

Five Hemiurid Trematodes from Tropical Marine Fishes of Southern Japan

By

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Abstract Five species of hemiurid trematodes from tropical marine fishes of southern Japan are described, that is, *Genolinea kyphosi*, *G. chilostoma*, *Neotheletrum akeh* n. sp., *Gonocercella trachinoti* and *Aponurus laguncula*. *Neotheletrum akeh* n. sp. from *Siganus virgatus* differs from *N. frontilatum* (MANTER, 1969) in that the testes lie away from the acetabulum, the uterus does not extend near the posterior extremity, the pars prostatica is oval, and there is a uterine vesicle. It is made clear that YAMAGUTI (1970) described *Genolinea kyphosi* without knowing the presence in it of two different species. Namely, the holotype and paratypes of *G. kyphosi* correspond to *G. isuzumi* MACHIDA, 1980 and *G. chilostoma* MACHIDA, 1980, respectively. Accordingly, *G. isuzumi* becomes a synonym of *G. kyphosi*.

Recently, DYER *et al.* (1988, 1989) reported many digeneans and monogeneans of marine fishes of Okinawa, southern Japan. As they pointed out, the helminth parasites of fishes of this region were incompletely known. I have collected a large number of parasites from fishes around the Ryukyu Islands including Okinawa, so I will describe them hereafter. This report deals with five species of hemiurid trematodes obtained: *Genolinea kyphosi* YAMAGUTI, 1970, *G. chilostoma* MACHIDA, 1980, *Neotheletrum akeh* n. sp., *Gonocercella trachinoti* (MACCALLUM, 1913) and *Aponurus laguncula* LOOSS, 1907.

Trematodes were washed in saline, fixed in alcohol-formalin-acetic acid (AFA) under slight coverslip pressure, stained with Heidenhain's hematoxylin and mounted in balsam. Specimens are deposited in the collection of the National Science Museum, Tokyo (NSMT).

I am especially indebted to Dr. R. LICHTENFELS, USDA, Beltsville, Maryland, and Dr. S. KAMEGAI, Meguro Parasitological Museum, Tokyo, for permitting me to examine the type specimens of *Genolinea kyphosi*.

***Genolinea kyphosi* YAMAGUTI, 1970, & *Genolinea chilostoma* MACHIDA, 1980**

(Fig. 1)

YAMAGUTI (1970) described *Genolinea kyphosi* as a new species from *Kyphosus cinerascens* from Hawaiian waters. I (1980) reported two new species of *Genolinea*, *G. isuzumi* and *G. chilostoma*, from *Kyphosus cinerascens* at Cape Shionomisaki in Japanese waters, and added that the paratypes of *G. kyphosi* (MPM Coll. No. 15184)

are mixed with another closely related species, of which YAMAGUTI (1970) made no mention. Later, I had an opportunity to examine the holotype of *G. kyphosi* (USNM Helm. Coll. No. 63748), which is mounted with three paratypes on a single slide. The holotype has an acetabulum without sphincter-like lamellar muscles at its opening, a posterior testis separated from the ovary, a cylindrical pars prostatica, no seminal receptacle, and an excretory pore near the posterior end of the body. These features of the holotype closely resemble those of *G. isuzumi* except for body size. Three paratypes that are mounted with the holotype of *G. kyphosi*, have an acetabulum with sphincter-like structure at its opening, testes and ovary in contact with each other, an oval pars prostatica, no seminal receptacle, and an excretory pore near the posterior extremity. The paratypes agree well with the original description of *G. chilostoma*. YAMAGUTI (1970) described *G. kyphosi* without knowing the presence in it of two different species. His holotype and paratypes of *G. kyphosi* correspond to *G. isuzumi* and *G. chilostoma*, respectively. *Genolinea isuzumi* accordingly becomes a synonym of *G. kyphosi*. For the correct description and illustration of the two species, refer to my previous report (MACHIDA, 1980). Body length in the two species is variable, measurements varying from 1.34 to 2.69 mm in *G. kyphosi* (NSMT-PI 2288 a, 2292 a & 3161 a), from 0.80 to 2.65 mm in *G. chilostoma* (NSMT-PI 2234 a, 2288 b, 2292 b & 3161 b).

Members of the genus *Genolinea* seem to be divided into two groups; the one has a distinct seminal receptacle such as *G. laticauda* MANTER, 1925; the other has a Juel's organ instead of the seminal receptacle such as *G. kyphosi* and *G. chilostoma*.

Neotheletrum akeh n. sp.

(Figs. 2-4)

Host. *Siganus virgatus* (VALENCIENNES) (Siganidae).

Site. Stomach.

Locality. Amami-ôshima.

Date. 14-XI-1985.

Specimen No. NSMT-PI 3184.

Description. Based on 10 specimens. Body subcylindrical with maximum width at acetabular level, 3.5-5.7 mm long and 0.85-1.27 mm wide. Oral sucker more or less globular, subterminal, $0.21-0.39 \times 0.28-0.45$ mm, surmounted by preoral lobe, with diagonal muscles from each side of the oral sucker posteriorly to caecal bifurcation. Prepharynx practically absent. Pharynx globular, $0.08-0.18 \times 0.10-0.17$ mm. Esophagus oval, up to 0.12 mm long. Caeca wide, terminating near posterior extremity. Acetabulum spherical, $0.44-0.63 \times 0.49-0.67$ mm, with diagonal muscles running from post- to preacetabular level. Forebody 27-36% of body length. Sucker ratio 1: 1.5-1.9.

Testes oval, tandem or diagonal, intercaecal, in contact or slightly separated, lying midway between acetabulum and ovary; the anterior $97-220 \times 140-209$ μ m, the

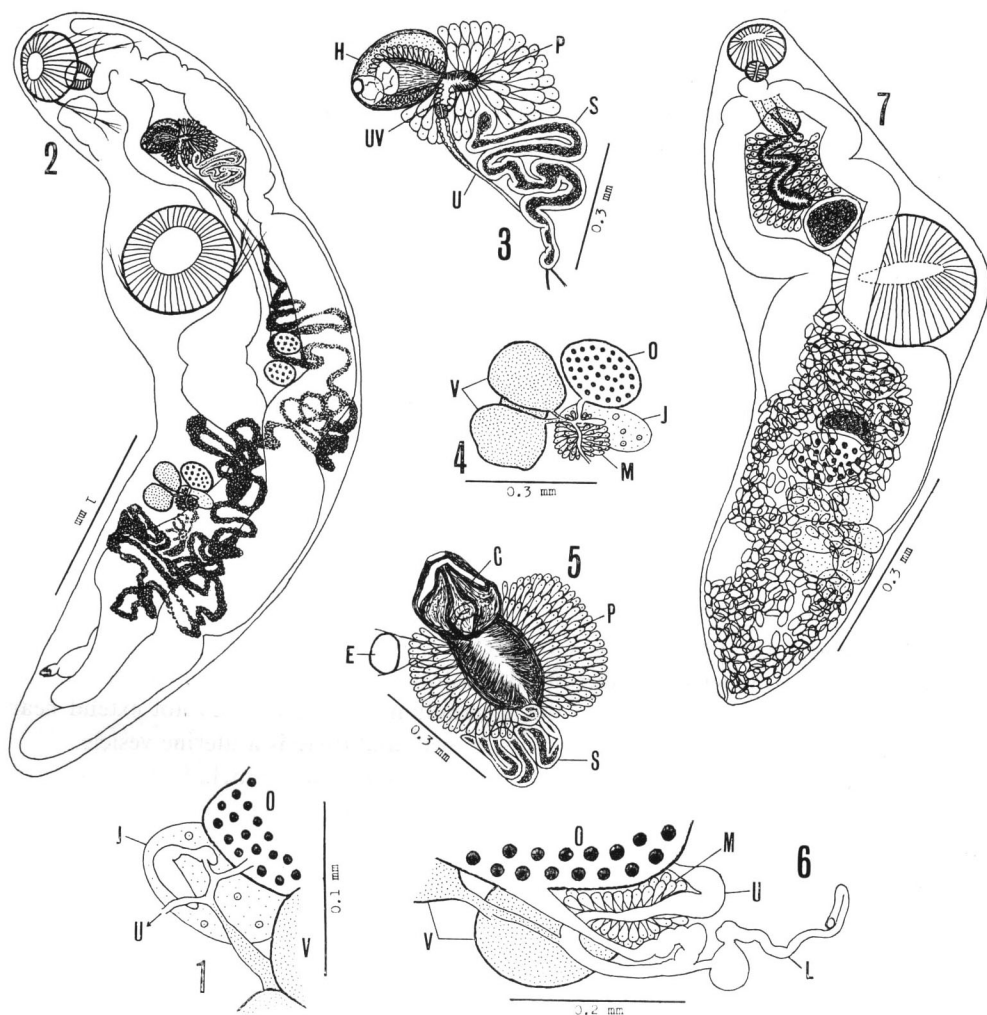


Fig. 1. *Genolinea kyphosi* YAMAGUTI, 1970 (NSMT-PI 2292 a). Ovarian complex, dorsal view.

Figs. 2-4. *Neotheletrum akeh* n. sp. (NSMT-PI 3184). — 2. Entire worm, ventral view. 3. Terminal genitalia, ventral view. 4. Ovarian complex, ventral view.

Figs. 5-6. *Gonocercella trachinoti* (MACCALLUM, 1913) (NSMT-PI 3431). — 5. Terminal genitalia, ventral view. 6. Ovarian complex, dorsal view.

Fig. 7. *Aponurus laguncula* LOOSS, 1907 (NSMT-PI 3409). Entire worm, dorsal view.

C, Genital cone; E, egg; H, hermaphroditic pouch; J, Juel's organ; L, Laurer's canal; M, Mehlis' gland; O, ovary; P, pars prostatica; S, seminal vesicle; U, uterus; UV, uterine vesicle; V, vitellarium.

posterior $107\text{--}199 \times 127\text{--}220\ \mu\text{m}$. Vas deferens lacking. Seminal vesicle tubular, convoluted, $18\text{--}52\ \mu\text{m}$ wide, reaching or occasionally slightly overlapping acetabulum. Pars prostatica oval, $51\text{--}78 \times 36\text{--}62\ \mu\text{m}$, surrounded by conspicuous prostatic cells. Hermaphroditic pouch subglobular, slightly longer than wide, $145\text{--}250 \times 122\text{--}199\ \mu\text{m}$, provided with thin muscular wall. Hermaphroditic duct nearly straight, consisting of two parts; posterior portion with thin wall containing longitudinal muscles and covered with glandular cells; anterior portion with thick wall, opening into short genital atrium close to genital pore. Genital pore slightly posterior to a level midway between suckers.

Ovary ovoid, $102\text{--}153 \times 153\text{--}220\ \mu\text{m}$, situated near anterior end of posterior third of body. Vitellaria consisting of two or three lobes, with smooth or indented surface, tandem or diagonal, immediately postovarian; the anterior $127\text{--}220 \times 112\text{--}199\ \mu\text{m}$; the posterior $102\text{--}199 \times 91\text{--}215\ \mu\text{m}$. Seminal receptacle absent and Juel's organ present. Uterus first narrow and coiled, then wide and filled with sperms, descending to midway between ovary and posterior extremity, and ascending dorsal to testes. Metraterm poorly developed. Uterine vesicle as large as pars prostatica, with sphincter between metraterm and uterine vesicle. Uterine eggs elliptical, $21\text{--}26 \times 11\text{--}14\ \mu\text{m}$. Excretory vesicle Y-shaped, arms ending blindly at each side of oral sucker; pore midventral, $0.25\text{--}0.48\ \text{mm}$ in front of posterior extremity.

Discussion. The present new species closely resembles *Neotheletrum frontilatum* (MANTER, 1969) from siganid fishes from Australia and New Caledonia, but differs from it in that testes lie away from the acetabulum, the uterus does not extend near the posterior extremity, the pars prostatica is oval, and there is a uterine vesicle.

GIBSON and BRAY (1979) erected the genus *Neotheletrum* to include *N. lissosomum* (MANTER, 1940), *N. frontilatum* (MANTER, 1969), *N. gravidum* (MANTER, 1940), *N. magnasaccum* (SOGANDARES-BERNAL et SOGANDARES, 1961) and *N. pomacentri* (NAHHAS et CABLE, 1964). *Neotheletrum frontilatum* and the present new species do not agree with the generic diagnosis of *Neotheletrum* on two points; first, the excretory arms are not united in the forebody, and second, Juel's organ exists instead of blind seminal receptacle, of which MANTER (1969) made no mention in *N. frontilatum*. The specific name of *N. akeh* refers to the local name of the host.

Gonocercella trachinoti (MACCALLUM, 1913)

(Figs. 5–6)

Host. *Trachinotus blochii* (LACEPÈDE) (Carangidae).

Site. Stomach.

Locality. Okinawa-jima.

Date. 6–VI–1988.

Specimen No. NSMT-PI 3431.

Description. Based on 4 specimens. Body cylindrical, rounded at anterior extremity and somewhat tapered at posterior extremity, $3.9\text{--}5.5\ \text{mm}$ long and 1.40--

1.78 mm wide at acetabular level. Oral sucker subterminal, nearly spherical, $0.38\text{--}0.42 \times 0.44\text{--}0.52$ mm; pharynx $0.20\text{--}0.22 \times 0.22\text{--}0.26$ mm; esophagus very short; caeca voluminous, extending to posterior extremity. Acetabulum globular, $0.85\text{--}0.99 \times 0.84\text{--}1.01$ mm. Forebody 64–70% of body length. Sucker ratio 1: 1.8–2.0.

Testes oval or triangular, symmetrical or diagonal, in contact with each other, just postacetabular; the right $0.31\text{--}0.44 \times 0.42\text{--}0.67$ mm, the left $0.32\text{--}0.40 \times 0.48\text{--}0.73$ mm. Genital pore median, just postbifurcal. Genital cone muscular, $96\text{--}107 \times 117\text{--}143$ μm at broad base, filling genital atrium. Pars prostatica barrel-shaped, $0.20\text{--}0.25 \times 0.13\text{--}0.18$ mm, surrounded by conspicuous prostatic cells. Seminal vesicle a convoluted narrow tube in a mass, extending a short distance posterior to pars prostatica.

Ovary oval, $0.16\text{--}0.26 \times 0.28\text{--}0.44$ mm, attached to posterior margin of rear testis. Vitellaria consisting of two ovoid masses, each of them $0.10\text{--}0.17 \times 0.12\text{--}0.26$ mm, side by side, immediately postovarian. Laurer's canal present and seminal receptacle absent. Uterus coiling between acetabulum and genital cone. Uterine eggs irregular in size and shape; at first 19×13 μm , larger as descending uterus, finally $100\text{--}116 \times 67\text{--}83$ μm ; egg shell flexible. Excretory pore terminal; posterior part of vesicle enclosed in glandular cells.

Discussion. My specimens closely resemble *Gonocercella trachinoti* (MACCALLUM, 1913) from *Trachinotus carolinus* caught off North Carolina, and the size of their eggs is 84 to 100 by 57 to 75 μm (YAMAGUTI, 1971). LINTON (1905) described *Distoma* sp. from *Trachinotus carolinus* caught off North Carolina, but he did not name this trematode. Unaware of MACCALLUM's report, MANTER (1940) described *G. pacifica* from *Trachinotus rhodopus* caught off Colombia, and at the same time gave the name *G. atlantica* to LINTON's *Distoma* sp. Subsequently, MANTER (1947) redescribed *G. atlantica* and distinguished between *G. atlantica* and *G. pacifica* on the basis of the presence in the former of more profuse prostatic cells, a longer and more coiled seminal vesicle, and shorter eggs. The former two features seem to be the characteristics which appear as the worm develops. The eggs found in my specimens are very changeable in size and shape. So, we should be cautious in using the feature as an indicator when identifying species. MANTER (1940) described *G. pacifica* using a single specimen 3.604 mm long by 0.972 mm wide, with eggs of extremely variable size, 34 by 15 μm as normal size. The specimens that GOMES *et al.* (1978) reported as *G. pacifica* from Brazilian waters are 2.79 to 4.42 by 0.84 to 1.43 mm in body size and 34 to 107 by 26 to 84 μm in egg size. From these points, *G. pacifica* and *G. atlantica* may be conspecific with *G. trachinoti*.

Aponurus laguncula LOOSS, 1907

(Fig. 7)

Host. *Scatophagus argus* (LINNAEUS) (Scatophagidae).

Site. Stomach.

Locality. Okinawa-jima.

Date. 2-VI-1988.

Specimen No. NSMT-PI 3409.

Description. Based on 15 specimens. Body plump, 0.76–1.22 mm long and 0.28–0.43 mm wide at acetabular level. Oral sucker subterminal, $72\text{--}90 \times 88\text{--}116\ \mu\text{m}$; prepharynx absent; pharynx globular, $30\text{--}60 \times 38\text{--}52\ \mu\text{m}$; esophagus up to $21\ \mu\text{m}$ long; caeca relatively wide, terminating near posterior extremity. Acetabulum spherical, $0.16\text{--}0.24 \times 0.18\text{--}0.26\ \text{mm}$. Forebody nearly 40% of body length and 45% in relatively young adults that have poorly-formed eggs. Sucker ratio 1: 1.9–2.4.

Testes rounded to ovoid, $53\text{--}93 \times 83\text{--}145\ \mu\text{m}$, diagonal or occasionally symmetrical or tandem, just or slightly posterior to acetabulum. Seminal vesicle saccular or tubular, $20\text{--}297 \times 41\text{--}127\ \mu\text{m}$, touching or overlapping partly acetabulum. Pars prostatica S-shaped, surrounded by conspicuous prostatic cells. Hermaphroditic pouch elongate to ovoid, $46\text{--}88 \times 51\text{--}80\ \mu\text{m}$, opening directly outside near caecal bifurcation.

Ovary ovoid, $54\text{--}107 \times 91\text{--}155\ \mu\text{m}$. Postovarian space 17–32% of body length. Seminal receptacle $42\text{--}114 \times 52\text{--}108\ \mu\text{m}$, lying between testes and ovary, overlapping partly them. Vitellaria consisting of seven lobes, each globular to ovoid. Eggs $25\text{--}32 \times 14\text{--}18\ \mu\text{m}$.

Discussion. The measurements for the body size and various organs of *Aponurus laguncula* have varied according to MANTER (1947), YAMAGUTI (1953) and NAHHAS and SHORT (1965). Accordingly, the combined range of measurements for *A. laguncula* is larger than initially described. For example, the specimens that NAHHAS and SHORT (1965) designated as *A. laguncula* are 0.541 to 1.275 mm by 0.138 to 0.335 mm in body size, 1: 1.7 to 2.1 in sucker ratio, and 26 to 32 by 14 to 18 μm in egg size. My specimens agree fairly well with the descriptions by these authors.

Five species of *Aponurus* from Japanese waters have been described. Of them *A. brevicaudatus* differs from the other four in that the ovarian complex lies near the posterior extremity. The four species, *A. vitellagrandis* LAYMAN, 1930, *A. rhinoplagusiae* YAMAGUTI, 1934, *A. callionymi* YAMAGUTI, 1938 and *A. acropomatis* YAMAGUTI, 1938, closely resemble each other. YAMAGUTI (1934, 1938) distinguished them by the size of their eggs and seminal receptacle. Taking the variation into consideration, all four are probably the same species. More studies on additional specimens may solve this problem.

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