our specimens also can be divided into two groups (tentatively named A and B) by the vitelline distribution and others.

Group A. Based on 8 specimens. Body 3.20–6.94 long by 0.92–1.38 wide. Oral sucker 0.25–0.40×0.28–0.45. Pharynx 0.19–0.26×0.20–0.33. Acetabulum 0.44–0.74×0.45–0.73. Sucker ratio 1 : 1.5–2.0. Forebody 28–34% of body length. Right testis 0.33–0.83×0.23–0.37 and left testis 0.38–0.60×0.20–0.40. Posttesticular space 29–43% of body length. Cirrus sac 0.54–0.80×0.18–0.27, with thick wall 11–20 μm thick. Ovary 0.20–0.34×0.25–0.50, some distance posterior to acetabulum, occasionally midway between acetabulum and testes. Vitelline follicles 9 on right and 12 on left, extending beyond testes. Eggs 30–37×17–21 μm .

Group B. Based on 7 specimens. Body 3.90–5.53 long by 1.17–1.50 wide. Oral sucker 0.23–0.29×0.24–0.29. Pharynx 0.21–0.25×0.16–0.23. Acetabulum 0.75–0.93×0.78–0.99. Sucker ratio 1 : 2.9–3.8. Forebody 26–33% of body length. Right testis 0.54–0.75×0.29–0.39 and left testis 0.52–0.69×0.31–0.39. Posttesticular space 27–35% of body length. Cirrus sac 0.56–0.86×0.27–0.34, with thin wall 2.5 μm thick. Ovary 0.19–0.31×0.40–0.48, immediately posterior to acetabulum. Vitelline follicles 9 on right and 12 on left, extending not beyond testes. Eggs 38–50×22–28 μm .

Some remarkable differences are observed in the two groups. The specimens of group A have vitellaria extending posterior beyond the testes, sucker ratios of 1 : 1.5 to 2.0 and eggs 30 to 37 by 17 to 21 μm . The cirrus sac is thick-walled and the ovary lies some distance posterior to the acetabulum. The specimens of group B with a vitelline distribution which does not reach posteriorly beyond the testes, have sucker ratios of 1 : 2.9 to 3.8 and eggs 38 to 50 by 22 to 28 μm . The cirrus sac is thin-walled and the ovary lies immediately posterior to the acetabulum.

Our Japanese material is a mixture of both groups. In an instance of 10 specimens from the same host individual, three belong to the group A and 7 to the group B. Our Philippine material, 19 from a host, all belong to the group A.

The specimens under the name of *Lecithostaphylus ahaaha* by Yamaguti (1970) and Shen (1990) from needlefishes from Hawaii and China, respectively, correspond to our group A. Manter's specimens (1947) under the name of *Steganoderma elongatum* from a needlefish of Florida are similar to the group A except that the vitellaria do not extend to the posttesticular region.

We regard the two groups in our specimens as a variation of *Steganoderma*

nitens.

Family Bucephalidae

Bucephalopsis karvei Bhalerao, 1937

Material. From lower intestine of *Ablennes hians* (Belonidae), Koniya, Kagoshima Prefecture, Japan, 18–XI–1985 (NSMT-PI 3203); rectum of *Tylosurus acus melanotus* (Belonidae), Nago, Okinawa Prefecture, Japan, 24–III–1988 (NSMT-PI 3359); and rectum of *T. acus melanotus*, Nago, 24–I–1990 (NSMT-PI 3828).

Remarks. Our 15 specimens are: Body 1.01–1.64 long by 0.38–0.68 wide. Rhynchus 0.12–0.17×0.15–0.23. Mouth opening 56–72% of body length from anterior extremity. Prepharynx 0.02–0.05 long. Pharynx 0.07–0.10×0.06–0.10. Esophagus 0.08–0.18 long. Caecum 0.14–0.25×0.10–0.19. Anterior testis 0.11–0.23×0.12–0.20 and posterior testis 0.11–0.23×0.11–0.22. Posttesticular space 24–43% of body length. Cirrus sac 0.38–0.50×0.10–0.16. Ovary 0.15–0.23×0.10–0.17. Eggs 16–20×10–13 μm . It is remarkable that internal organs are changeable in position depending on fixation. Mouth opening is observed to vary between midlevel of anterior testis and some distance posterior to rear testis. Anterior extent of caecum varies from some distance anterior to ovary to midlevel of ovary. Anterior extent of cirrus sac ranges from anterior level of front testis to posterior level of rear testis.

Nine species of *Bucephalopsis* have been described from needlefishes from the Indo-West Pacific region: *B. karvei* Bhalerao, 1937 from India, *B. southwelli* Nagaty, 1937 from the Red Sea, *B. lenti* Nagaty, 1937 from the Red Sea, *B. megacetabulus* Nagaty, 1937 from the Red Sea, *B. belonea* Srivastava, 1938 from India, *B. tylosuris* Ozaki & Ozaki, 1952 from Japan, *B. abpyriformis* Gu & Shen, 1976 from China, *B. ablennus* Gu & Shen, 1976 from China and *B. bennetti* (Hopkins & Sparks, 1958) of Gu & Shen, 1976 from China. Of them, *B. belonea* was synonymous with *B. karvei* by Gupta (1956). Gupta (1956) noted the considerable range in characteristics of *B. karvei*: the body is pear-shaped with broader anterior and narrower posterior end, 0.69 to 1.52 long by 0.46 to 0.83 wide; the mouth opening lies at about two-thirds of the body length from the anterior extremity; the globular caecum is situated medianly in the same level with the anterior testis; the relative positions of testes and ovary to the mouth opening are changeable; the testes, ovary and cirrus sac are variable in size and position; the eggs measure 14 to 22 by 14 to 19 μm , etc.

Taking these respects into consideration, the above eight species from needlefishes are indistinguishable from each other. We consider them the same species. Bhalerao and Nagaty each named different species of *Bucephalopsis* in the same year 1937. The date of publication of the former was April, whereas that of the latter not given. It follows from the Article 21 of the International Code of Zoological Nomenclature that *B. karvei* Bhalerao, 1937 has priority. Accordingly, *B. southwelli*, *B. lenti*, *B. megacetabulus*, *B. tylosuris*, *B. abpyriformis*, *B. ablennus* and *B. bennetti* of Gu &

Shen become synonyms of *B. karvei*.

Family Lecithasteridae

Aponurus laguncula Looss, 1907

Material. From stomach of *Ablennes hians* (Belonidae), Nago, Okinawa Prefecture, Japan, 6–VI–1988 (NSMT-PI 3432); and anterior end of intestine of *A. hians*, Nago, 20–V–1992 (NSMT-PI 4265).

Lecithaster stellatus Looss, 1907

Material. From intestine of *Hyporhamphus sajori* (Hemiramphidae), Japan (locality unknown; obtained from the Tokyo Fish Market), 11–XII–1969 (NSMT-PI 643, 647 & 652).

Remarks. Manter and Pritchard (1960) placed *Lecithaster sayori* Yamaguti, 1938 from *Hyporhamphus sajori* of Japan as a synonym of *L. stellatus*.

Prolecitha obesa Manter, 1961

Material. One specimen from intestine of *Tylosurus acus melanotus* (Belonidae), Nago, Okinawa Prefecture, Japan, 24–III–1988 (NSMT-PI 3358); 1 specimen from intestine of *T. acus melanotus*, Nago, 28–III–1988 (NSMT-PI 3381); and 2 specimens from intestine of *Strongylura* sp. (Belonidae), Palawan, Philippines, 20–VIII–1990 (NSMT-PI 3949a).

Remarks. Intensities of infection were very low, 1–2. Four specimens are: Body 1.22–1.74 long by 0.61–0.83 wide. Oral sucker 0.13–0.17×0.15–0.21. Pharynx 0.10–0.11×0.08–0.11. Caeca forming a cyclocoel. Acetabulum 0.42–0.55×0.39–0.52. Sucker ratio 1 : 2.2–2.9. Forebody 49–55% of body length. Testes 0.17–0.25×0.11–0.22. Seminal vesicle 0.28–0.42×0.12–0.25. Pars prostatica with well-developed glandular cells. Short ejaculatory duct joining metraterm at base of genital atrium. Ovary consisting of 4 lobes. Vitellaria composed of 7–8 lobes. Eggs 15–17×9–10 μm in Japanese specimens, 12–14×8–10 μm in Philippine specimens.

Manter (1961) described this species as a new genus and species from a needlefish of Fiji. Manter later (1969) considered the genus *Prolecitha* to be synonymous with *Dichadena*, and transferred this species to the genus *Dichadena*. Yamaguti (1971) did not accept the synonymy, returned it to *Prolecitha* and created the new subfamily Prolecithinae for it. We agree with Yamaguti that *Prolecitha* is valid on the basis of the terminal genitalia, neither having hermaphroditic duct nor hermaphroditic sac.

References

- Bray, R. A., 1987. A revision of the family Zoogonidae Odhner, 1902 (Platyhelminthes: Digenea): sub-family Lepidophyllinae and comments on some aspects of biology. *Syst. Parasitol.*, **9**: 83–123.
- Cribb, T. H., R. A. Bray & S. C. Barker, 1994. Bivesiculidae and Haplospilichnidae (Digenea) from fishes of the southern Great Barrier Reef, Australia. *Syst. Parasitol.*, **28**: 81–97.
- Durio, W. O. & H. W. Manter, 1968. Some digenetic trematodes of marine fishes of New Caledonia. Part I. Bucephalidae, Monorchiiidae, and some small families. *Proc. Helminthol. Soc. Wash.*, **35**: 143–153.
- Gu, C. & J. Shen, 1976. Report on some gasterostomatous trematodes (Family Bucephalidae Poche, 1907) from marine fishes in Dong Hai and Nan Hai, China. *Acta Zool. Sinica*, **22**: 371–384. (In Chinese with English summary.)
- Gupta, S. P., 1956. A redescription of *Bucephalopsis magnum* (Verma, 1936) Srivastava, 1938 and *Bucephalopsis karvei* Bhalerao, 1937. *Ind. J. Helminthol.*, **8**: 112–121.
- Hafeezullah, M., 1971. On some new and known digenetic trematodes from marine fishes of India. *J. Helminthol.*, **45**: 73–88.
- Kamegai, Sh., 1970. Three new digenetic trematodes: *Pseudopalaeorchis elongatus* n. g., n. sp., *Hurleytrematoides japonicus* n. sp. and *Lasiotocus baiosomus* n. sp. (Monorchiiidae Odhner, 1911) from marine fishes of Tsushima Islands, Sea of Japan. *Res. Bull. Meguro Parasit. Mus.*, (4): 1–10.
- Manter, H. W., 1937. The status of the trematode genus *Deradena* Linton with a description of six species of *Haplospilichnus* Looss (Trematoda). *Skrjabin Jubilee Vol.*, 381–387.
- Manter, H. W., 1947. The digenetic trematodes of marine fishes of Tortugas, Florida. *Am. Midl. Nat.*, **38**: 257–416.
- Manter, H. W., 1961. Studies on digenetic trematodes of fishes of Fiji. I. Families Haplospilichnidae, Bivesiculidae, and Hemiuridae. *Proc. Helminthol. Soc. Wash.*, **28**: 67–74.
- Manter, H. W., 1963. Studies on digenetic trematodes of fishes of Fiji. III. Families Acanthocolpidae, Fellodistomatidae, and Cryptogonimidae. *J. Parasitol.*, **49**: 443–450.
- Manter, H. W., 1969. Some digenetic trematodes of marine fishes of New Caledonia. Part IV. Hemiuridae and summary. *Proc. Helminthol. Soc. Wash.*, **36**: 194–204.
- Manter, H. W. & M. H. Pritchard, 1960. Additional hemiurid trematodes from Hawaiian fishes. *Proc. Helminthol. Soc. Wash.*, **27**: 165–180.
- Nagaty, H. F., 1937. Trematodes of fishes from the Red Sea. Part I. Studies on the family Bucephalidae Poche, 1907. *Egypt. Univ., Fac. Med., Publ.* (12): 1–172.
- Nahas, F. M. & R. M. Cable, 1964. Digenetic and aspidogastrid trematodes from marine fishes of Curaçao and Jamaica. *Tulane Stud. Zool.*, **11**: 168–228.
- Nahas, F. M. & O. Sey, 1998. *Chauhanotrema spiniacetabulum* sp. n. (Digenea: Waretrematidae) from *Hemiramphus marginatus* (Forsskal) (Hemiramphidae) from the Kuwait coast of Arabian Gulf. *J. Helminthol. Soc. Wash.*, **65**: 6–9.
- Odhner, T., 1911. Zum natürlichen System der digenen Trematoden. III. *Zool. Anz.*, **38**: 97–117.
- Overstreet, R. M., 1969. Digenetic trematodes of marine teleost fishes from Biscayne Bay, Florida. *Tulane Stud. Zool. Bot.*, **15**: 119–176.
- Ozaki, H. & Y. Ozaki, 1952. A new gasterostome trematode *Bucephalopsis tylosuris* n. sp. *J. Sci. Hiroshima Univ., Ser. B, Div. 1*, **13**: 85–90.
- Shen, J., 1990. Digenetic Trematodes of Marine Fishes from Hainan Island. 228 pp. Science Press, Beijing. (In Chinese with English summary.)
- Srivastava, H. D., 1938. Studies on the gasterostomatous parasites of Indian food-fishes. *Ind. J. Vet. Sci. Anim. Husband.*, **8**: 317–340.
- Yamaguti, S., 1938. Studies on the helminth fauna of Japan. Part 21. Trematodes of fishes, IV. Publ. by

author. 139 pp, 1 pl.

Yamaguti, S., 1970. Digenetic Trematodes of Hawaiian Fishes. 436 pp. Keigaku Publ., Tokyo.

Yamaguti, S., 1971. Synopsis of Digenetic Trematodes of Vertebrates. 1074 pp, 349 pls. Keigaku Publ., Tokyo.

Zhukov, E. V., 1972. New genera of trematodes from marine fishes of India. *Parazitologiya*, **6**: 346–350. (In Russian with English summary.)