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## Parasitic Worms mainly from Celebes. Part 5. Trematodes of Mammals

Satyu Yamaguti\*

\*Okayama University,

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# Parasitic Worms mainly from Celebes. Part 5. Trematodes of Mammals\*

Satyu Yamaguti

## Abstract

Lecithodendriidae Odhner, 1910 1. *Phaneropsolus simiae* n. sp. Heterophyidae Odhner, 1914 2. *Galactosomum canis* n. sp. Paramphistomidae Fiscoeder, 1901 3. *Explanatum explanatum* (Creplin, 1857) 4. *Paramphistomum cervi* (Schrunk, 1790) 5. *Calicophoron cauliorchis* (Stiles et Goldberger, 1900) 6. *Ceylonocotyle ecoliocoelium* (Fiscoeder, 1901) 7. *Fiscoederius elongatus* (Poirier, 1883) Fasciolidae Railliet, 1895 8. *Fasciola hepatica* Linne, 1758

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## PARASITIC WORMS MAINLY FROM CELEBES

### Part 5. Trematodes of Mammals

With 1 Plate

By

Satyu Yamaguti

(Department of Parasitology, Okayama University Medical School)

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#### LECITHODENDRIIDAE Odhner, 1910

##### 1. *Phaneropsolus simiae* n. sp. (Fig. 1)

Habitat and locality. Small intestine of a monkey; Celebes.

Material. One immature and two fully gravid specimens, all fixed in acetic sublimate, stained and mounted as usual.

Body elongate oval or elliptical, flattened dorsoventrally, 0.6–0.8 mm long by 0.32–0.41 mm broad at middle, covered all over with minute spines embedded in cuticle. Oral sucker ventroterminal, 80–102×80–108  $\mu$ . Prepharynx very short, pharynx subglobular, 25–35×33–45  $\mu$ . Esophagus 45–70  $\mu$  long, ceca elliptical, 75–

$100 \times 42 - 45 \mu$ , lined with thick epithelia, each terminating just medial to testis. Acetabulum  $70 - 115 \mu$  in diameter, its center pre-equatorial.

Testes subglobular to oval,  $90 - 120 \mu$  long by  $60 - 90 \mu$  wide, situated symmetrically one on each side at posterior end of anterior third of body. Cirrus pouch  $0.3 - 0.35$  mm long by  $35 - 55 \mu$  wide at posterior part, extending arcuately from dextrodorsal side of acetabulum to postbifurcal region, where it takes a median position and runs up to the genital pore. Vesicula seminalis occupying posterior portion of cirrus pouch,  $60 - 90 \mu$  long by  $30 - 80 \mu$  wide, divided into two unequal portions, the anterior portion being the longer. Pars prostatica strongly developed, surrounded by prostate cells, tapering toward ductus ejaculatorius, which is very short. There is no protrusible cirrus. Genital pore ventral to posterior end of pharynx.

Ovary oval to elliptical,  $80 - 110 \times 60 - 80 \mu$ , situated in right submedian line at equatorial level posterior or lateral to posterior end of cirrus pouch. The germiduct arising from the posteromedial end of the ovary forms a bulbous swelling ( $18 \mu$  wide in the type) before joining the receptaculum seminis, which is  $75 - 80 \mu$  long by  $40 - 50 \mu$  wide and lies behind the acetabulum. Laurer's canal arising from junction of germiduct with receptaculum seminis, winding sinuously and opening middorsally a little behind acetabulum. The uterus coiling first at the middle of the left posttesticular region passes to the right to occupy the greater part of the right posttesticular area, then coming again to the left fills up the space between its initial coils and the left testis, and finally runs forward along with cirrus pouch on its left side, leaving the posterior extremity, especially the posterior median field, entirely free. Eggs elliptical, embryonated,  $26 - 33 \times 12 - 18 \mu$  in life. Vitelline follicles  $7 - 10$  on each side in front of testis, forming a bunch  $90 - 130 \mu$  long by  $50 - 80 \mu$  broad; vitelline ducts running backward convergently along the inner margin of the testes and then along the acetabulum, behind which they are united together to form the vitelline reservoir, which in turn joins the germiduct at a point close to the junction of the latter with the seminal receptacle.

Excretory vesicle Y- or V-shaped, with terminal pore; the two arms reach to the level of the posterior end of the acetabulum.

This species differs from the most closely related *P. longipenis*

Looss, 1899, and *P. oviformis* (Poirier, 1886) chiefly in the length of the cirrus pouch relative to the body length. In these two species the cirrus pouch is distinctly looped proximally, and its ratio to the body length is 12:17 in *P. longipenis* and 14:26 in *P. oviformis*, but 14:45 in the present species.

## HETEROPHYIDAE Odhner, 1914

### 2. *Galactosomum canis* n. sp. (Fig. 2)

Habitat and locality. Small intestine of *Canis familiaris*; Macassar.

Material. A dozen gravid specimens, one of which was cut into serial sections, and the others were stained and mounted in toto.

Body spatulate, with blunt-pointed extremities, 1.85–2.7 mm long, 0.5–0.75 mm broad at middle or a little more posteriorly. Cuticle 2–4  $\mu$  thick, beset throughout with very fine spines. Subcuticular longitudinal musculature comparatively well developed, especially in forebody.

Oral sucker ventroterminal, cup-shaped, 40–90  $\times$  90–110  $\mu$ . Prepharynx 0.12–0.25 mm long, provided with longitudinal muscle fibers; its cuticular lining folded just in front of pharynx. Pharynx barrel-shaped, 90–100  $\times$  60–90  $\mu$ , with radiating muscle fibers attached to its posterior half. Esophagus only 20–40  $\mu$  long, provided with circular and longitudinal muscle fibers, bifurcating into transverse intestinal limbs which turn backward at right angles and terminate blindly near the posterior extremity. Acetabulum 90–135  $\mu$  in diameter, embedded in body parenchyma on the right of median line at or near posterior end of anterior third of body, with 4–5 circular rows of minute spines up to 5  $\mu$  long on its free margin, near which it is encircled by the genital atrium.

Testes round or subglobular, 0.12–0.24  $\times$  0.13–0.28 mm, situated one obliquely behind the other, separated from each other by uterine coils; the anterior, confined to the posterior half of the middle third of the body, lies usually a little to the left of the median line, whereas the posterior lies exactly in the median line or only slightly to the right of the median line at the junction of the posterior two thirds of the body or at the anterior end of the posterior third. Vasa efferentia arising each from anterior end of

testis, crossing shell gland ventrally and joining together on the left of ovary to form a short vas deferens, which opens into the vesicula seminalis at its posterior end. Vesicula seminalis lying obliquely a little in front of the middle of the body, constricted into two portions of different size and structure, the anterior portion is 60 - 120  $\mu$  long by 45 - 105  $\mu$  wide and has a thin wall of circular muscle, while the elliptical posterior is much larger (0.16 - 0.345 mm long by 0.13 - 0.2 mm wide), occupying the greater part of the preovarian intercecal field, and has a very thick wall of longitudinal muscle except at the posterior end where it receives the vas deferens. Pars prostatica strongly developed, subcylindrical, curved, 0.15 - 0.23 mm long by 36 - 54  $\mu$  wide, provided with inner circular and outer longitudinal muscle fibers, lined with a layer of typical epithelia except at the distal end which is covered with cuticle and projects into the hermaphroditic duct. Prostate cells well developed around anterior portion of seminal vesicle and pars prostatica. The hermaphroditic duct, 60 - 80  $\mu$  long by 15 - 25  $\mu$  wide and provided with a thin layer of circular muscle and surrounded by accompanying cells, receives at its posteroventral end the contracted end of the metraterm and at its posterodorsal end the truncate conical terminal portion of the pars prostatica. It opens into the genital atrium on the posterosinistral margin of the acetabulum, where it is surmounted by a lip-like muscular lobe projecting into the genital atrium from its dorsal wall. In dorsoventral view the seminal vesicle, pars prostatica and hermaphroditic duct describe an S behind the genital atrium. The genital atrium surrounding the acetabulum develops on the left side a saccular outgrowth which may be distended with spermatozoa or reduced, when empty, to a narrow space with folded cuticular wall. The round genital pore, 70  $\mu$  wide in the type, opens in the midventral line some distance behind intestinal bifurcation.

Ovary ovoid, 90 - 160  $\times$  130 - 180  $\mu$ , intercalated between receptaculum seminis and posterior portion of seminal vesicle on the right of median line just in front of middle of body or a little more anteriorly. The germiduct arising from the left end of the ovary turns back on itself and joins the medial end of the receptaculum seminis, where the Laurer's canal is given off, and then unites with the vitelline duct and is surrounded by shell gland cells. Laurer's canal pursuing an 8-shaped course and opening middorsally at

level of receptaculum seminis or ovary. Seminal receptacle rounded, 80–220  $\mu$  in diameter, situated on the right of midbody. Uterus strongly coiled and occupying all available space of inter- and extracecal fields between level of seminal vesicle and posterior extremity; metraterm short, running forward sinistroversal to distal portion of pars prostatica, contracted at its opening into hermaphroditic duct. Eggs oval, brown, thick-shelled, 24–27  $\mu$  long by 14–15  $\mu$  wide in life. Vitellarian acini tubular, branched, commencing on each side at level of vesicula seminalis or ovary and extending in lateral and dorsal peripheral areas to posttesticular zone, where they reach to the median field both dorsally and ventrally, thus encircling the whole body, and terminate short of the posterior extremity, a little back of the cecal ends.

Excretory vesicle tubular, central, widened anteriorly, not reaching to posterior testis, with dorsoterminal pore, about 0.55 mm long in the type, giving rise near its anterior end to symmetrical collecting vessels which run forward along the ceca.

This species differs from *G. sanaensis* Kobayasi, 1942, which was recovered experimentally from the intestine of a dog fed with a mullet, in the structure of the seminal vesicle and of the genito-acetabular complex, in the extent of the vitellaria and of the excretory vesicle, etc. and from *G. anguillarum* (Tubanguui, 1933) which was found in the intestine of *Anguilla mauritiana*, in the structure of the genito-acetabular complex<sup>1)</sup> and in the extent of the vitellaria.

## PARAMPHISTOMIDAE Fiscoeder. 1901

### 3. *Explanatum explanatum* (Crepl., 1857). (Fig. 3)

Habitat and locality. Bile ducts of buffalo; Macassar.

Material. Numerous mature specimens fixed in 70% alcohol, stained with hematoxylin or carmine, and mounted in balsam under cover glass pressure.

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1) It seems doubtful that the acetabulum is absent. With the addition of the present species some emendation is necessary for the generic diagnosis given in my paper of 1939, so far as the position of the genital pore and reproductive organs in relation to the body length and the extent of the vitellaria and excretory vesicle are concerned. It is interesting to note that in the new species the excretory vesicle is a simple short tube and does not pass between the two testes as in *G. humbargari* Park, 1936.

In some specimens the genital organs were dissected out and examined for their detailed anatomy. Serial sections were also prepared.

Body conical, more or less strongly curved ventrally, 4–11 mm long by 3.8–4.8 mm broad at level of acetabulum, with flat, inconspicuous cuticular papillae in anterior part. Mouth terminal, leading directly into pharynx. Latter subglobular, strongly muscular,  $0.77-1.05 \times 0.73-0.98$  mm. Esophagus running posterodorsally, provided with well developed circular muscle, may be over 1 mm long in dissected-out examples. Ceca very wide, terminating at level of ovary. Acetabulum 3.1–3.8 mm in diameter, with ventro-terminal aperture.

Testes broader than long ( $0.98-2.2 \times 1.8-2.5$  mm) in flattened mounts, but rather rounded (1.4–1.7 mm in diameter) and irregularly indented or lobed as dissected out and examined without cover glass pressure, situated one obliquely behind the other with the posterior in equatorial zone. Vas deferens strongly coiled between cecal arch and uterus. Pars muscosa provided with thick layer of longitudinal and circular muscle fibers, lined with a layer of flattened epithelia, somewhat winding and longer than pars prostatica, which is surrounded by a very compact mass of prostate cells. Ductus hermaphroditicus short, opening at top of small papilla which projects into the genital atrium. Genital atrium not very wide, provided with strongly developed subcuticular muscle fibers at right angles to the surface. Genital pore midventral, at level of posterior end of pharynx or esophagus in contracted specimens, but level with intestinal bifurcation in extended ones.

Ovary ovoid, 0.28–0.5 mm in diameter in balsam mounts,  $0.6-0.85 \times 0.7-1.0$  mm when dissected out and subjected to cover glass pressure, placed dorsally in right submedian line between posterior testis and acetabulum. Laurer's canal arising from germiduct just at the point where the latter enters the shell gland mass, opening middorsally at level of posterior testis or anterior end of ovary. Shell gland compact, immediately posterior to ovary. Uterine coils intruding ventrally into space between posterior testis and acetabulum, passing forward dorsal to testes, and then between vas deferens coils and anterior testis; metraterm lined with epithelia, tapered as it opens into the hermaphroditic duct behind the pars prostatica. Eggs elongate oval,  $123-138 \times 75-84 \mu$ . Vitelline



follicles comparatively small, extending in lateral fields between pharynx and cecal ends; vitelline reservoir lying transversely posteroventral to shell gland.

Excretory vesicle elongate saccular, opening middorsally at level of posterior end of anterior testis or anterior end of posterior testis.

#### 4. *Paramphistomum cervi* (Schränk, 1790). (Figs. 4-6)

Habitat and locality. First stomach of buffalo; Macassar.

Material. Some 20 gravid specimens, of which about a dozen were dissected and examined for the terminal genitalia and the ovarian complex.

Body plump, only slightly curved ventrally, 3-11.5 mm in length, with maximum width of 1.5-3.0 mm at anterior end of posterior third or at its junction with middle third. Cuticle 12-18  $\mu$  thick, smooth except at genital pore and anterior extremity which is covered with numerous prominent papillae. Mouth terminal, funnel-shaped; pharynx 0.32-0.8 mm long; esophagus 0.35-0.7 mm long, widened posteriorly; ceca wide, pursuing a serpentine course, terminating one on each side of anterior part of acetabulum. Acetabulum ventroterminal, 0.6-2.6 mm in diameter, about one-fourth to one-fifth of body length.

Testes distinctly lobed,  $0.37-1.9 \times 0.5-2.5$  mm, situated a little obliquely tandem, with the anterior in equatorial zone. Vesicula seminalis tubular, up to 0.23 mm wide, convoluted in front of anterior testis. Pars musculosa strongly winding, up to 3 mm long by 0.28 mm wide, lined with cylindrical epithelia, and provided with a very thick inner layer of circular, and a thinner layer of longitudinal muscle fibers. Pars prostatica cylindrical,  $0.7 \times 0.28$  mm, surrounded by a thick layer of prostate cells. Ductus ejaculatorius short and narrow, lined with thick cuticle. Ductus hermaphroditicus bulbously dilated at base, projecting into genital atrium in form of a papilla. Genital atrium provided with well developed radial muscle fibers, and covered with cuticular papillae which extend over the surrounding body surface. It may be surmounted or encircled by a fold of the body wall. Genital pore behind intestinal bifurcation.

Ovary subglobular to oval, 0.14-0.5 mm in diameter in balsam

whole mounts,  $0.5-0.9 \times 0.8-1.1$  mm when dissected out and flattened under a cover glass, somewhat indented or lobed, situated a little to the right of median line between posterior testis and acetabulum.

Shell gland compact, posterodorsal to ovary. Laurer's canal arising from germiduct as the latter enters the shell gland, opening middorsally at level of ovary. Receptaculum seminis uterinum present. Uterus following the same course as in *Explanatum explanatum* but not so strongly coiled. Metraterm lined with epithelia as in uterus proper, but provided with much thicker layer of circular muscle; the terminal portion of the metraterm is covered inside with thick cuticle and outside with a coat of accompanying cells for a length of  $0.32-0.65$  mm (as measured on dissected-out preparations), showing a marked contraction as its opening into the ductus hermaphroditicus. Eggs elongate oval,  $126-141 \times 66-87$   $\mu$ . Vitelline follicles comparatively small, extending along ceca on their dorsal, lateral and ventral sides, commencing at level of pharynx, esophagus or intestinal bifurcation.

Excretory vesicle elongate saccular, opening middorsally at level of posterior testis.

##### 5. *Calicophoron cauliorchis* (Stiles et Goldberger, 1910)

Näsmark, 1937

Habitat and locality. Abomasum of buffalo; Macassar.

Material. Several gravid and a few immature specimens.

Body pear-shaped, curved ventrally,  $5.0-8.0$  mm long, with greatest width of  $3-5$  mm in testiculo-acetabular zone; covered anteriorly with cuticular papillae. Anterior extremity blunt-pointed, rather truncated conical; posterior extremity broadly rounded in ventral view, truncated in lateral view at opening of acetabulum which is directed ventroposteriorly. Mouth crater-shaped, covered with cuticular papillae. The surface folds around the mouth aperture are seen extending into the mouth in longitudinal ridges. Pharynx  $0.88-1.1$  mm in diameter, with wide lumen, whose surface is covered with rough cuticle. Esophagus lined with thick cuticle and coated with accompanying cells, directed ventrad, then turning dorsad, bifurcating just posterodorsal to pharynx. Ceca winding, terminating one on each side dorsolateral to ace-

tabulum. Acetabulum 1.7-2.7 in transverse diameter, embedded in body parenchyma, with its ventroterminal aperture surmounted by body folds.

Testes irregular in outline, multilobate,  $0.7-3.6 \times 0.98-2.2$  mm, distinctly smaller than acetabulum in immature specimens, though the greatest diameter may well exceed the transverse dimension of this sucker in gravid individuals, situated exactly or a little obliquely side by side just behind equator, fields separate or overlapping, zones almost coinciding. Vesicula seminalis coiled anterodorsal to left testis on the left of median line. Pars musculosa enormously developed, attaining maximum width of 0.4 mm, lined with epithelia and provided with extremely thick inner layer of oblique muscle fibers and a much thinner outer layer of longitudinal muscle fibers, occupying most of the space between testes and intestinal bifurcation. Pars prostatica straight, 0.85-1.0 mm long, running dorsoventrally behind esophagus, with its lumen widened proximally and gradually narrowed distally, covered with very thick coat of prostate cells. Ductus hermaphroditicus enlarged basally to receive the ductus ejaculatorius and metraterm, running through genital papilla, on the top of which it opens into the genital atrium. Genital atrium with thick muscular wall which bulges out to form a transversely elongated ellipsoidal ring around the genital pore. In a specimen 7 mm long the ring measures 0.85 mm long by 1.25 mm wide. Genital pore midventral, immediately behind intestinal bifurcation.

Ovary subglobular to oval, up to 0.65 mm by 0.55 mm, situated between right or left testis and acetabulum. Shell gland compact, as large as ovary or a little smaller, dorsoposterior to ovary. Laurer's canal opening dorsally at level of anterior border of acetabulum. Uterus coiled in median field dorsal to testes and ventral to pars musculosa; metraterm opening into hermaphroditic duct immediately behind ductus ejaculatorius. Eggs oval,  $108-120 \times 63-72 \mu$ . Vitelline follicles comparatively small, extending in lateral fields from pharyngeal level to cecal ends; vitelline reservoir transversely elongated behind shell gland. Excretory pore apparently posterior to opening of Laurer's canal.

That the testes are comparatively small in the original specimens of Stiles and Goldberger is probably due to the material being still immature,

6. *Ceylonocotyle scoliocoelium* (Fishoed., 1901)  
Näsmark, 1937. (Fig. 7)

Habitat and locality. Abomasum of buffalo; Macassar.

Material. Several not fully mature, somewhat contracted specimens.

Body elongate oval in ventral view, curved ventrally, 2.9–3.8 mm long, 1.7–2.2 mm wide, with numerous cuticular papillae at anterior extremity. Mouth terminal with small papillae around its aperture. Pharynx 0.5–0.56 mm in diameter. Esophagus twisted anteriorly posteroventral to pharynx, forming muscular bulb posteriorly, which is 0.17–0.28 mm in diameter, lined with very thick cuticle, and coated with accompanying cells. Ceca wide, undulating, terminating at level of anterior end of acetabulum. Acetabulum 0.72–1.1 mm in diameter, directed ventrally at posterior extremity.

Testes transversely elongated in ventral view,  $0.28-0.56 \times 0.65-1.1$  mm; anterior testis situated at about midbody, posterior one at junction of middle with posterior third of body. Vesicula seminalis convoluted anterodorsal to anterior testis on the right or left of median line; pars muscosa convoluted posterodorsal to genital pore, pars prostatica dorsal to genital atrium which is provided with fine radial muscle fibers and opens a little behind or ventral to the intestinal bifurcation at the junction of the anterior two thirds of the body by a transversely elongated oval aperture 0.11 mm long by 0.18 mm wide.

Ovary subglobular,  $0.18-0.21 \times 0.22-0.23$  mm, placed anterodorsal to acetabulum in right or left submedian line. Laurer's canal opening middorsally at level of ovary, 0.25 mm in front of excretory pore in a specimen 2.9 mm long. Uterus winding dorsal to testes and then between anterior testis and genital pore; eggs elliptical,  $135-150 \times 78-87 \mu$ . Vitelline follicles large, irregular in outline, not very numerous, extending mostly on outer side of intestine. Excretory pore middorsal, at a level a little behind middle of acetabulum.

7. *Fischoederius elongatus* (Poirier, 1883)  
Stiles et Goldberger, 1910

This species was found in the abomasum of a buffalo at Macassar. I have been unable to find anything new worthy of record.

**FASCIOLIDAE Raill., 1895****8. *Fasciola hepatica* Linné, 1758**

This cosmopolitan parasite of cattle occurs frequently in the liver of the buffaloes slaughtered at the Macassar abattoir. Young worms have been found sometimes in the lung of the buffalo but nowhere else except in the head which has not been examined for parasites. Although their body has grown up to a maximum size of 20 mm by 5 mm, the genital organs are still immature, showing so-called development *en cul-de-sac*.

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**Explanation of Plate**

Fig. 1. *Phaneropsolus simiae* n. sp., ventral view.

- Fig. 2. *Galactosomum canis* n. sp., ventral view.  
Fig. 3. *Explanatum explanatum* (Creplin, 1857), lateral view.  
Fig. 4. *Paramphistomum cervi* (Schrunk, 1790), lateral view.  
Fig. 5. Ovarian complex of *Paramphistomum cervi* (Schrunk), lateral view.  
Fig. 6. Terminal genitalia of *Paramphistomum cervi* (Schrunk), lateral view.  
Fig. 7. *Ceylonocotyle scoliocoelium* (Fischoeder, 1901), ventral view.

### Abbreviations used in Figures

a = acetabulum, ct = collecting tubule, d = vas deferens, eb = esophageal bulb, ep = excretory pore, gp = genital pore, i = intestine, lc = Laurer's canal, m = metraterm, o = ovary, os = oral sucker, p = pharynx, po = prostatic cell, pm = pars muscosa, pp = pars prostatica, rs = receptaculum seminis, sg = shell gland, t = testis, u = uterus, vd = vitelline duct, vs = vesicula seminalis, vsi = vesicula seminalis interna, vt = vitellarium.

YAMAGUTI: PARASITIC WORMS MAINLY FROM CELEBES—TREMATODES OF MAMMALS

