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Parasitic Worms mainly from Celebes. Part 3. Digentic Trematodes of Fishes, II.

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Parasitic Worms mainly from Celebes. Part 3. Digentic Trematodes of Fishes, II.*

Satyu Yamaguti

Abstract

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PARASITIC WORMS MAINLY FROM CELEBES

Part 3. Digenetic Trematodes of Fishes, II.

With 4 Plates

By

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BUCEPHALIDAE Poche, 1907

1. *Prosorhynchus longicollis* n. sp.

Pl. II, Fig. 8.

Habitat. Small intestine of *Sphyraena* sp.

Material and locality. Two whole mounts; Macassar.

Body slender, fragile, with long neck region, 1.5-2.2 mm in length, with maximum breadth of 0.21-0.25 mm at posterior third. Cuticle thin, beset with minute evanescent spines. Of the subcuticular muscles the longitudinal and diagonal fibers are well developed in the long neck region. Rhynchus plug-shaped, not very muscular, 100-105 μ long by 95 μ broad. Pharynx 75-80 \times 90-96 μ , situated at junction of middle with posterior third of body or a little more posteriorly. Esophagus 25 μ wide, curved, consisting mainly of longitudinal muscle fibers. Intestine saccular, voluminous, 0.16-0.18 mm in diameter, directed backward, reaching to ovary and anterior testis, separated from cirrus pouch by uterine loop.

Testes ovoid, 65-100 \times 105-160 μ , situated on the right, one directly behind the other; anterior testis at middle of posterior third of body or a little more posteriorly with its anterior end in contact with intestine. Cirrus pouch subcylindrical, 0.21-0.27 mm long by 75-90 μ broad, consisting of longitudinal muscle fibers,

extending on the left to level of anterior testis or ovary. Vesicula seminalis somewhat winding, pars prostatica and prostate cells well developed, cirrus narrow. Genital lobe filling up almost entire genital atrium, with accessory lobe near opening of cirrus, provided at base with well developed circular muscle fibers, which constrict off the genital lobe from the cirrus pouch. Genital atrium 65–75 μ in diameter, opening at extreme posterior end of body in the type, but 35 μ in front of it ventrally in the paratype, by a wide funnel-shaped duct provided with inner longitudinal and outer circular muscles.

Ovary subglobular or rounded triangular, 65–80 μ in greater diameter, immediately anterodextral to anterior testis in contact with posterior end of intestine. Shell gland complex dorsal or dorsodextral to anterior testis. Uterus extending between testes and cirrus pouch as well as behind posterior testis, forming a loop in the narrow space between the intestine and the anterior end of the cirrus pouch. Eggs oval, thin-shelled, 18–21 \times 12 μ . Vitelline follicles oval, divided into two lateral series, 14–16 on each side, each series commencing a short distance behind middle of body and terminating at level of intestine. The right vitelline duct passes down dorsal to the ovary, while the left one, running down along the left side of the intestine and then between the cirrus pouch and the intestine dorsal to the uterus, turns forward at right angles to join its fellow dorsal to the anterior testis near its anterior end; the common duct runs obliquely backward at right angles to the right and left vitelline ducts which are on the same line, and unites with the germiduct dorsal to the anterior testis.

Excretory pore dorsal, 18 μ in front of terminal genital pore in the type; extent of vesicle not determined.

This species is characterized by the possession of a very long neck, to which the specific name refers. In this respect it bears a certain resemblance to *Prosorhynchus freitasi* Nagaty, 1937, but differs from this in the intestine being directed backward instead of forward, and in the reproductive organs being confined to the posterior quarter of the body.

2. *Rhipidocotyle khalili* Nagaty, 1937

Habitat. Small intestine and pyloric appendages of *Sphyaena* sp.

Material and locality. 5 gravid specimens fixed, stained and mounted as usual; Macassar.

Body slender, tapering anteriorly, 2.0-4.8 mm long, 0.23-0.3 mm broad; cuticle beset all over with very small spines. Rhynchus muscular, 105-150 μ long by 100-150 μ broad; truncated in front and rounded behind, with a pair of lappets like a lying-down collar and a central depression on the ventral side, and three small conical projections on the anterior margin: one of the projections lying middorsally and the others one each on the lateral edge. Pharynx 48-90 \times 51-84 μ , at or near middle of body. Intestine turning backward just in front of pharynx, terminating at level of ovary.

Testes subglobular, contiguous, obliquely tandem, 0.12-0.2 \times 0.12-0.18 mm, situated at junction of middle with posterior third of body or a little further behind. Cirrus pouch subcylindrical, provided with well developed longitudinal muscle, 0.45-0.7 \times 0.066-0.12 mm, containing oval vesicula seminalis 60-140 μ long, well developed pars prostatica surrounded by prostate cells, and a lobed cirrus projecting into genital atrium, reaching as far forward as posterior testis. Genital atrium, 90-140 μ in diameter at its dilated base, opening ventrally near rounded posterior extremity.

Ovary subglobular, 95-180 \times 78-150 μ , situated between pharynx and anterior testis, usually a little nearer to the latter than to the former.

The initial portion of the uterus, containing abundant sperm, is convoluted between the ovary and the anterior testis. This is what Nagaty mistook for the receptaculum seminis. Ascending uterus usually reaching to middle of anterior third of body but may extend only a short distance beyond the pharynx in young individuals; descending uterus forming a loop behind base of genital atrium when fully developed. Eggs oval, 21-23 \times 13-15 μ . Vitelline follicles commencing on each side at the same level a little behind pharynx, terminating on the right at level of anterior testis, but on the left a little more posteriorly at level of posterior testis or anterior end of cirrus pouch; right follicles numbering 13-14, left ones 19-21.

Excretory vesicle tubular, long, reaching a considerable distance beyond pharynx; in young individuals it may well extend beyond the anterior end of the uterus; pore terminal.

The cuticular spines of Nagaty's specimens have fallen off evi-

dently before the fixation. Evanescent as they are, they having been fixed never disappear during the process of staining and mounting.

ALLOCREADIIDAE Stossich, 1904

3. *Helicometra epinepheli* Yamaguti, 1934

Habitat. Small intestine of *Serranus merra* (Bloch).

Material and locality. Two gravid specimens; Macassar.

Body spatulate, 1.95–2.25 mm long, 0.5–0.6 mm broad at middle. Oral sucker 0.12–0.13×0.125–0.15 mm. Pharynx 54–87×90–114 μ ; esophagus 0.11–0.2 mm long; acetabulum 0.22–0.24 mm in diameter, at junction of anterior with middle third of body. Testes tandem, indented, 0.13–0.16×0.16–0.2 mm, anterior testis at junction of middle with posterior third of body; cirrus pouch slender, slightly undulating, reaching to anterior part of acetabulum, 0.27–0.35 mm long by 70–75 μ wide. Genital pore ventral to esophagus at level of its middle or posterior end.

Ovary coarsely trilobate, 0.14–0.15×0.19 mm, immediately in front of anterior testis, median; receptaculum seminis retort-shaped, 60–80 μ wide, anterolateral to ovary. Eggs with polar filament, averaging 50 μ long by 35 μ wide. Vitellaria extending in lateral fields from level of intestinal bifurcation to posterior extremity.

The above measurements fall within the limits of variations given for this species in 1934, 1940 and 1942, though the testes are a little smaller than they are in the original specimens.

4. *Opechona scombri* Yamaguti 1938

A single gravid specimen from intestine of *Scomber kanagunta* (Russel); Macassar. As fixed in acetic sublimate, stained and mounted as usual, it gave the following measurements.

Body lancet-shaped, 1.35×0.4 mm, covered all over with minute spines. Pigment granules scattered in anterior part of body. Oral sucker 70 μ in diameter; acetabulum 95 μ in diameter, placed at junction of anterior with middle third of body. Testes median, tandem, 130–150×135–140 μ ; anterior testis at junction of middle with posterior third of body. Cirrus pouch club-shaped, 0.18×0.05 mm, containing round seminal vesicle, strongly muscular

pars prostatica and ductus ejaculatorius. Genital atrium wide, anterosinistral to acetabulum, with comparatively large aperture provided with circular muscle. Ovary globular, $90\ \mu$ in diameter, nearly median, pretesticular. Receptaculum seminis ovoid, $90 \times 60\ \mu$, situated in the right submedian line between ovary and anterior testis. Uterus coiled in intercecal field between ovary and metraterm, containing 16 eggs; metraterm arcuate, muscular, 0.13 mm long, forming at its distal end a bulbous dilatation $66\ \mu$ wide. Eggs $57 - 60\ \mu$ long. Vitelline follicles surrounding ceca on all sides, extending from level of posterior end of acetabulum to posterior extremity; vitelline reservoir between ovary and anterior testis. Excretory vesicle long, tubular, surrounded by accompanying cells at its dorsoterminal opening.

As compared with the type the present specimen is more elongate, and the ovary and testes are globular, probably because a much lighter pressure was applied to the cover glass at the time of fixation.

5. *Pseudopcoeloides tenuis* Yamaguti, 1940

Habitat. Small intestine of *Priacanthus hamrur* (Bleeker).

Material and locality. 7 mature specimens fixed in acetic sublimate under slight cover glass pressure, stained and mounted in toto; Macassar.

Body $5.8 - 10.8 \times 0.37 - 0.55$ mm. Oral sucker $0.22 - 0.33 \times 0.21 - 0.3$ mm, Prepharynx up to $75\ \mu$ long. Pharynx $0.12 - 0.15 \times 0.11 - 0.156$ mm. Esophagus up to 0.15 mm long. Ceca opening into excretory vesicle at posterior extremity. Acetabulum oval, with slit-like aperture, $0.09 - 0.12 \times 0.11 - 0.156$ mm, retracted into its peduncle, latter $0.25 - 0.6$ mm long, $0.065 - 0.12$ mm in diameter at its narrowest part, with fine circular wrinkles unless it is extended, containing powerful retractor of acetabulum.

Testes elliptical, fusiform or rhomboid, $0.62 - 0.81 \times 0.26 - 0.35$ mm, $0.025 - 0.32$ mm apart from each other; anterior testis at or near midbody; posterior testis at posterior end of middle third of body or at its junction with posterior third. Vesicula seminalis $0.3 - 0.55 \times 0.08 - 0.12$ mm, reaching as far back as middle of anterior third of body, or a little more posteriorly. Genital pore at level of posterior end of oral sucker.

Ovary ovoid to elliptical, $0.23 - 0.35 \times 0.15 - 0.22$ mm, pre-equa-

torial, 0.11–0.7 mm in front of anterior testis. Uterus more intricately coiled posteriorly than anteriorly; eggs $48-60 \times 33-39 \mu$. Vitelline follicles extending along ceca from about middle of anterior third to posterior extremity, interrupted on each side of shell gland or ovary and testes.

SCHISTORCHIIDAE Yamaguti, 1942

6. *Schistorchis sigani* Yamaguti, 1942

A single not yet fully gravid specimen of this species was found in the intestine of *Siganus* sp. from Macassar fish market. Since a full account of this species has been given in my description of 1942 any further comment will be unnecessary.

The measurements made on the present material are as follows:

Body 7.7×1.5 mm; oral sucker 0.45×0.55 mm; pharynx 0.2×0.3 mm; acetabulum 0.5×0.5 mm; testes 11 in number, $0.175-0.23 \times 0.15-0.33$ mm; vesicula seminalis 1.15×0.21 mm; ovary 0.18×0.25 mm; receptaculum seminis 0.15 mm in diameter; eggs $78 \times 45 \mu$.

7. *Apocreadium synagris* n. sp.

Pl. III, Fig. 12.

Habitat. Small intestine of *Synagris taeniopterus* (Valenc.).

Material and locality. 5 mature and 3 immature specimens; Macassar.

Body lanceolate, with blunt-pointed extremities, 2.3–5.3 mm in length, 0.4–1.05 mm in maximum width in ovariotesticular region, covered with spines all over, though sparsely toward posterior extremity. Preoral lobe indistinct. Oral sucker subterminal, $0.15-0.28 \times 0.18-0.3$ mm. Prepharynx 50–200 μ long. Pharynx subglobular to barrel-shaped, three-lobed in front, $0.1-0.18 \times 0.095-0.16$ mm. Esophagus short, bifurcating about midway between two suckers. Ceca narrow, terminating at posterior extremity. Acetabulum 0.19–0.5 mm in diameter, situated at second sixth of body.

Testes usually longer than wide, indented on each side, $0.29-0.9 \times 0.17-0.53$ mm, placed one immediately behind the other in middle third of body; the anterior may be wider than long in contracted examples, in which the posterior is, however, longer

than wide and may intrude into the posterior third of the body. The vas deferens arises from the pre-equatorial side of each testis; the right one passes along the left border of the ovary, and the left one dorsal to the uterine coils, both opening together into the vesicula seminalis at its posterior end. Vesicula seminalis sub-cylindrical, slightly curved, 0.13-0.33 mm long, 0.075-0.2 mm wide, extending from dorsolateral side of acetabulum to near ovary, from which it is separated by the receptaculum seminis, sharply constricted off from pars prostatica, which is cylindrical and measures about 0.1 mm long by 20 μ wide in the specimen 5.3 mm long. Prostate cells poorly developed around pars prostatica. Ductus hermaphroditicus shorter than half diameter of acetabulum. Genital pore immediately anterior to acetabulum.

Ovary subglobular, 0.1-0.28 \times 0.1-0.25 mm, on the right of median line behind acetabulum. The germiduct arising from the dorsal posteromedial part of the ovary forms a bulbous dilatation before joining the receptaculum seminis and Laurer's canal, and then describing a U-shaped curve unites with the common vitelline duct coming from behind. Uterus coiling forward on left of ovary. Eggs oval, about 90 \times 60 μ . Laurer's canal arising from the point where the germiduct joins the seminal receptacle, describing an S-shaped curve and opening dorsally sinistral to ovary. Shell gland well developed between ovary and anterior testis. Receptaculum seminis elongate saccular, extending along left border of ovary with its dilated anterior end 65-130 μ wide immediately in front of this organ. Vitelline follicles small, extending in lateral fields from behind acetabulum to posterior extremity, confluent in post-testicular field. They may commence at the genital pore, or at the level of the acetabulum on one side, and some follicles may form an isolated group around or on one side of the genital pore: the transverse vitelline ducts unite together immediately in front of the anterior testis without forming a definite reservoir.

Excretory vesicle tubular, with terminal pore, reaching to posterior end of hind testis, where the paired collecting vessels are given off. The lymph system as demonstrated by Manter for *Apocreadium mexicanum* and *A. longisinosum* has not been detected with certainty.

The present species resembles *A. balistis* Manter, 1947, and *A. mexicanum* more closely than *A. longisinosum*, but differs from

them distinctly in egg size. The measurements of body size, suckers and eggs between the species in question and the American representatives are shown in the following table.

	<i>A. synagris</i>	<i>A. mexicanum</i>	<i>A. longisinosum</i>	<i>A. balistis</i>
Body	2.3 - 5.3 × 0.4 - 1.05	2.15 - 4.1 × 0.75 - 1.1	6.57 - 9.65 × 1.55 - 2.4	3.73 × 0.62
Diameter of oral sucker	0.18 - 0.3	0.225 - 0.315	0.375 - 0.532	0.255
Diameter of ace- tabulum	0.19 - 0.5	0.352 - 0.502	0.675 - 0.885	0.35
Eggs	90 - 60 μ	61 - 67 × 31 - 34 μ	88 - 102 × 48 - 60 μ	73 - 78 × 49 μ

FELLODISTOMIDAE Nicoll, 1913

8. *Symmetrovesicula chaetodontis* Yamaguti, 1938

A single fully gravid specimen of this species was found in the intestine of *Chaetodon* sp. at Macassar.

The measurements given below will serve to extend the ranges of variation of the species.

Body lanceolate, 7.25 mm long by 1.15 mm broad. Subcuticular cells grouped into small, uniformly scattered patches. Oral sucker subterminal, 0.325 × 0.325 mm. Prepharynx very short, entirely covered up by ventral posterior border of oral sucker. Pharynx somewhat enlarged behind its middle, 0.2 mm long by 0.188 mm broad. Anterior portion of esophagus narrow, lined with thick smooth cuticle; wider greater posterior portion lined with epithelia, bifurcating behind acetabulum. Ceca terminating outside excretory tubes, about 0.6 mm from posterior extremity. Acetabulum 0.575 mm in diameter, just behind middle of anterior third of body. Testes subglobular, only slightly indented, situated one obliquely behind the other in front of middle of body; the left anterior measuring 0.25 × 0.288 mm and the right posterior 0.23 × 0.275 mm. Cirrus pouch fusiform, 0.5 × 0.17 mm, containing bipartite vesicula seminalis, pars prostatica surrounded by strongly developed prostate cells. Cirrus unarmed, projecting out of genital atrium. Genital pore inside left excretory tube a little in front of acetabulum. In my previous description of the species I have

made an error in stating that it opens " at junction of anterior with middle third of body ". For this passage read " at junction of first with second sixth of body ".

Ovary subglobular, 0.26×0.225 mm, situated a little to right of median line at posterior end of anterior third of body in contact with right excretory tube. Ootype about midway between ovary and vitelline reservoir. Uterine coils passing between testes, reaching to near posterior extremity a little beyond cecal termination. Eggs elongate oval, thick-shelled, $36 - 44 \times 20 - 26 \mu$. Vitelline rosettes arranged in longitudinal series, 6 on the right, 7 on the left; right gland commencing at level of anterior end of right posterior testis, left gland commencing at level of posterior end of this testis. Vitelline reservoir median, small, triangular, 0.175 mm behind ovary. Excretory tubes symmetrical, with sinuous wall, extending from posterior extremity to sides of oral sucker, crossing ceca between ovary and testes.

MONORCHIIDAE Odhner, 1911

9. *Lasiotocus lethrini* n. sp.

Pl. I, Fig. 4.

Habitat. Small intestine of *Lethrinus* sp. (type host) and *Diagramma* sp.

Material and locality. 4 gravid specimens from the first host and five more from the second host; fixed in acetic sublimate, stained and mounted as usual; Macassar.

Body delicate, elongate, somewhat fusiform, 1.35-2.4 mm in length, with maximum breadth of 0.26-0.36 mm in acetabulotesticular region; forebody slender, with a long neck; hindbody tapering toward posterior end which is pointed in the well extended type but stumpy and corrugated in contracted paratypes. Forebody longer than hindbody, but may be shorter when contracted. Cuticle thin, beset with minute spines. Oral sucker terminal, $0.09 - 0.14 \times 0.11 - 0.16$ mm. Prepharynx very short or practically lacking. Pharynx $36 - 60 \times 57 - 72 \mu$. Esophagus narrow, 0.13-0.5 mm long, bifurcating at about junction of anterior with middle third of body. Ceca narrow, terminating at different levels some distance from posterior extremity. Acetabulum 75-100 μ in diameter, anterior or posterior to middle of body.

Testis oval, $0.27 - 0.36 \times 0.1 - 0.22$ mm, posterodorsal to acetabulum. Cirrus pouch thin-walled, $0.44 - 0.6$ mm long by $68 - 100 \mu$ broad, containing oval to elliptical vesicula seminalis, pars prostatica surrounded by well developed prostate cells, and cirrus, extending arcuately from dorsal side of ovary to genital atrium, with height of convexity immediately behind cecal bifurcation. Cirrus occupying half length and almost entire breadth of cirrus pouch, covered throughout with sharp spines which are up to 20μ long at the proximal end of the cirrus and become gradually smaller toward the genital atrium. Between the cirrus and the pars prostatica is a short narrow ductus ejaculatorius. Genital atrium covered inside with spines similar to those of the female terminal organ, opening a little in front of acetabulum.

Ovary oval, entire, $80 - 150 \times 70 - 100 \mu$, situated between testis and proximal end of cirrus pouch. Receptaculum seminis and Laurer's canal absent. Uterus winding between cirrus pouch and posttesticular region, covering testis and ovary ventrally, leaving a considerable free space at posterior end of body. Receptaculum seminis uterinum conspicuous. The terminal portion of the uterus lying in the concavity of the cirrus pouch leads by a very narrow passage into the retort-shaped terminal organ $45 - 72 \mu$ wide, which lies alongside the distal portion of the cirrus pouch and is covered with spines $5 - 11 \mu$ long. These spines are less numerous than those of the cirrus, but extend directly into the genital atrium. Eggs oval, embryonated, measuring $21 - 25 \times 13 - 15 \mu$ in mounted condition. Vitellaria divided into few coarse lobules, extending on dorsolateral sides from level of posterior portion of cirrus pouch to level of testis.

Excretory vesicle subcylindrical, about 0.15 mm long by 35μ wide when extended, giving off a pair of collecting vessels at its anterior end; pore terminal.

This species is characterized by the armature of the cirrus and of the terminal organ, and by the latter organ being connected with the uterus proper at its proximal end. That the uterine coils do not extend to the posterior extremity is also worth noting.

I take this opportunity to correct the lapsus calami made on page 386 in my paper of 1934. For *P. elongatum* read *P. plectorhynchi*.

HETEROPHYIDAE Odhner, 1911

10. *Paracryptogonimus acanthostomus* Yamaguti, 1934

Pl. IV, Fig. 13.

Habitat. Small intestine of *Lutianus* sp.

Material and locality. Two fully mature specimens, fixed in acetic sublimate under a cover slip, stained and mounted in toto; Macassar.

Body flattened cylindrical, blunt-pointed in front and rounded behind, 3-3.15 mm long, 0.82-0.87 mm broad at middle. Cuticle beset with extremely fine spines, which are for the most part unrecognizable owing to postmortem maceration. Dermal gland cells profuse in anterior half of body. Larval eye spot present on each side of esophagus. Oral sucker terminal, bowl-shaped, 0.15-0.18×0.25-0.26 mm, with a crown of simple spines which are 14-20 μ long by 3-5 μ broad at the base, and whose number is unable to determine since most of them have been lost. Prepharynx 0.16 mm long. Pharynx 0.09-0.1 mm long by 0.11-0.15 mm broad, with a wide cylindrical lumen and well developed circular muscle at its anterior part. Esophagus about 0.15 mm long, with longitudinal muscle, bifurcating at anterior part of second sixth of body. Ceca approaching each other as they pass by the testes on their medioventral side, terminating near posterior extremity alongside excretory vesicle. Acetabulum about 0.15 mm in diameter, mainly composed of radial muscle, embedded in encircling fold of body wall at posterior end of anterior third of body.

Testes subglobular, 0.26-0.36×0.24-0.31 mm, situated diagonally outside ceca; anterior testis on the right or left, at posterior end of middle third of body; posterior testis at anterior end of posterior third of body. Vesicula seminalis twisted, extending in median field dorsal to uterus between ovary and acetabulum, tapering anteriorly to ductus ejaculatorius which opens along with the uterus on the anterior border of the acetabulum into the genito-acetabular pouch formed by the above mentioned fold of the body wall.

Ovary consisting of numerous small, rounded or pyriform acini which are of varying sizes (20-80 μ in diameter) and closely massed together, assuming a moruloid appearance; 0.4-0.45 mm long by 0.25-0.36 mm broad, situated in ventral median field with its

center just behind midbody, overlapping posterior portion of seminal receptacle anteriorly and vitellarian branches laterally, separated from anterior testis by cecum only. The germiduct, arising from the middorsal surface of the ovary, proceeds forward a short distance and turns back on itself at its junction with the posterior end of the seminal receptacle to receive the short duct from the vitelline reservoir. The receptaculum seminis is longitudinally elongated and constricted into three unequal portions. The Laurer's canal arising from the junction of the germiduct with the posterior end of the seminal receptacle runs forward a short distance and turns backward on the left side of the junction of the middle with the posterior portion of the seminal receptacle, and after crossing the left vitelline duct dorsally describes a sigmoid curve which is surrounded by accompanying cells, and opens mid-dorsally at the level of the posterior portion of the ovary. It is fairly wide except at the distal end. The tubulo-acinous vitellaria form on each side of the body dorsal and lateral to the intestine a longitudinal series of bunches commencing at the level of the posterior end of the acetabulum and terminating at the level of the posterior end of the ovary; on the side of the anterior testis there are four bunches, of which the posteriormost reaches to the testis; on the other side there are four to six bunches and may reach a little more posteriorly. The descending uterus coils backward behind the anterior testis and reaching to near the posterior extremity leads into the ascending uterus. The latter winds its way forward posterior, medial, and then anterior, to the posterior testis on the ventral side of the intestine and vitellaria, and crossing the median line ventral to the seminal receptacle comes to the other side and descends to near the anterior testis, where it turns back on itself and takes its final course toward the genital pore. Eggs oval, $16-18 \times 10-11 \mu$.

Excretory vesicle Y-shaped, with terminal pore; stem very wide, dorsomedian, divided dorsal to posterior end of ovary; arms also fairly wide, crossing ceca ventrally at a level between acetabulum and intestinal bifurcation, approaching each other dorsally behind oral sucker.

The present worm is assigned to *P. acanthostomus* Yamaguti, 1934, though differing in the size of the body and of the organs.

I take this opportunity to correct my error made in my descrip-

tion of 1934. For the sake of comparison I have reexamined my original specimens of the genotype, and found that the alleged proximal vesicle of the seminal vesicle is really the seminal receptacle which has connection with the germiduct as well as with the Laurer's canal, and that some of the eggs are of the same size as the largest eggs in the present worm. The generic diagnosis of *Paracryptogonimus* should, therefore, be emended, so far as the seminal vesicle and receptaculum seminis are concerned.

GYLIAUCHENIDAE Ozaki, 1933

11. *Gyliauchen nahaensis* Ozaki, 1937

Habitat. Small intestine of *Teuthis* sp.

Material and locality. Numerous gravid specimens fixed in acetic sublimate under cover glass pressure, stained and mounted; Macassar.

Body 1.65 - 2.4 mm long, 0.58 - 0.75 mm thick. Oral sucker 0.13 - 0.19 × 0.1 - 0.15 mm, pharynx 0.15 - 0.25 × 0.13 - 0.3 mm. Ceca 0.4 - 0.55 × 0.14 - 0.21 mm. Acetabulum 0.25 - 0.36 mm in diameter. Testes globular to oval, sometimes indented, 0.11 - 0.23 × 0.1 - 0.2 mm. Ovary subglobular, 60 - 110 × 60 - 100 μ . Receptaculum seminis 0.16 - 0.2 × 0.11 - 0.15 mm. Eggs 75 - 81 × 42 - 48 μ in life.

12. *Gyliauchen papillatus* (Goto et Matsudaira, 1918)

This species has been found not uncommonly in the intestine of *Siganus* sp. at Macassar. Since it has been dealt with in details no further comment is necessary. The asymmetrically oval eggs measured in life 72 - 84 × 42 - 54 μ .

HEMIURIDAE Lühe, 1901

13. *Parahemiurus clupeae* n. sp.

Pl. II, Flg. 5.

Habitat. Stomach of *Clupea clupeioides*.

Material and locality. Four gravid specimens; Macassar.

Body cylindrical, 3.7 - 4.9 mm in total length, 0.5 - 0.73 mm in maximum width in front of tail invagination which occurs a little behind the midbody in three specimens including the type, but just at the midbody in the other. In the latter specimen the body

proper is telescoped into the tail for a distance of 0.13 mm, and the ovary lies just at this point of invagination. Tail $1.6-2.2 \times 0.48-0.65$ mm, blunt-pointed. Cuticular denticulations present on whole surface of body proper. Oral sucker subterminal, $0.15-0.175 \times 0.17-0.2$ mm; pharynx $93-105 \times 87-95 \mu$; esophagus very short, with fine longitudinal muscle fibers, curved dorsad to bifurcate into intestinal limbs, which are very wide except at the commencement and terminate close to the posterior extremity. Acetabulum $0.22-0.275$ mm in diameter, situated just in front of middle of anterior third of body.

Testes subglobular, $0.175-0.33 \times 0.2-0.31$ mm, directly tandem with their longitudinal axis only a little oblique to that of body; anterior testis at junction of anterior with middle third of body. Vesicula seminalis fusiform $0.32-0.4 \times 0.11-0.2$ mm, with extremely thick ($25-50 \mu$) wall of diagonal muscle fibers situated longitudinally or a little obliquely in front of anterior testis with its posterior end on a level with the anterior end of the latter. Pars prostatica $0.45-0.78$ mm long, $15-27 \mu$ wide at its somewhat sinuous posterior portion, $6-12 \mu$ wide and devoid of prostate cells at its anterior end; ductus hermaphroditicus $0.28-0.39$ mm long, enclosed in a sheath of strong longitudinal muscle, extending from level of anterior end of acetabulum to that of posterior end of oral sucker.

Ovary subglobular $0.13-0.2 \times 0.2-0.26$ mm, equatorial or pre-equatorial. In the type the receptaculum seminis lying postero-dorsal to the ovary is 20μ in diameter and connected with the germiduct by a narrow duct about 40μ long. Vitellaria subglobular, oval or rounded triangular, not indented, $0.18-0.31 \times 0.13-0.25$ mm. Receptaculum seminis uterinum behind vitellaria. Uterus reaching to a point $0.75-1.2$ mm from posterior extremity, coiled between ovary and posterior testis, and dorsal or dorsolateral to testes and vesicula seminalis. Eggs embryonated, asymmetrically elliptical, usually $18-21 \times 9-11 \mu$; some may be as small as 15μ by 8μ . Excretory system as usual.

This species is the largest of all known members of the genus, and characterized by the unusually long tail, the very strongly muscular vesicula seminalis, the small egg size, etc.

In the discussion of the *Parahemiurus* species Manter states that the thickness of the wall of the seminal vesicle varies greatly according to the volume of sperm cells within it. It is true to a

certain extent, but in any of the numerous paratypes of *P. harengulae* the wall of the seminal vesicle is never so thin ($5-15\ \mu$ thick), though distended with sperm, as it is ($3-4\ \mu$ thick) in *P. atherinae*, and the eggs are distinctly longer and more bowed than those of the latter species. The cuticular denticulations, to which much importance is attached by Manter, extend in *P. harengulae* all over the dorsal surface as far back as the vesicula seminalis, while they are absent in *P. merus* (Linton) dorsally at this level. Furthermore, Manter gives the egg size for *P. merus* as varying from 18 to $34\ \mu$ in length and 8 to $14\ \mu$ in width. Such variations as $16\ \mu$ in length and $6\ \mu$ in width are too great as compared with any other members of the genus which show rather limited ranges of variation. It seems to me, therefore, that he has included different species in one and the same species. In spite of Manter's controversy I am still convinced of specific, at least subspecific, distinction between *Parahemiurus harengulae* mihi and *P. merus* (Linton).

14. *Aphanurus harengulae* Yamaguti, 1938

Habitat. Stomach of *Clupea clupeioides*.

Material and locality. 5 mature specimens; Macassar.

Body $0.9-1.2 \times 0.2-0.3$ mm, blunt-pointed in front, rounded behind. Oral sucker ventroterminal, $45-60 \times 56-78\ \mu$, pharynx $24-36 \times 33-42\ \mu$. Ceca wide, terminating near posterior extremity. Acetabulum $0.13-0.17$ mm in diameter, at posterior half of anterior third of body. Testes ovoid, obliquely tandem, $50-80 \times 65-135\ \mu$; anterior testis at about middle of body. Vesicula seminalis oval, $60-120 \times 50-100\ \mu$, overlying anterior testis; pars prostatica provided with longitudinal muscle fibers. Ductus hermaphroditicus enclosed in cylindrical muscular pouch, $80-100\ \mu$ long. Genital pore ventral to posterior end of oral sucker. Ovary and vitelline gland transversely elongated (probably owing to pressure applied on cover glass), $60-90 \times 100-170\ \mu$ and $70-150 \times 130-180\ \mu$ respectively; uterus reaching to near posterior extremity, and then running forward dorsolateral to vitelline gland and ovary, may or may not pass between ovary and posterior testis as well as between two testes. Eggs elliptical, thin-shelled, embryonated, $21-22 \times 9-12\ \mu$ in mounted condition. Excretory trunk divided at level of anterior testis, arms uniting dorsal to oral sucker or pharynx.

Though not quite agreeing in measurements the present worm

may be assigned to *Aphanurus harengulae* Yamaguti, 1938, but not to *A. stossichi* (Montic.) Looss, 1907 on account of difference in egg size.

15. *Aphanurus dorosomatis* n. sp.

Pl. II, Fig. 6.

Habitat. Stomach of *Dorosoma chacunda* (Hamilt. et Buchan.).

Material and locality. Two gravid specimens; Macassar.

Body cylindrical, slender, with blunt-pointed extremities, 1.45–1.6 mm long by 0.16–0.17 mm broad. Cuticle smooth, without denticulations. Oral sucker terminal, inclined ventrally, $60 \times 78 \mu$; pharynx globular, $36 \times 42 \mu$. Esophagus 30μ long by 30μ wide. Ceca wide, terminating at posterior extremity. Acetabulum 0.12–0.16 mm in diameter, situated behind middle of anterior third of body.

Testes ovoid, 60–90 μ in diameter, placed one obliquely behind the other in middle third of body; in the type the anterior testis lies dorsodextral to the uterus, while the posterior testis lies ventral to it just at the midbody. Vesicula seminalis oval, $65-90 \times 45-80 \mu$, situated at anterior part of middle third of body, with its posterior end overlapping anterior testis ventrally, provided with a thick wall of longitudinal muscle fibers which is thickest at the equator, attaining a maximum of 2.5–4.8 μ . Pars prostatica 0.37–0.4 mm long, 12–20 μ wide, surrounded throughout by prostate cells, united with uterus a little (40 μ in the type) in front of acetabulum. Ductus hermaphroditicus thin-walled, eversible, enclosed in tubular sheath-like hermaphroditic pouch which is 66–100 μ long by 12–15 μ wide and consists of comparatively weak longitudinal muscle fibers. In the type as well as in the paratype the ductus hermaphroditicus is evaginated in form of a smooth cirrus 12–15 μ in diameter. Genital pore midventral, at level of posterior end of pharynx.

Ovary subglobular, $80-90 \times 60-75 \mu$, situated ventrally a little behind middle of body. Vitelline gland irregularly oval, 0.12–0.16 mm long by 70–95 μ broad, placed longitudinally just behind ovary ventral to uterus at junction of middle with posterior third of body, with its dorsal side, except at the posterior part, fluted longitudinally. Receptaculum seminis uterinum posterior to vitelline gland. Uterus reaching to or near posterior extremity, winding forward

dorsal to vitelline gland, ovary, and posterior testis, ventrolateral to anterior testis and vesicula seminalis, and then alongside pars prostatica; eggs elongate oval, $17-18 \times 10-12 \mu$. Excretory pore terminal; excretory arms uniting dorsal to pharynx.

This species is distinguished from any of the known members of the genus by its slender body shape. *A. monolecithus* (Srivastava, 1941) Manter, 1947, has not been compared, since the original paper by Srivastava was inaccessible to me.

16. *Aponurus laguncula* Looss, 1907

Habitat. Intestine of *Megalaspis* sp.

Material and locality. Two whole mounts; Macassar.

Body subcylindrical, with blunt extremities, $1.15-1.25 \times 0.22-0.25$ mm. Cuticle smooth. Oral sucker subterminal, $90-100 \times 96-102 \mu$. Pharynx $30-45 \times 54 \mu$. Esophagus very short; ceca wide, terminating near posterior extremity. Acetabulum 0.18 mm in diameter, its center at anterior end of middle third of body.

Testes subglobular, $0.1-0.15 \times 0.12-0.135$ mm, situated ventrally one directly behind the other; anterior testis at about middle of body. Vesicula seminalis round or pyriform, $50-100 \mu$ in diameter, situated immediately in front of acetabulum. Pars prostatica tubular, only slightly curved, about 60μ long by 12μ wide, surrounded by prostate cells. Hermaphroditic pouch oval, thin-walled, $60 \times 36 \mu$; hermaphroditic duct about 50μ long, 6μ wide at posterior end, 10μ wide at its middle portion, provided with circular and longitudinal muscles. Genital pore just ventral to posterior end of pharynx.

Ovary subglobular, $0.075-0.1 \times 0.12-0.15$ mm, at junction of middle with posterior third of body. Receptaculum seminis between and dorsal to ovary and posterior testis. Vitellaria immediately posterior to ovary, divided into seven rounded lobes measuring $60-90 \times 35-80 \mu$. Uterus filling most of hindbody; eggs oval, $24-27 \times 13-16 \mu$. Excretory arms uniting dorsal to pharynx.

17. *Aponurus synagris* n. sp.

Pl. IV, Fig. 14.

Habitat. Intestine of *Synagris taeniopterus* (Valenc.).

Material and locality. 15 gravid specimens fixed in acetic sublimate, stained and mounted as usual; Macassar.

Body subcylindrical, 0.65-1.3 mm long, with maximum breadth of 0.2-0.35 mm at ovarian level; forebody more tapered than hindbody. Cuticle smooth. Oral sucker subterminal, $33-78 \times 54-90 \mu$; pharynx $27-60 \times 40-60 \mu$. Esophagus very short; ceca wide, reaching to posterior extremity. Acetabulum 0.11-0.18 mm in diameter, situated at junction of anterior with middle third of body.

Testes globular, 0.065-0.14 mm in diameter, lying symmetrically or a little obliquely behind acetabulum at middle of body or only a little more anteriorly, not contiguous to each other. Vesicula seminalis retort-shaped or somewhat convoluted, with the broad base just in front of acetabulum, $0.075-0.2 \times 0.04-0.13$ mm. Pars prostatica turned backward from anterior end of seminal vesicle and then running forward, penetrating hermaphroditic pouch close to its posterior end to open into the posterior dilated portion of hermaphroditic duct from dorsal side, about 0.2 mm long in the type, surrounded by well developed prostate cells. Hermaphroditic pouch elongate oval, $42-81 \mu$ wide, with moderately thick wall of inner circular and outer longitudinal muscles; hermaphroditic duct thin-walled, dilated posteriorly to a width of $20-27 \mu$, often protruded outside in form of a cirrus which measures up to 70μ long and 27μ broad at the base. Genital pore ventral to posterior end of pharynx.

Ovary subglobular, $0.06-0.13 \times 0.065-0.105$ mm, situated at posterior end of middle third of body in median line or slightly to one side of it. Receptaculum seminis round, conspicuous, antero-lateral and slightly dorsal to ovary and between this and right or posterior testis, about 90μ in diameter in the type. Vitelline gland immediately behind ovary, divided into 7 rounded or oval, closely massed lobes measuring $65-110 \mu$ by $45-80 \mu$. The uterus, occupying all available space in the hindbody, opens into the hermaphroditic duct at its posterior end, so that the latter appears as if it were the direct continuation of the former; eggs elliptical, $30-39 \times 15-18 \mu$. Excretory arms uniting dorsal to pharynx. The posterior end of the body where the excretory pore lies may be produced backward prominently.

This species differs from *A. laguncula* Looss, 1907, in the exactly or nearly symmetrical position of the testes, in the much longer, more curved pars prostatica, in the more muscular herma

phroditic pouch, and in the greater length of the eggs, and from *A. vitellograndis* Layman, 1930, *A. rhinoplagusiae* Yamaguti, 1934, and *A. callionymi* Yamaguti, 1938, in the smaller size of the body and of the principal organs. In *A. sphaerolecithus* Manter, 1925, the eggs are very large, measuring 56–75 μ by 26 μ . *A. intermedius* Manter, 1934, possesses much larger oral and ventral suckers than in the present species though agreeing in egg size. *A. trachinoti* Manter, 1940, is characterized by the small, pyriform eggs as well as by the almost straight tubular seminal vesicle. In *A. acropomatis* Yamaguti, 1938, the body and organs are larger except the testes, which lie directly tandem in contrast with those in the species in question, and the hermaphroditic pouch is thin-walled. *A. brevicaudatus* Yamaguti, 1934, may be safely excluded from comparison on account of remarkable shortness of the postvitellarian region.

18. *Lecithochirium priacanthi* n. sp.

Pl. III, Fig. 11.

Habitat. Stomach of *Priacanthus hamrur* (Bleeker).

Material and locality. A single whole mount; Macassar.

Body 2.3 mm long by 0.68 mm; forebody conical, tapered to an obtuse point; hindbody cylindrical; tail retracted, with blunt end, 0.525 mm long by 0.35 mm broad at base. Cuticle smooth, not wrinkled. Preoral lobe not prominent. Preacetabular pit with well developed radial muscle, appearing like a sucker though not provided with outer limiting membrane, 0.105 mm in outside diameter, directed anteroventrally, with its center 0.12 mm in front of acetabulum. Oral sucker subterminal, 132 \times 165 μ . Pharynx 75 \times 90 μ . Esophagus compressed, 90 μ wide, bifurcating dorsal to itself. Ceca wide, terminating just in front of base of tail. Acetabulum 0.4 mm in diameter, at posterior part of anterior third of body; sucker ratio 1 : 2.7.

Testes ovoid, 0.18–0.2 \times 0.22–0.25 mm, situated one obliquely behind the other at anterior half of middle third of body, separated from each other by uterine coils. Vesicula seminalis divided into three portions; the largest posterior portion 0.125 mm wide, reaching to level of anterior border of acetabulum, with a shallow constriction between itself and the middle portion which in turn is deeply constricted off from the smallest anterior portion, whose ventral end is produced into a transverse duct leading into the pars

prostatica. Though the pars prostatica is divided into two vesicles the proximal vesicle appears to be lined with cuticle (?), whereas the distal vesicle has a typical epithelial lining and is surrounded distally by few muscle fibers which are continued on to the hermaphroditic duct. The prostate cells are massed on either side of the pars prostatica, with their ducts directed convergently toward the constriction between the two prostatic vesicles. Ductus ejaculatorius practically lacking. Hermaphroditic duct provided with circular and longitudinal muscles, projecting into genital atrium, which has a very wide (50 μ) transversely elongated aperture immediately behind the esophagus.

Ovary oval, 0.15 \times 0.24 mm, a little to left of median line at posterior end of middle third of body. Vitellaria consisting of seven elliptical lobes which are divided into two groups of three (on the right) and four (on the left) respectively just at junction of middle with posterior third of body. Uterus not extending into tail, with its main bulk between ovary and testes; metraterm with a sphincter-like muscular thickening at its posterior end dextrodorsal to acetabulum, running forward dorsal to pre-acetabular pit and ventral to pars prostatica. Eggs oval, 20-22 \times 12-15 μ . Excretory arms uniting dorsal to pharynx.

This species resembles *Lecithochirium magnaporum* Manter, 1940, very closely in the possession of a large genital pore and of a muscular pre-acetabular pit, but differs in the pars prostatica being bipartite, in the eggs being definitely larger, etc. From *L. microstomum* Chandler, 1935, it can easily be distinguished by the large genital pore and the sucker-like pre-acetabular pit. In *L. synodi* Manter, 1931, the "sinus sac" is complete and encloses the anterior prostatic vesicle, whereas in the present species there is a muscular hermaphroditic duct instead of Manter's sinus sac. In *L. acutum* Chauhan, 1945, from Indian *Arius fulcarius* the eggs are 15 μ by 10 μ on the average.

19. *Lecithochirium longicaudatum* n. sp.

Pl. III, Fig. 10.

Habitat. Stomach of *Saurida argyrophanes* Richardson.

Material and locality. Two gravid specimens fixed in acetic sublimate, stained and mounted; Macassar.

Body robust, with tail a little longer than body proper, 7.4-10.0 mm in length, 1.7-2.0 mm in maximum width just in front of tail invagination. Cuticle folded transversely, especially on tail. Preoral lobe prominent, 0.07-0.1 mm thick, without special projection. No pre-acetabular pit. Oral sucker subterminal, $0.28-0.4 \times 0.38-0.45$ mm. Pharynx $0.125-0.16 \times 0.13-0.18$ mm. Esophagus short, turned dorsally. Ceca wide, terminating at posterior extremity. Acetabulum 0.75-1.0 mm in diameter, its center just behind middle of anterior third of body.

Testes subglobular, $0.35-0.4 \times 0.3-0.35$ mm, situated a little obliquely behind acetabulum, the right one being posterior and slightly larger. Vesicula seminalis sigmoid, tapering anteriorly, constricted into three portions measuring 0.1 mm, 0.16 mm and 0.23 mm in diameter respectively; the largest posterior portion lies just in front of the acetabulum. Pars prostatica flask-shaped, 80μ in width, with compact mass of prostate cells on each side. Ductus hermaphroditicus appearing like direct continuation of metraterm, but provided, besides longitudinal muscle, with a little more strongly developed circular muscle than that of metraterm, widened out distally and continued into genital atrium which opens outside just behind the intestinal bifurcation.

Ovary round, somewhat lobed or entire, $0.25-0.53 \times 0.38-0.51$ mm, situated only slightly to right of median line at anterior part of middle third of body; in the type it lies a little in front of the tail invagination, and in the paratype just at this point. Vitellarian lobes slender, digitiform, 4 on the right and 3 on the left; in the paratype one of the left lobes is forked distally. Slender vitelline ducts uniting together in shell gland which lies immediately posterior to the ovary. Receptaculum seminis uterinum present. Uterine coils extending into tail for a considerable distance; in the paratype they reach to near the posterior extremity. Metraterm ventral to vesicula seminalis, apparently without sphincter. Eggs elliptical, $18-22 \times 9-12 \mu$. Excretory pore terminal, arms uniting dorsal to pharynx.

This worm is characterized by the body being definitely large, and by the tail being unusually long. In these respects it resembles *L. polynemus* Chauhan, 1945, but differs from the latter in possessing no pre-acetabular pit as well as in the vitellarian lobes being longer and slender.

20. *Lecithocladium parviovum* n. sp.

Pl. II, Fig. 7.

Habitat. Stomach of *Scomber kanagunta* (Russel).

Material and locality. A single whole mount; Macassar.

Body slender, 6.86 mm long, 0.68 mm wide at level of ovary just in front of tail invagination; anterior extremity truncate, posterior extremity blunt-pointed. Oral sucker terminal, finger-bowl-shaped, 0.27×0.35 mm, ventral border very deeply incised on each side of median line; median lobe semicircular, 0.13 mm broad. Pharynx subcylindrical, 0.21×0.17 mm. Ceca wide, terminating near posterior extremity. Acetabulum 0.225×0.27 mm, situated near anterior extremity with its anterior border 0.12 mm behind pharynx.

Testes ovoid, $0.2 - 0.21 \times 0.16 - 0.175$ mm, situated one behind the other at posterior end of anterior third of body. Vesicula seminalis subelliptical, 0.41×0.15 mm, with very thick wall of oblique muscle fibers, overlapping anterior testis posteriorly. Pars prostatica $27 - 42 \mu$ wide proximally, 15μ wide distally, convoluted between vesicula seminalis and acetabulum, uniting with uterus dorsal to acetabulum. Ductus hermaphroditicus 0.54 mm long, somewhat undulating, enclosed in a weakly muscular sheath, opening ventral to posterior end of oral sucker.

Ovary subglobular, 0.25×0.21 mm, situated a little in front of midbody. The germiduct arising from the middle of the posterior border of the ovary proceeds backward a short distance and curving slightly to the left unites with the duct from the receptaculum seminis. At this point of junction it turns backward at right angles and soon joins the common vitelline duct. The shell gland lying immediately behind the ovary at the tail invagination is a round compact mass, which is enclosed in a membranous capsule 0.15 mm in diameter, and in which the germiduct, the receptaculum seminis, the common vitelline duct, and the commencement of the uterine duct are embedded. The uterine duct is very narrow at the beginning, but as it turns back on itself it becomes wider and is provided with very fine circular muscle fibers for a short distance before emerging from the compact mass of the shell gland as if a certain function, such as expulsion of ova, might be ascribed to it in connection with the capsule of the shell gland. The formation

of the egg shell appears to take place in that portion of the uterine duct outside the shell gland. Receptaculum seminis subglobular, about $30\ \mu$ in diameter, situated in shell gland mass just dorsal to proximal portion of germiduct. Vitellarian tubules long, winding, $40 - 90\ \mu$ in diameter, three on the right and four on the left; one right and two left tubules extend a little more anteriorly than the ovary, while the remaining are directed backward, and one right and one left tubules reach as far as 1.0 mm back of the shell gland. The uterus descending on the left reaches to a level 1.5 mm from the posterior extremity, where it turns to the right to take an ascending course. The ascending uterus passes by the right side of the ovary and is thrown into convolutions between the ovary and the posterior testis, and then running forward dorsal to the testes, dorsolateral to the vesicula seminalis and pars prostatica opens into the ductus hermaphroditicus. Eggs oval, thick-shelled, embryonated, $13 - 15 \times 9 - 10\ \mu$. Excretory pore terminal; arms uniting dorsal to anterior end of pharynx.

This species is easily distinguished from any of the known members of the genus except *L. annulatum* Chauhan, 1945, by its unusually small egg size, hence the specific name. The deep submedian incisions of the oral sucker are also a very conspicuous feature. In *L. annulatum* the eggs are $12\ \mu$ long by $4.8\ \mu$ broad, and the tail invagination occurs further back of the ovary than in the present species.

21. *Lecithocladium megalaspis* n. sp.

Pl. III, Fig. 9.

Habitat. Stomach of *Megalaspis* sp.

Material and locality. A single whole mount; Macassar.

Body rather slender, 3.4 mm in whole length, with maximum breadth of 0.58 mm at vitellarian level. Cuticular denticulations prominent on body proper. Tail 1.3 mm long, tapering posteriorly to a rather sharp point, with smooth cuticle. Preoral lobe distinct. Oral sucker approximately funnel-shaped, 0.2 mm by 0.21 mm, with a membranous, medianly notched flap on its anterior ventral border. Ventral to this notch is another small transverse flap. Pharynx cylindrical, 0.15 mm long by $87\ \mu$ broad. Esophagus turned sinistrodorsad at right angles, provided with fairly well developed longitudinal muscle. Ceca wide, terminating near posterior ex-

tremity. Acetabulum 0.225 mm in diameter; situated just behind middle of anterior third of body.

Testes subglobular, 0.15-0.16×0.12-0.15 mm, placed ventrally one obliquely behind the other a little in front of midbody, with a uterine loop between. Vesicula seminalis elliptical, 0.35×0.12 mm, with a very thick (up to 36 μ) wall of somewhat spiral muscle fibers, extending obliquely from left side of anterior testis to a point 0.25 mm posterior to acetabulum. Pars prostatica winding a little posteriorly, 0.54 mm long, 12-22 μ wide, surrounded by prostatic cells throughout its length. Ductus hermaphroditicus 0.36 mm long, 28 μ wide at its somewhat enlarged posterior end, provided with a comparatively thick wall of longitudinal muscle fibers, extending almost straight from a point a little in front of acetabulum to posterior end of oral sucker, on the ventral side of which it opens to the outside.

Ovary subglobular, 0.15 mm long by 0.19 mm broad, lying a little behind midbody. Receptaculum seminis oval, 60×40 μ; immediately posterodorsal to ovary. Vitellaria consisting of three right and four left, long tubular lobes, some of which are subdivided near the tip. Uterus descending to middle of tail, describing between ovary and posterior testis a few transverse coils reaching to ventral cuticle, passing between two testes dorsally and then coiling forward along right side of vesicula seminalis and dorsal or dextrodorsal to posterior portion of pars prostatica, finally running straight by the right side of anterior portion of pars prostatica. Eggs elliptical, 18-20×10-12 μ. Excretory pore terminal, arms uniting dorsal to oral sucker.

This species differs from the most closely related *Lecithocladium glandulum* Chauhan, 1945, in lacking the "Nackenbuckel" of Rudolphi, in the vitellaria consisting of seven tubular lobes instead of eight, and in the length of the eggs. In Chauhan's species the eggs are 24 μ long on the average, whereas in the present species they vary from 18 μ to 20 μ in length.

22. *Lecithocladium angustiovum* n. sp.

Pl. I, Fig. 2.

Habitat. Stomach of *Scomber kanagunta* (Russel).

Material and locality. 7 mature specimens fixed in acetic sub-

limate under slight cover glass pressure, stained and mounted as usual; Macassar.

Body elongate, 2.5-4 mm in length, 0.32-0.55 mm in maximum width at tail invagination which occurs just at the middle of the body or a little more posteriorly. Tail 1.3-2.1 mm long, tapering posteriorly. Cuticular denticulations present on whole surface of body proper. It is worth while to note that the lateral cuticular folds curve backward to take a longitudinal direction at the ventral posterior end of the body proper, so that this small midventral area is covered like the tail with smooth cuticle. Oral sucker terminal, cup-shaped, with a pair of distinct submedian incisions ventrally like that of *Lecithocladium scombri*, measuring 0.2-0.3 mm long by 0.21-0.3 mm wide. Pharynx cylindrical, 0.2-0.3×0.11-0.15 mm. Esophagus very short, frequently turned dorsally and bifurcating into M-shaped ceca. Latter wide, terminating at posterior extremity. Acetabulum 0.175-0.22 mm in diameter, situated at middle of anterior third of body or a little more posteriorly.

Testes subglobular, contiguous, a little obliquely tandem, confined to anterior half of middle third of body. Vesicula seminalis elliptical to fusiform, 0.12-0.3×0.11-0.13 mm, with very thick (up to 36 μ) wall of spiral muscle fibers, situated somewhat obliquely just in front of anterior testis at anterior end of middle third of body or at its junction with anterior third. Pars prostatica narrow, long, twisted posteriorly, surrounded by well developed prostate cells except for a short anterior portion. Hermaphroditic pouch slender, variable in length according to state of contraction, 0.15-0.42 mm long by 20-30 μ wide, provided with fairly well developed muscular wall, which may attain a thickness of 5 μ at the contracted part. Genital pore ventral to posterior part of oral sucker.

Ovary ovoid, 0.1-0.13×0.15-0.21 mm, placed at or near middle of body, a little in front of or just at tail invagination. Vitellarian lobes long and slender, divided into two groups (an anterior and a posterior or a right and a left) of 4 and 3 each; some or most of them extending into tail, and a few turning round dorsally. Uterus extending into tail more than half its length, coiled between posterior testis and ovary, running dorsal or dextral, occasionally sinistral, to testes and vesicula seminalis and then alongside pars prostatica. Eggs elliptical, 16-20×7-9 μ . Excretory pore terminal; arms uniting dorsal to posterior end of oral sucker.

This species differs from the most closely related *Lecithocladium scombri* in the larger size of the body, in the narrower eggs, in the definitely longer pharynx, and in the posterior extent of the hermaphroditic duct. The specific name refers to the narrow eggs.

23. *Lecithocladium scombri* n. sp.

Pl. I, Fig. 1.

Habitat. Stomach of *Scomber kanagunta* (Russel) (type host) and *S. microlepidotus* Rüppel.

Material and locality. 8 gravid specimens from type host and one from other host, fixed in acetic sublimate, stained and mounted as usual; Macassar.

Body rather slender, somewhat attenuated in neck region as well as behind acetabulum, 0.3–0.48 mm wide in ovariovitellarian zone, 1.9–3.2 mm in whole length including tail which is 0.8–1.5 mm long and tapers posteriorly to a more or less sharp point. Tail invagination in vitellarian zone. Oral sucker 0.13–0.23×0.18–0.24 mm, cup- or finger-bowl-shaped, with a pair of distinct submedian incisions on ventral border. Pharynx subcylindrical, 75–130 μ long by 60–100 μ wide. Esophagus up to 75 μ long, turned dorsad to bifurcate into wide ceca which terminate close to the posterior extremity. Acetabulum 0.135–0.165 mm in diameter, at or near middle of anterior third of body.

Testes subglobular, 60–150×90–160 μ , ventral, obliquely tandem, in direct contact, at anterior half of middle third of body. Vesicula seminalis pear- or spindle-shaped, 0.15–0.25×0.09–0.15 mm, with very thick (up to 30 μ at middle) wall of spiral muscle, reaching to anterior testis, occasionally to posterior testis. Pars prostatica strongly winding, uniting with uterus anterior, dorsal or posterior to acetabulum; ductus hermaphroditicus narrow, often protruded outside, enclosed in somewhat twisted muscular sheath which is variable in length (0.3–0.5 mm) and thickness according to state of contraction. Genital pore ventral to posterior part of oral sucker.

Ovary ovoid, 75–130×100–160 μ , usually postequatorial, sometimes pre-equatorial, separated from posterior testis by uterine coils. Receptaculum seminis, about 30 μ in diameter, postovarian. Vitellarian tubules long, winding, divided into two groups of three and four respectively; backwardly directed ones extending into

tail ; forwardly directed ones not extending beyond ovary. Uterus reaching backward beyond middle of tail to a point 0.27 - 0.63 mm from posterior extremity, intruding into space between ovary and posterior testis, passing dorsal to testes, vesicula seminalis and pars prostatica. Eggs oval, embryonated, 16-21 × 9-12 μ . Excretory pore terminal ; excretory arms uniting dorsal to pharynx or oral sucker.

This species is characterized by the ventral border of the oral sucker being distinctly incised on each side of the median line. In this respect it resembles *Lecithocladium parviovum*, but differs in other respects, especially in body size.

24. *Tubulovesicula angusticauda* (Nicoll, 1915)
Yamaguti, 1934

Habitat. Stomach of *Saurida argyrophanes* Richardson.

Material and locality. A single whole mount ; Macassar.

Body subcylindrical, 3.3 mm in whole length by 0.73 mm in maximum width at middle ; forebody tapered anteriorly, tail 1.15 mm long by 0.4 mm wide near its rounded posterior end, projecting out of body proper for its greater part. Cuticle smooth. Preoral lobe inconspicuous. Oral sucker subterminal, 0.188 × 0.22 mm. Pharynx 90 × 110 μ . Ceca terminating at posterior extremity. Acetabulum 0.38 × 0.41 mm, at posterior end of anterior third of body.

Testes approximately triangular with rounded corners, situated symmetrically just behind acetabulum near lateral cuticle at anterior end of middle third of body, measuring about 0.15 mm by 0.12 mm. Vesicula seminalis tubular, 0.56 mm long, 60 μ wide at its posterior portion, sinuous at middle, extending whole length of acetabulum. Pars prostatica about 0.4 mm long, somewhat sigmoid anteriorly, surrounded throughout by dense layer of prostate cells. Ductus hermaphroditicus 0.12 mm long, 60 μ wide at its basal swelling, 35 μ wide at its opening into genital atrium. Hermaphroditic pouch oval, 126 μ in diameter, consisting of longitudinal muscle. Genital pore transversely elongated oval, about 60 μ in diameter, immediately behind intestinal bifurcation.

Ovary oval, 125 × 180 μ , just posteromedial to right testis. Vitellarian tubules slender, long, running transversely nearly all round body ; three on the right and four on the left. The uterus descending on the right turns to the left a little in front of the base

of the tail, and ascends on this side near the dorsal cuticle as far as the posterior end of the vesicula seminalis, whence it runs along the right side of the vesicle and pars prostatica. Eggs oval, with very thick shell, $28-33 \times 20-24 \mu$. Excretory system as usual.

Though different in some details such as the position of the acetabulum, and of the genital pore, the length of the pars prostatica and of the vitellarian lobes, the absence of a sinuous middle portion in the vesicula seminalis, the present worm may well be assigned to *Tubulovesicula angusticauda* (Nicoll, 1915) Yamaguti, 1934, from the stomach of an Australian eel (*Muraenesox cinereus*).

25. *Magnacetabulum leiognathi* n. sp.

Pl. I, Fig. 3.

Habitat. Stomach of *Leiognathus dussumieri* (Cuv. et Valenc.).

Material and locality. A single specimen fixed in acetic sublimate under cover slip, stained and mounted as usual; Macassar.

Body elongate, with comparatively long tail; body proper 1.65 mm long, 0.43 mm wide at posterior end of uterus; cuticular denticulations from immediately behind acetabulum as far back as vitellaria. Tail about 1.0 mm long, smooth, with its blunt-pointed posterior portion invaginated into itself. Preoral lobe 15μ thick. Oral sucker subterminal, subglobular, $90 \times 98 \mu$; pharynx also subglobular, $51 \times 63 \mu$. Esophagus directed posterodorsally, about 60μ long. Ceca turning backward at right angles, where the right one shows a small bulb due to contraction; both terminating in anterior portion of tail. Acetabulum prominent, near anterior extremity, measuring 0.25 mm anteroposteriorly and 0.225 mm dorsoventrally.

Testes oval, obliquely tandem behind acetabulum, about 0.105×0.13 mm. Vesicula seminalis longitudinally elongated, reaching to dorsal side of anterior testis, 25μ wide, with two not very conspicuous constrictions, tapering anteriorly to a long narrow duct running straight forward dorsal to the acetabulum. Pars prostatica about 80μ long by 5μ wide, surrounded by prostate cells, not marked off from the above mentioned duct of the seminal vesicle. Ductus hermaphroditicus narrow, tubular, about 90μ long by 8μ wide, extending from immediately behind intestinal bifurcation to ventral side of pharynx, enclosed in a very thin membranous capsule, opening into genital atrium, which is cylindrical, about 60μ

long by $15\ \mu$ wide, and opens to the outside close to the midventral margin of the oral sucker.

Ovary ovoid, 0.1×0.15 mm, situated ventrally at about middle of body proper, overlapping posterior testis at its anterior end. Vitellaria consisting of seven winding tubular lobes, (three on the right and four on the left); one each of the two groups is directed forward dorsolateral to the ovary, while all the remaining ones embracing the proximal descending portion of the uterus are directed posterodorsally. The descending uterus is strongly coiled behind the vitellaria and do not enter the tail; the ascending uterus runs sinuously near the dorsal cuticle, but finally straight alongside the duct of the seminal vesicle and the pars prostatica. Eggs elongate oval, thin-shelled, embryonated, $21 - 24 \times 11 - 13.5\ \mu$. Excretory arms terminating immediately behind oral sucker without uniting with each other.

This species differs from the only known genotype in the acetabulum being not so large in relation to the oral sucker, in the shape of the seminal vesicle, etc. The terminal genital ducts are similar to those of the genotype which are illustrated in Fig. 31 in my paper of 1942, though the hermaphroditic duct is much slender in the present species.

26. *Hysterolecitha nahaensis* Yamaguti, 1942

Habitat. Intestine of *Lobotes* sp.

Material and locality. A single whole mount; Macassar.

Body cylindrical, with blunt ends, 1.1×0.21 mm. Cuticle thin, unarmed. Oral sucker subterminal, $66 \times 84\ \mu$. Pharynx $36 \times 35\ \mu$. Esophagus very short. Ceca wide, parallel to each other, terminating at posterior extremity. Acetabulum 0.18 mm in diameter, at junction of anterior with middle third of body.

Testes subglobular, $75 - 90 \times 90 - 100\ \mu$, obliquely tandem (left one in front) at about middle of body, with uterus between and dorsally, Vesicula seminalis elliptical, $105 \times 45\ \mu$, reaching to anterior end of acetabulum. Pars prostatica comparatively wide ($20\ \mu$); prostate cells poorly developed. Hermaphroditic pouch pyriform, $44\ \mu$ in diameter, provided with fine longitudinal and circular muscle fibers. Genital pore immediately behind intestinal bifurcation.

Ovary subglobular, $90 \times 100\ \mu$, situated ventrally at anterior part

of posterior third of body, occupying a little more than entire breadth of intercecal field. Receptaculum seminis round, dorsal to ovary. Vitellaria forming a rosette of 8 plump to claviform lobes, which measure $40 - 150 \mu$ long by $33 - 45 \mu$ broad, and whose posterior one reaches to a point 90μ from the posterior end of the body. Uterus extending backward to level of cecal ends, filling up all available space between ovary and testes, and then intercecal field between anterior testis and acetabulum. Eggs elliptical, $21 - 24 \times 10 - 12 \mu$.

27. *Hysterolecithoides epinepheli* Yamaguti, 1934

Habitat. Stomach of *Siganus* sp.

Material and locality. 14 gravid specimens stained and mounted as usual; Macassar.

Body fusiform, $2.5 - 4.4 \times 0.65 - 1.25$ mm. Oral sucker bowl-shaped, $0.21 - 0.34 \times 0.26 - 0.38$ mm. Pharynx $65 - 110 \times 84 - 120 \mu$, overlapping oral sucker. Esophagus $0.09 - 0.18$ mm long. Ceca wide, terminating at about middle of posterior third of body. Acetabulum $0.46 - 0.75$ mm in diameter, situated at about midbody or in front of it.

Testes subglobular, $0.09 - 0.21 \times 0.075 - 0.18$ mm, placed symmetrically posterodorsal to acetabulum. Vesicula seminalis tubular, up to 45μ wide, winding in preacetabular median field. Pars prostatica tubular, sigmoid, $0.18 - 0.3$ mm long by $30 - 40 \mu$ wide, provided with thick coat of prostate cells, united with uterus at posterior end of hermaphroditic pouch to form ductus hermaphroditicus, which is straight or winding, and very narrow at the posterior end but gradually widens toward the base of the genital atrium, whence the duct becomes narrow and is lined with cuticle. This terminal portion, when everted, forms a smooth papilla $40 - 60 \mu$ long by $45 - 66 \mu$ wide and projecting out of the genital pore. Hermaphroditic pouch oval, $0.11 - 0.16 \times 0.11 - 0.15$ mm. Genital pore provided with circular muscle, opening at a distance of $0.5 - 1.0$ mm from anterior extremity. Immediately in front of the genital pore there is a small pit, which has often an irregular lumen and whose wall is provided with longitudinal muscle fibers.

Ovary rounded, $0.09 - 0.15 \times 0.09 - 0.2$ mm, situated in ventral median line at junction of posterior two thirds of body or in posterior half of middle third. Eggs elongate oval, $21 - 27 \times 12 - 15 \mu$.

Vitelline gland made up of 2 - 6 rounded follicles which are massed together near the ventral cuticle behind the ovary, and measure $75 - 150 \times 66 - 200 \mu$, the posteriormost one being the largest. Excretory pore ventroterminal, median excretory stem divided dorsal to anterior part of acetabulum into two arms, which run forward sinuously ventral or lateral to the ceca and terminate blindly beside the pharynx without being connected with each other.

The present worm is assigned to *Hysterolecithoides epinepheli* Yamaguti 1934, though different in the number of the vitelline follicles and in the uterus extending beyond the cecal ends. Re-examination of the original specimens has convinced me of the presence of the small muscular pit in front of the genital pore.

28. *Lecithaster stellatus* Loosse, 1907

Habitat. Intestine of *Lobotes* sp.

Material and locality. Two mature specimens; Macassar.

Body fusiform, 1.15 - 1.25 mm in length, with maximum breadth of 0.38 - 0.42 mm at about middle. Oral sucker subterminal, 0.12 - 0.123 mm in diameter. Pharynx $66 - 70 \times 60 - 72 \mu$. Esophagus short. Ceca reaching a little further backward than vitellaria in one specimen, but terminating at level of this gland in the other. Acetabulum 0.17 - 0.18 mm in diameter, at junction of anterior with middle third of body.

Testes subglobular, 70 - 80 μ in diameter, situated almost symmetrically or a little obliquely posterodorsal to acetabulum. Vesicula seminalis $80 \times 30 \mu$, pars prostatica narrow, about 0.1 mm long by 6 μ wide. Hermaphroditic pouch rounded, 54 - 66 μ in diameter; hermaphroditic duct 20 μ wide, provided with well developed longitudinal muscle fibers.

Ovary 4-lobed, $0.24 - 0.31 \times 0.18$ mm, situated at posterior end of middle third of body. Receptaculum seminis round, intercecal, anterodorsal to ovary, 80 - 90 μ in diameter. Vitellaria divided into 7 claviform lobes, which form a rosette posteroventral to the ovary. Uterus profusely developed, may or may not extend further forward than acetabulum; eggs oval, $15 - 16 \times 10 - 11 \mu$.

ANGIODICTYIDAE Looss, 1902

29. *Hexangium sigani* Goto et Ozaki, 1929

Habitat. Small intestine of *Siganus* sp.

Material and locality. Several mature specimens fixed in acetic sublimate, stained and mounted in toto; Macassar.

As compared with the original description by Goto and Ozaki the present material is much smaller, but I would refer it to their species owing to complete agreement in general anatomy and in egg size.

Body lanceolate, yellowish in life, $3.6-5.3 \times 0.7-1.15$ mm, oral sucker $0.12-0.13 \times 0.13-0.15$ mm, esophagus $0.5-0.85$ mm long, bulbously swollen at its posterior end to form a pseudopharynx. Ceca wide, parallel to each other, terminating at level of anterior testis. No acetabulum. Testes subglobular, $0.4-0.55 \times 0.3-0.45$ mm, situated one obliquely behind the other near posterior extremity. Genital pore $0.4-0.55$ mm from anterior extremity. Ovary subglobular, $0.2-0.3 \times 0.15-0.25$ mm immediately behind posterior testis; eggs oval, thick-shelled, $75-81 \times 54 \mu$ in life. Vitelline follicles extending from some distance posterior to intestinal bifurcation to near anterior testis.

DIDYMOZOIDAE Poche, 1907

30. *Didymozoon spirale* Yamaguti, 1938

Two specimens from different cysts which were found in the pharyngeal region of *Platycephalus indicus* Linné at Macassar gave the following measurements.

Forebody flattened cylindrical, $0.8-1.25$ mm long, $0.15-0.21$ mm wide, blunt-conical at anterior end. Hindbody spirally twisted, $5.6-6.6$ mm long by $0.3-0.4$ mm wide. Oral sucker $25-27 \times 21-27 \mu$, pharynx $10-15 \times 11-15 \mu$. Esophagus $0.27-0.42$ mm long. Ceca wide, reaching to posterior extremity of hindbody.

Testes tubular, $30-45 \mu$ wide, extending sinuously from anterior end of hindbody to a point $2.5-3.5$ mm from posterior extremity, so that they reach much more posteriorly than they are shown in my original figure (1938, Pl. VI, fig. 43). Vas deferens between uterus and esophagus. Ovary single, tubular, winding, extending from near anterior end of hindbody to near posterior extremity. Uterus forming a double or triple loop extending whole length of hindbody; so that in any cross section of the hindbody there are four or six uteri. Metraterm somewhat muscular, midventral. Vitellaria

single, tubular, winding, extending from near anterior end of hindbody to its posterior end.

31. *Didymozoon brevicolle* Yamaguti, 1938

Habitat. Encysted in pairs in the wall of the esophagus of *Platycephalus indicus* Linné ; Macassar.

Material. 6 whole mounts subjected to cover glass pressure. The following measurements, especially those of the hindbody are exaggerated by the pressure applied on the cover glass.

Forebody fusiform anteriorly, but slender posteriorly, 1.05 - 1.9 mm in length with maximum width of 0.2 - 0.35 mm at middle of esophagus, attached to hindbody 0.2 - 0.45 mm from its anterior end. Hindbody plump, with rounded ends, 3.5 - 5.3 × 1.2 - 1.4 mm. Oral sucker barrel-shaped, 50 - 66 × 39 - 56 μ ; pharynx spherical, 42 - 54 × 36 - 48 μ . Esophagus slender, 0.27 - 0.51 mm long, may be occasionally constricted at its posterior end ; ceca dilated at commencement, but narrowed in posterior part of forebody, widened considerably as they enter the hindbody, in which they run sinuously along the sides and terminate close to each other at the extreme posterior end.

Testes 0.9 - 2.2 mm long, 30 - 100 μ wide, extending backward in dorsolateral areas from base of forebody to a point a little back of shell gland complex. Vas deferens twisted, sometimes constricted at intervals, running in median field along metraterm on its dorsal or dorsolateral side, apparently opening into anterior end of metraterm and opening outside by a very short common duct ventral to oral sucker.

Ovary tubular, 30 - 60 μ wide, winding along one side of hindbody and then along the other, commencing at a point 0.8 - 1.25 mm from posterior extremity. Receptaculum seminis oval or elongate, 30 - 110 μ wide, shell gland compact, 0.8 - 1.4 mm from anterior end of hindbody. Vitellarium tubular, 24 - 90 μ wide, winding, turning from side to side along dorsal body wall, reaching to a point 0.3 - 0.5 mm from posterior extremity. Uterine coils occupying most of hindbody, leaving posterior extremity free ; egg reservoir closely winding in midventral region, continued into metraterm just behind base of forebody ; metraterm muscular, midventral, varying in caliber according to degree of its being dis-

tended with eggs. Eggs collapsed, $21-27 \times 10-18 \mu$ in mounted condition.

32. *Unitubulotestis carangis* n. g., n. sp.

Pl. IV, Fig. 15 (A-D).

Habitat. Pharyngobranchial region of *Caranx* sp.

Material and locality. A single whole mount; Macassar.

Body slender, 18 mm in length, with maximum breadth of 0.92 mm at about middle, whence it tapers slowly toward the pointed anterior extremity; posterior extremity rounded and only a little enlarged. Cuticle thin, smooth; subcuticular longitudinal muscle fairly well developed, but circular muscle very fine, discernible under high power magnification only.

Oral sucker terminal $18 \times 30 \mu$, with very poorly developed musculature, directly followed by a bulbous pharynx which is 40μ long by 38μ broad and has weak musculature. Esophagus very narrow, about 0.16 mm long by 2.5μ wide; ceca dorsolateral, narrow, and strongly winding anteriorly but moderately wide for greater posterior part, rather straightened out as they approach the posterior extremity, about 1.3 mm in front of which they terminate blindly. Acetabulum lacking.

Testis single, tubular, 0.1-0.22 mm wide, extending sinuously dorsal to uterus for a distance of 6.3 mm, commencing at a point 3.8 mm from anterior extremity and terminating just in front of anterior end of ovary. Vas deferens arising from anterior end of testis, winding its way forward in intercecal field dorsal to metraterm, provided with fine longitudinal and circular muscle fibers and lined with a layer of epithelium, dilated bulbously to a width of $50-65 \mu$ at some places, varying elsewhere from 30μ to 40μ in diameter with gradual decrease toward distal end. It opens mid-ventrally together with the metraterm at a distance of 72μ from anterior end of body.

Ovary tubular, $60-80 \mu$ in diameter, winding irregularly dorsal to uterus from behind testis to a point 5.8 mm from posterior extremity, where it tapers abruptly to a short germiduct by which it joins the receptaculum seminis and the vitelline duct. From this point of junction arises the uterine duct surrounded by a dense cluster of shell gland cells, which runs backwards somewhat sinuously for a distance of about 0.5 mm and then passes into the uterus

proper. Receptaculum seminis retort-shaped, about 0.15 mm in diameter, situated on the right of posterior end of ovary, connected with genital junction by means of a sigmoid duct about 0.21 mm long by 12-15 μ wide and surrounded by a thick layer of accompanying cells. The uterus descends in an irregularly winding course as far as the posterior extremity of the body, where it turns back on itself to be continued into the ascending uterus. This portion, 0.07-0.18 mm in diameter, winds its way forward ventral to the vitelline gland and ceca, ventral or sinistral to the descending uterus, and then ventral to the ovary and testis, and finally tapers markedly at the level of the anterior end of the testis to pass into the well differentiated metraterm. The latter is provided with circular muscle and a thick coat of accompanying cells, with greatest diameter of about 0.1 mm near its posterior end; it makes serpentine windings ventral to the vas deferens and narrows gradually as it proceeds forwards, and attaining a minimum width of 12 μ opens to the outside along with the vas deferens. Eggs elliptical, rather thin-shelled, embryonated, 27-30 μ by 15-17 μ . Vitelline gland tubular, single, 60-75 μ wide, originating with a blunt end near posterior extremity, winding irregularly dorsal to uterus, partly interlacing with the latter, finally running through shell gland along right side of uterine duct to join the germiduct and the receptaculum seminis at the same point. Excretory system not made out.

The present worm is characterized by the possession of a single tubular testis. In this respect as well as in general anatomy of the female reproductive organs it bears a close resemblance to *Nematobothrium sardae* G. A. et W. G. MacCallum, 1916, all the other well known members of *Nematobothrium* possessing two testes. In *Nematobothrium* species the digestive system and the acetabulum being subject to considerable variation due to retrogression cannot be utilized for taxonomic differentiation. The number and disposition of the reproductive organs are, however, characteristic of each member and apparently of more than specific significance. Though not worked out definitely in regard to these organs, *N. filarina* shows a marked tendency toward proterandrous development in smaller individuals (predominant male) in contrast with larger ones (predominant female) as in *Gonapodasmius*, and in addition to this, both genera being similar in general body shape, in

beads-like dilatation of the uterus due to uneven accumulation of eggs, and in the mode of living may turn out to be identical. Until convincing evidences are submitted by re-examination of van Beneden's original specimens, I would prefer to retain the genus *Nematobothrium* in a broad sense as defined in my paper of 1934, but the finding of the present species with a single testis compels me to separate it with *N. sardae* as representing a distinct genus, for which the name *Unitubulotestis* is proposed.

Unitubulotestis n. g.

Generic diagnosis: Didymozoidae Poche, 1907; complete hermaphrodites. Encysted in pairs or not. Body slender, long, not divided into two distinct regions. Oral sucker and pharynx present. Acetabulum absent. Esophagus narrow. Ceca extending to near posterior extremity or degenerated. Testes single, tubular, long or sausage-shaped, anterior to ovary. Vas deferens sinuous or convoluted, opening with metraterm near anterior extremity. Ovary and vitellarium single, tubular, former anterior, latter posterior, to shell gland complex. Shell gland and receptaculum seminis pre- or post-equatorial. Uterus reaching to posterior extremity where it turns back on itself and runs up to the genital pore, with its terminal portion provided with well developed circular muscle or without any special musculature. Eggs comparatively small.

Genotype: *Unitubulotestis carangis*.

Other species: *U. sardae* (G. A. et W. G. MacCallum, 1916).

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Explanation of Plates

Plate I

- Fig. 1. *Lecithocladium scombri* n. sp., lateral view.
 Fig. 2. *Lecithocladium angustiovum* n. sp., ventral view.
 Fig. 3. *Magnacetabulum leiognathi* n. sp., lateral view.
 Fig. 4. *Lasiotocus lethrini* n. sp., lateral view.

Plate II

- Fig. 5. *Parahemiurus clupear* n. sp., ventral view.
 Fig. 6. *Aphanurus dorosomatis* n. sp., ventral view.
 Fig. 7. *Lecithocladium parviovum* n. sp., ventral view.
 Fig. 8. *Prosorhynchus longicollis* n. sp., ventral view.

Plate III

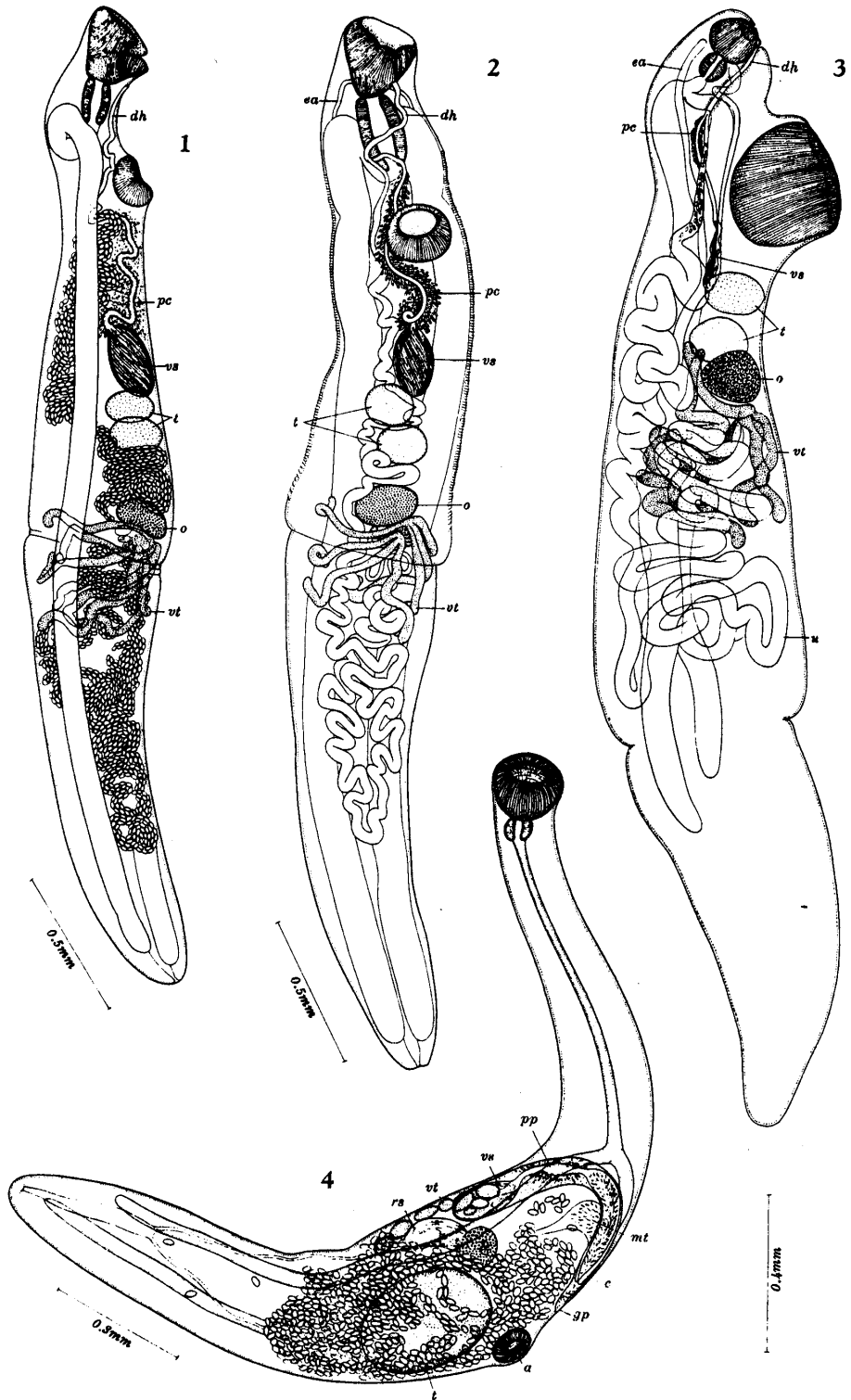
- Fig. 9. *Lecithocladium megalaspis* n. sp., ventral view.
 Fig. 10. *Lecithochirium longicaudatum* n. sp., ventral view.
 Fig. 11. *Lecithochirium priacanthi* n. sp., ventral view.
 Fig. 12. *Apocreadium synagris* n. sp., ventral view.

Plate IV

- Fig. 13. *Paracryptogonimus acathostomus* Yamaguti, 1934, ventral view.
 Fig. 14. *Aponurus synagris* n. sp., ventral view.
 Fig. 15, A - D. *Unitubulotestis carangis* n. g., n. sp., ventral view.

Abbreviations used in Figures

a = acetabulum, an = anus, ao = accessory organ, ap = preacetabular pit, as = anterior sucker, at = genital atrium, c = cirrus, cg = cervical gland, cp = cirrus pouch, dh = ductus hermaphroditicus, d = vas deferens, ea = excretory arm, ep = excretory pore, ev = excretory vesicle, gc = genital cone, gd = germiduct, gp = genital pore, i = intestine, lc = Laurer's canal, mt = metraterm, o = ovary, oc = eye spot, p = pharynx, pc = prostate cell, pp = pars prostatica, r = rhynchus, rs = receptaculum seminis, rsu = receptaculum seminis uterinum, sg = shell gland, t = testis, u = uterus, vr = vitelline reservoir, vs = vesicula seminalis, vse = vesicula seminalis externa, vsi = vesicula seminalis interna, vt = vitellarium.



YAMAGUTI: DIGENETIC TREMATODES OF FISHES . II

