

Acta Medica Okayama

Volume 8, Issue 2

1952

Article 4

JUNE 1952

Parasitic Worms mainly from Celebes. Part 1. New Digenetic Trematodes of Fishes.

Satyu Yamaguti*

*Okayama University,

Copyright ©1999 OKAYAMA UNIVERSITY MEDICAL SCHOOL. All rights reserved.

Parasitic Worms mainly from Celebes. Part 1. New Digenetic Trematodes of Fishes.*

Satyu Yamaguti

Abstract

While I was on duty with the Naval Institute of Tropical Hygiene at Macaar, Celebes, during World War Ⅱ, I had the opportunity to examine various wild and domestic animals for parasites, these animals being taken mainly from Celebes. Since the parasitic worms of this island had not yet been worked out at any length, an opportunity for collecting in this part of the world yielded much interesting material. I collected a fairly large amount of material from monkeys, buffaloes, birds, lizards, snakes and fishes, the latter being examined very carefully from the standpoint of prevention of parasitic infections transmitted from fish to man. Domestic fowl and small wild birds were also examined for intestinal parasites during my study on avian malaria carried out at the institute. Unfortunately I managed to bring back to Japan by air only a part of the collection before the termination of the war. The greater part of the collection shipped to me subsequently by air mail suffered serious damage in transit, and for this reason description and illustrations are based almost exclusively on mounted slides.

Parasitic Worms mainly from Celebes
Part 1. New Digenetic Trematodes of Fishes
With 6 Plates

By

Prof. Satyu Yamaguti

(Department of Parasitology, Okayama University Medical School)

Received for publication on 14 February, 1952

Contents

Introduction	147
Bucephalidae Poche, 1907	147
1. <i>Bucephalus sphyraenae</i> n. sp.	147
2. <i>Bucephalus retractilis</i> n. sp.	148
3. <i>Bucephalopsis tenuis</i> n. sp.	149
4. <i>Prosorhynchus chorinemi</i> n. sp.	150
Allocreadiidae Stossich, 1904	152
5. <i>Plagioporus (Plagioporus) macassarensis</i> n. sp.	152
6. <i>Plagioporus (Plagioporus) longivesicula</i> n. sp.	153
7. <i>Plagioporus (Caudotestis) synagris</i> n. sp.	155
8. <i>Podocotyle gracilis</i> n. sp.	156
9. <i>Podocotyle serrani</i> n. sp.	157
10. <i>Diplobulbus scari</i> n. sp.	159
11. <i>Pseudolepidapedon lethrini</i> n. sp.	160
12. <i>Opegaster gobii</i> n. sp.	161
13. <i>Opegaster longivesicula</i> n. sp.	162
14. <i>Opecoelus piriformis</i> n. sp.	164
15. <i>Marsupioacetabulum marinum</i> n. g., n. sp.	165
Monorchidae Odhner, 1911	168
16. <i>Diplolasiotocus chaetodontis</i> n. g., n. sp.	168
17. <i>Opisthomonorchis carangis</i> n. g., n. sp.	170
Heterophyidae Odhner, 1911	173
18. <i>Paracryptogonimus ovatus</i> n. sp.	173
19. <i>Pseudometadena celebesensis</i> n. sp.	176
Waretrematidae Srivastava, 1939	178
20. <i>Pseudohapladena scatophagi</i> n. g., n. sp.	178
Hemiuridae Lühe, 1901	182
21. <i>Aphanurus caesionis</i> n. sp.	182

S. Yamaguti : Parasitic Worms mainly from Celebes. Part I 147

22. <i>Aponurus carangis</i> n. sp.	183
23. <i>Lecithochirium lobatum</i> n. sp.	184
Monodhelminthidae Dollfus, 1937	185
24. <i>Monodharmis arii</i> n. sp.	185
25. <i>Prosogonarium arii</i> n. g., n. sp.	187
Prosogonotrematidae Viguera, 1940.	192
26. <i>Prosogonotrema clupei</i> n. sp.	192
Literature	195
Explanation of Plates	196
Abbreviations used in Figures	197

Introduction

While I was on duty with the Naval Institute of Tropical Hygiene at Macassar, Celebes, during World War II, I had the opportunity to examine various wild and domestic animals for parasites, these animals being taken mainly from Celebes. Since the parasitic worms of this island had not yet been worked out at any length, an opportunity for collecting in this part of the world yielded much interesting material. I collected a fairly large amount of material from monkeys, buffaloes, birds, lizards, snakes and fishes, the latter being examined very carefully from the stand-point of prevention of parasitic infections transmitted from fish to man. Domestic fowl and small wild birds were also examined for intestinal parasites during my study on avian malaria carried out at the institute. Unfortunately I managed to bring back to Japan by air only a part of the collection before the termination of the war. The greater part of the collection shipped to me subsequently by air mail suffered serious damage in transit, and for this reason description and illustrations are based almost exclusively on mounted slides.

BUCEPHALIDAE Poche, 1907

1. *Bucephalus sphyraenae* n. sp.

Pl. I, Fig. 1.

Habitat. Small intestine of *Sphyraena* sp.

Material and locality. Two gravid specimens; Macassar.

Body subcylindrical, 2.5-2.8×0.31-0.45 mm, beset with minute spines. Rhynchus muscular, approximately inverted conical, 0.13-

0.15×0.14–0.16 mm, with seven simple tentacular appendages along its anterior margin; the two ventrolateral appendages are stout and conical, while the others are produced each into a slender process tapering to a point. Pharynx about 65 μ in diameter, post-equatorial; intestine directed forwards from pharynx, with its enlarged base in front of ovary. Testes globular, 0.15–0.17 mm in diameter, directly tandem, at about junction of middle with posterior third of body; cirrus pouch subcylindrical, 0.52–0.58×0.09–0.095 mm, provided with well developed oblique muscle fibers, reaching to posterior testis. Genital atrium opening ventrally by a funnel-shaped passage at a distance of 65 μ from posterior end of body.

Ovary ovoid, 0.15–0.18×0.14–0.15 mm, immediately post-equatorial, on the right of intestine. Laurer's canal arising from posterior end of oval dilatation of germiduct, running backward dorsal to anterior testis and dorsodextral to posterior testis, opening dorsally on right of median line at level of anterior end of cirrus pouch. Shell gland rather diffuse, between ovary and anterior testis. Uterus reaching as far as anterior quarter of body. Eggs oval, 18–24×12–16 μ in mounted condition. Vitelline follicles oval, 45–70×30–55 μ , extending along each side of body in middle third, 13 on the right and 19 on the left. Excretory vesicle tubular, reaching a little further forward than anterior extent of uterus; pore terminal.

So far as the body size and the topography of the internal organs are concerned the present species represents an intermediate form between *Bucephalus uranoscopi* Yamaguti, 1934, and *B. varicus* Manter, 1940. From either of these it can easily be distinguished by the apical tentacles being devoid of side branches or tubercles. Further, it is to be noted that the intestine lies in the species in question ventral to the uterus by which it is separated from the dorsal wall of the body, whereas it extends to near this wall in *B. uranoscopi* and *B. varicus*.

2. *Bucephalus retractilis* n. sp.

Pl. III, Fig. 13.

Habitat. Stomach and intestine of *Caranx* sp.

Material and locality. 4 gravid whole mounts; Macassar.

Body subcylindrical, $1.4-1.95 \times 0.3-0.45$ mm, tapering toward anterior extremity; posterior extremity blunt or rounded. Cuticle beset with minute spines. Rhynchus muscular, truncated in front and rounded behind, $96-130 \mu$ long by $70-100 \mu$ broad, with 7 simple, retractile tentacles $12-16 \mu$ broad at the base and devoid of any accessory branches or protuberances. Pharynx $56-72 \mu$ long by $56-102 \mu$ broad, situated just posterior or anterior to midbody at level of anterior testis or ovary. Intestine saccular, directed forwards from pharynx, ventral to uterus. Testes subglobular, comparatively large, $0.15-0.21 \times 0.13-0.2$ mm, situated one behind the other on the right side, occupying whole length of posterior half of middle third of body. Cirrus pouch cylindrical, $0.3-0.57 \times 0.08-0.14$ mm, with thick muscular wall, extending forward to hind testis. Vesicula seminalis subglobular to oval, $60-120 \times 57-90 \mu$. Genital atrium opening ventrally by a funnel-shaped duct at a distance of $40-60 \mu$ from posterior extremity. Ovary subglobular, $0.12-0.18 \times 0.11-0.17$ mm, situated on the right immediately in front of anterior testis (partly overlapping the latter ventrally in the type). Germiduct forming a bulbous swelling about 20μ wide just before giving rise to Laurer's canal. Uterus extending as far forward as middle of anterior third of body or a little more anteriorly, slightly beyond anterior extent of vitellaria, with its main bulk lying in vitellarian zone and reaching back of genital atrium. Eggs oval, thick-shelled, $15-16 \times 10-12 \mu$. Vitelline follicles divided into two symmetrical lateral rows extending from a little behind middle of anterior third of body to a pre-equatorial level, 16 on the right and 12 on the left in the type. Excretory pore terminal.

This species bears in general anatomy a certain resemblance to *Bucephalus varicus* Manter, 1940, but differs in the tentacles being devoid of prongs or anything alike, and in the eggs being definitely smaller, and from *B. sphyraenae* (v. s.) in position of vitellaria as well as in egg size. The specific name refers to the retractile tentacles.

3. *Bucephalopsis tenuis* n. sp.

Pl. II, Fig. 6.

Habitat. Small intestine of *Platycephalus indicus* Linné.

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

Body slender, 2.1 - 3.3 mm long ; anterior half tapering forward to a blunt point, posterior half cylindrical, with obtuse end 0.21 - 0.35 mm wide. Cuticle with minute spines. Anterior sucker discoid, weakly muscular, 50 - 90 μ in diameter. Pharynx 60 - 110 μ in diameter, a little in front of midbody. Intestine elongate saccular, 0.11 - 0.14 mm wide, directed backward, with its posterior end anterodorsal to ovary. Testes subglobular to oval, directly tandem, 0.1 - 0.24 \times 0.11 - 0.22 mm ; anterior more ventral than posterior at junction of middle with posterior third of body. Vasa efferentia short, uniting together on the left of testes ; vas deferens elliptical, about 75 \times 33 μ , lying transversely between testes and anterior end of cirrus pouch. Cirrus pouch subcylindrical, strongly muscular, 0.5 - 0.67 \times 0.09 - 0.14 mm, reaching to posterior testis ; vesicula seminalis oval, 75 - 120 \times 45 - 75 μ . Genital atrium 0.09 - 0.15 mm in diameter, opening ventrally by a funnel-shaped passage at a point 50 - 90 μ from posterior extremity. Ovary oval, 0.1 - 0.18 \times 0.09 - 0.15 mm, postequatorial. Germiduct forming a bulbous swelling (35 μ wide in the type) just before giving rise to Laurer's canal. Latter forming a fusiform dilatation up to 20 μ wide at its commencement, running straight backward and opening outside dorsodextral to anterior testis. Uterus ascending to middle of anterior third of body, descending to postatrial region. Eggs oval, light brown, 21 - 24 \times 13 - 16 μ . Vitelline follicles extending along each side in middle third of body, 11 - 13 on the right and 14 - 18 on the left. Vitelline reservoir between ovary and anterior testis, approximately triangular, 25 - 30 μ wide at base. Excretory vesicle long, tubular, reaching 0.12 - 0.3 mm anterior to pharynx ; excretory pore terminal.

This species differs from the most closely related *Bucephalopsis arcuata* (Linton, 1900) chiefly in the extent of the vitellaria.

4. *Prosorhynchus chorinemi* n. sp.

Pl. II, Fig. 8.

Habitat. Small intestine of *Chorinemus moadetta* (Cuv. et Valenc.).

Material and locality. A single whole mount ; Macassar.

Body rod-shaped, 3.3 \times 0.625 mm. Cuticular spines lacking, probably owing to postmortem maceration. Strong dorsoventral

muscle bundles grouped in form of an inverted V in front of anterior end of uterus. Rhynchus in form of a short plug, 0.41 mm long by 0.45 mm broad at flattened anterior end where the muscle fibers are disposed irregularly; its rounded posterior portion occupied by powerful dorsoventral muscle bundles. Pharynx globular, 0.1 mm in diameter, situated just behind midbody. Esophagus cylindrical, slightly curved, about 0.15 mm long by 35 μ broad. Intestine approximately elliptical, 0.375 \times 0.175 mm, situated longitudinally in front of ovary. Testes oval, situated on the right about midway between pharynx and posterior extremity, separated one from the other by two loops of initial portion of uterus. Vas deferens running transversely toward anterior end of cirrus pouch, crossing ascending and descending uterus ventrally. Cirrus pouch elongate elliptical, 0.66 \times 0.135 mm, with a very thin, apparently membranous wall, extending along left side a little further forward than middle of posterior third of body. Vesicula seminalis elliptical, 0.31 \times 0.13 mm. Genital lobe rolled up as usual, provided dorsally with a small oval accessory lobe 27 μ long by 36 μ broad. Genital atrium about 0.1 mm in diameter, with a delicate membranous wall covered all over with a dense layer of glandular cells, opening ventroterminally by a short wide passage. Ovary oval, 0.26 \times 0.19 mm, situated on the right between intestine and anterior testis. The germiduct, arising from the dorsal side of the ovary near its posterior end, forms a bulbous swelling 27 μ wide and then gives off the Laurer's canal about midway between the ovary and the anterior testis, where it turns to the right to receive the common vitelline duct. Laurer's canal running obliquely backward in a somewhat undulating course and turning forward acutely close to left margin of anterior testis, opening outside on middorsal line at level of posterior end of ovary. Ascending uterus turning backward in vitellarian zone. Eggs elliptical, thin-shelled, 18 \times 11 - 12 μ in mounted condition. Vitelline follicles divided into two lateral longitudinal groups of about a dozen each about midway between anterior extremity and ovary. Excretory pore terminal; excretory vesicle tubular, wide, apparently reaching to midbody.

This species differs from any of the known members of the genus in the disposition of the digestive and reproductive organs. In these respects it rather resembles *Rhipidocotyle pentagonum* (Ozaki, 1924) but differs from this fundamentally in the structure of

the rhynchus. That the Laurer's canal turns forward instead of taking a usual straight backward course is worth noting.

ALLOCREADIIDAE Stossich, 1904

5. *Plagioporus (Plagioporus) macassarensis* n. sp.

Pl. IV, Fig. 18.

Habitat. Small intestine of *Lethrinus* sp.

Material and locality. A single gravid specimen, examined in life for excretory system, fixed in acetic sublimate under a cover glass, stained and mounted as usual; Macassar.

Body spatulate, with blunt ends, about 5 mm long, 1.16 mm wide at middle. Cuticle unarmed. Subcuticular longitudinal muscle strongly developed. Oral sucker subterminal, 0.3×0.35 mm. Prepharynx very short and wide, with clusters of accompanying cells on each side. Pharynx 0.175×0.21 mm. Esophagus moderately muscular, 0.26 mm long, surrounded by accompanying cells. Ceca wide, terminating at posterior extremity. Acetabulum 0.5×0.525 mm, situated at junction of anterior with middle third of body. Testes subglobular, oblique, contiguous, a little behind midbody; right posterior testis measuring 0.5×0.375 mm, left anterior one 0.42×0.375 mm. Cirrus pouch club-shaped, 0.75×0.14 mm, consisting of a layer of longitudinal muscle, extending obliquely from anterodextral margin of acetabulum to genital pore which lies in the left submedian line ventral to the cecum just behind the intestinal bifurcation. Vesicula seminalis constricted into two portions; posterior portion elliptical, 0.27×0.13 mm; anterior portion fusiform, 0.275×0.095 mm, marked off from ductus ejaculatorius by a distinct partition. There is no distinct pars prostatica, though prostate cells are present within the cirrus pouch. Ovary subglobular, 0.32 mm in diameter, situated immediately in front of right testis. The germiduct shows at its origin a marked constriction toward which elongated gland cells are converged, then it forms a bulbous swelling 30 μ wide and lined with distinctly nucleated epithelia. It joins the receptaculum seminis and Laurer's canal at the same point as shown in Fig. 18. Receptaculum seminis oval, 0.18×0.12 mm, bordering on right side of ovary. Laurer's canal running forward sinuously toward right cecum, on the dorsal

side of which it opens to the exterior at the level of the vitelline reservoir. Uterus descending from right to left as far as anterior testis, then turning back on itself and winding its way forward from left to right; finally running obliquely forward along cirrus pouch. Eggs oval, thin-shelled, $60-66 \times 41-42 \mu$ in life. Vitelline gland divided on each side into about 10 grape-like bunches, extending along intestine, on the left from genital pore to posterior extremity, but commencing on the right a little more posteriorly. Excretory vesicle tubular, forming bulbous dilatation 0.22 mm wide just in front of its terminal opening, much more widely swollen at its anterior end reaching to acetabulum, giving off a pair of lateral collecting vessels between ovary and testes; each collecting vessel divided in neck region into an anterior and a posterior tubule.

6. *Plagioporus (Plagioporus) longivesicula* n. sp.

Pl. III, Fig. 14.

Habitat. Small intestine of *Lethrinus* sp.

Material and locality. Two gravid and three immature specimens; Macassar.

Body spatulate, with blunt anterior and rounded posterior extremity, 3.5-4.0 mm long by 1.0-1.3 mm wide in ovariotesticular region. Cuticle smooth. Oral sucker subterminal, $0.24-0.29 \times 0.26-0.31$ mm; prepharynx very short, with a compact mass of accompanying cells on each side; pharynx $0.125-0.16 \times 0.15-0.2$ mm; esophagus 0.2-0.25 mm long, bifurcating at about middle of anterior third of body; ceca moderately wide, terminating at posterior extremity. Acetabulum 0.45-0.48 mm in diameter, situated at anterior end of middle third of body or at its junction with anterior third.

Testes subglobular, oblique, contiguous, $0.3-0.45 \times 0.24-0.41$ mm; right posterior testis situated at junction of posterior two thirds or a little more anteriorly. Cirrus pouch claviform or subcylindrical, $0.62-0.67 \times 0.11-0.13$ mm, provided with longitudinal muscle, extending obliquely in front of acetabulum with its posterior end reaching to anterodextral margin of acetabulum. In the paratype, however, it extends on the left of the acetabulum to near the level of its posterior margin. Vesicula seminalis tubular, sigmoid and 60μ wide in the type, but constricted into two portions in the paratype as in *P. macassarensis*. There is no distinct pars

prostatica, though the prostate cells are present. Ductus ejaculatorius tubular, 20–30 μ wide; its distal portion everted in the paratype as a smooth cirrus 0.12 mm long by 27 μ wide. Genital pore ventral to left cecum at a postbifurcal level 0.85–0.98 mm from anterior extremity.

Ovary 0.22–0.24 \times 0.26–0.35 mm, consisting of a central part and three rounded lobes of nearly the same size, situated in front of posterior testis by right side of anterior testis. Receptaculum seminis oval, 90 μ wide, immediately dextral to ovary in the type; in the paratype, however, it is transversely elongated, about 0.15 mm long, and lies immediately anterodorsal to the ovary, and joins the germiduct at its right end. It tapers anteriorly to a very long winding Laurer's canal which opens on the dorsal surface about 0.12 mm behind the acetabulum. Uterus winding from side to side in intercecal field between anterior testis and acetabulum, finally running along left side of cirrus pouch. Eggs oval, thin-shelled, 66–72 μ long; their width is unable to measure on account of shrivelling. Vitellaria forming on each side 8 grape-like bunches of small follicular acini, extending all round ceca from level of genital pore to posterior extremity; the fusiform vitelline reservoir is formed in the type at the beginning of the common vitelline duct; in the paratype, however, it is formed by the dilatation of the distal end of the left vitelline duct.

The long, tubular excretory vesicle extends somewhat sinusously in the median field from its terminal pore as far as the left side of the esophagus; the left collecting vessel arises from the vesicle at the level of the anterior testis, and runs along the dorsal side of the anterior border of this testis, then medial to the left cecum, which it crosses ventrally just behind the metraterm; the right collecting vessel arising at the same level, passes dorsal to the ovary, then medial to the right cecum, which it crosses at the same level as the left one; both terminate at the level of the esophagus or a little more anteriorly.

On cursory examination the present worm which may turn out to be identical with *Plagioporus pallensicus* (Shipley et Hornell, 1905) may be confused with *Plagioporus macassarensis*, but they are quite different in the anterior extent of the excretory vesicle, in the origin of the Laurer's canal and the position of its dorsal opening, in the lobed ovary, etc.

The specific name refers to the long excretory vesicle.

7. *Plagioporus (Caudotestis) synagris* n. sp.

Pl. VI, Fig. 27.

Habitat. Small intestine of *Synagris* sp.

Material and locality. A single specimen fixed in acetic sublimate, stained and mounted; Macassar.

Body fusiform, with blunt ends, 1.4 mm long, 0.52 mm wide at level of acetabulum. Cuticle thin, smooth. Oral sucker sub-terminal, $105 \times 110 \mu$; prepharynx about 30μ long; pharynx $50 \times 75 \mu$; esophagus 0.15 mm long, bifurcating in front of acetabulum. Ceca terminating at level of posterior end of hind testis. Acetabulum 0.27 mm in diameter, occupying whole length of anterior half of middle third of body.

Testes globular, contiguous, oblique, $0.13 - 0.15 \times 0.15$ mm; anterior testis a little to left of median line at anterior part of posterior third of body; posterior one median, at middle of posterior third of body. Cirrus pouch 0.58×0.05 mm, thin-walled, extending along left side of acetabulum with its posterior end between acetabulum and anterior end of receptaculum seminis. Vesicula seminalis filling entire posterior portion of cirrus pouch, with its tapered anterior part turned back on itself two times at level of middle of acetabulum. Pars prostatica not distinctly differentiated, though prostate cells are present. Ductus ejaculatorius long, $8 - 10 \mu$ wide. Genital pore in left submedian line 0.24 mm from anterior extremity.

Ovary ovoid, entire, 0.15×0.09 mm, situated obliquely on the right of median line just inside right cecum at posterior part of middle third of body. Receptaculum seminis elongated retort-shaped, 0.14 mm wide, lying obliquely between ovary and anterior testis, with its posterior end reaching to right cecum; joining germiduct at its tapering anterior end, where the Laurer's canal is filled with yolk material besides spermatozoa. The uterus describes a loop in front of the anterior testis and then proceeds forward alongside the cirrus pouch. There are only two collapsed mature eggs $57 - 66 \mu$ long besides a few abortive ones. Vitelline follicles extending from level of genital pore to posterior extremity, surrounding ceca on all sides. Excretory vesicle tubular, with terminal pore.

This species is characterized by the long cirrus pouch reaching beyond the acetabulum, and the enormous receptaculum seminis being much larger than the ovary.

8. *Podocotyle gracilis* n. sp.

Pl. IV, Fig. 16.

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

Material and locality. Three gravid specimens from the first host and four more from the second host, fixed in acetic sublimate, stained and mounted : Macassar.

Body subcylindrical, 0.92 - 1.9 mm long, 0.15 - 0.26 mm broad in ovariotesticular region, more or less pointed at both ends. Cuticle thin, smooth. Oral sucker terminal, 90 - 120 × 80 - 150 μ , with subterminal opening. Prepharynx 15 - 45 μ long. Pharynx 50 - 80 × 56 - 95 μ . Esophagus slender, 0.15 - 0.25 mm long. Ceca terminating at different levels near posterior extremity. Acetabulum 0.15 - 0.2 mm in diameter, situated at junction of anterior with middle third of body, with a prominent broad-based stalk containing muscle fibers attached to the sucker.

Testes elongate oval, obliquely tandem 20 - 50 μ apart from each other, 0.1 - 0.18 mm long by 50 - 90 μ broad ; anterior testis situated ventrally at junction of middle with posterior third of body or a little more posteriorly. Cirrus pouch slender, 0.38 - 0.69 mm long by 30 - 60 μ broad, mainly composed of longitudinal muscle fibers, reaching further backward than base of acetabulum, with its rather pointed posterior end intruding into vitellarian zone. Vesicula seminalis 0.09 - 0.2 mm long, divided into three portions ; the smallest oval anterior portion is very deeply constricted off from the middle which in turn is separated from the longest posterior by a rather shallow constriction. Pars prostatica not very distinctly differentiated ; prostate cells well developed around anterior portion of vesicula seminalis, ductus ejaculatorius and pars prostatica. Cirrus simple, without petaloid appendage. Genital atrium 70 μ long in the type, 90 μ long when extended, narrowed at its external opening but widened at base, where the cirrus and vagina open ; its wall consisting of numerous longitudinal and scanty circular muscle fibers. Genital pore in left submedian line at level of middle of esophagus.

Ovary subglobular to oval, entire, 60–100 μ long by 36–70 μ broad, situated anterodorsal or opposite to anterior testis. Receptaculum seminis oval to elliptical, 30–52 μ wide, giving rise to Laurer's canal at its anterodorsally directed end. Laurer's canal turning abruptly backward near its origin and opening dorsally in left submedian line at level of anterior end of seminal receptacle. Uterus winding its way forward in ventral intercecal field and passing into well differentiated metraterm at level of posterior end of acetabulum or a little more anteriorly. Metraterm composed of well developed circular and longitudinal muscle fibers, about 0.24 mm long with maximum diameter of 33–56 μ behind its middle, whence it tapers rapidly toward uterus proper; provided at its anterior end with a bulbous ring of circular muscle fibers running convergently toward the two dorsomedial points approximating each other. This ring is, therefore, interrupted between these two points and has a maximum length of 20–60 μ on the opposite side, its transverse diameter being 27–56 μ . Eggs few, 51–63 μ by 36–48 μ in mounted condition. Vitelline follicles extending along ceca from behind base of acetabulum to near posterior extremity, encroaching upon intercecal field both dorsally and ventrally. Excretory vesicle median, tubular, reaching to near base of acetabulum, where it is moderately expanded, giving rise to symmetrical collecting vessels at level of posterior end of ovary; pore terminal.

This species differs from the most closely related *Podocotyloides petalophallus* Yamaguti, 1934, in the sizes of the body, oral and ventral suckers and reproductive organs, and in the cirrus being devoid of petaloid appendages. With the recent addition of many *Podocotyle* species representing intermediate forms between *Podocotyle* and *Podocotyloides* it has become necessary to refer the latter genus to the former as suggested by Park in 1937.

9. *Podocotyle serrani* n. sp.

Pl. II, Fig. 7.

Habitat. Small intestine of *Serranus* sp.

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

Body rather plump, with blunt-pointed extremities, 3.7–4.3 mm long, 0.8–0.9 mm broad in testicular zone. Cuticle smooth, about

3 μ thick. Oral sucker subterminal, 0.18-0.19 \times 0.21-0.24 mm. Prepharynx present. Pharynx 0.12-0.14 \times 0.13-0.16 mm. Esophagus 0.1-0.18 mm long. Ceca rather narrow, terminating at posterior extremity. Acetabulum prominent, 0.4-0.45 \times 0.47-0.5 mm, at second sixth of body; sucker ratio approximately 1:2.2.

Testes subglobular. 0.2-0.34 \times 0.22-0.3 mm, situated obliquely tandem a little behind middle of body, the anterior on the left of median line and the posterior on the right, with its hind end at junction of middle with posterior third of body. Cirrus pouch much elongated, sigmoid, 1.5-1.86 mm long, 0.13-0.14 mm broad at its posterior swelling, extending to near middle of body, intruding a little into vitellarian zone, provided throughout with strongly developed longitudinal muscle. Vesicula seminalis tubular, straight, 0.45-0.78 mm long, 0.07-0.11 mm wide; pars prostatica indistinct, though prostate cells are well developed, surrounding anterior part of vesicula seminalis and ductus ejaculatorius. Cirrus eversible, unarmed. Genital pore sinistral, at about middle of anterior third of body.

Ovary rounded triangular, or somewhat constricted at middle, 0.22-0.25 \times 0.12-0.2 mm, situated a little to right of median line just behind middle of body anterodextral to anterior testis. Receptaculum seminis retort-shaped, anterior to ovary, from which it is separated by the right transverse vitelline duct. Laurer's canal arising from tapering end of receptaculum seminis, apparently opening outside dorsal to receptaculum seminis. Uterus winding between shell gland and acetabulum, and then running straight alongside cirrus pouch toward genital pore. Eggs 63-66 \times 36-39 μ in life. Vitelline follicles small, surrounding ceca all round, commencing a little in front of middle of body, may or may not overlap the ovary and testes, not confluent in median line.

Excretory vesicle tubular, curved in an S-shape between two testes and between anterior testis and ovary, where it terminates in a dilatation and gives off a pair of collecting vessels running as far forward as the pharynx. At its terminal aperture it is provided for a length of about 45-60 μ with well developed inner longitudinal and outer circular muscle fibers, and lined with cuticle.

This species differs from the most closely related *Podocotyle epinepheli* Yamaguti, 1942, in the cirrus pouch being much longer and containing a straight vesicula seminalis, in the vitelline follicles

of the two sides extending further forward than the transverse vitelline ducts and not being confluent in the posttesticular median field.

10. *Diplobulbus scari* n. sp.

Pl. III, Fig. 15.

Habitat. Intestine of *Scarus* sp.

Material and locality. 9 gravid specimens, somewhat macerated, with two suckers evaginated, fixed in acetic sublimate under a cover slip, stained and mounted as usual; Macassar.

Body elongated pyriform, $0.74-1.25 \times 0.3-0.55$ mm. Oral sucker $75-160 \mu$ in diameter, pharynx $30-50 \times 27-50 \mu$. Esophagus $45-110 \mu$ long; ceca terminating at level of anterior end of ovary. Acetabulum $0.28-0.4 \times 0.22-0.38$ mm, containing two transverse bulbous bolsters which are protruded outside owing to postmortem maceration; its center situated a little behind midbody.

Testes oval to subglobular, $65-130 \times 90-180 \mu$, placed obliquely tandem at middle of posterior third of body. Cirrus pouch claviform or subelliptical, $0.12-0.25$ mm long by $42-75 \mu$ broad, not quite reaching to acetabulum, provided with longitudinal muscle which is developed better distally than proximally; vesicula seminalis S-shaped, occupying greater part of cirrus pouch. Pars prostatica indistinct, though postate cells are well developed. Protruded cirrus smooth, plump, up to 0.1 mm in diameter. Genital pore in left submedian line at level of intestinal bifurcation.

Ovary longitudinally elongated oval to elliptical, $0.095-0.17$ mm long by $30-100 \mu$ broad, situated on the right or left at anterior end of posterior third of body immediately behind the cecum of its own side. Receptaculum seminis claviform, $20-45 \mu$ in diameter, dorso-medial to ovary. Laurer's canal opening dorsally in right or left submedian line at level of shell gland. Vitelline follicles extending along ceca from level of intestinal bifurcation or esophagus to level of testes. In the dorsal preacetabular area they may reach to the median line. Uterus convoluted behind acetabulum dorsal, ventral and posterior to testes, finally running straight obliquely forward toward genital pore. Eggs oval, $22-24 \times 14-16 \mu$, with a filament about 45μ long at each pole. Excretory system not made out.

This species resembles *Diplobulbus calotomi* Yamaguti, 1934,

very closely, but differs, except for measurements, in the genital pore being level with the cecal bifurcation, in the vesicula seminalis turning back on itself in every instance, in the receptaculum seminis being claviform instead of roundish, in the germiduct arising from the anterior end of the ovary, and in the breadth of the eggs being definitely greater.

Re-examination of my original specimens of *D. calotomi* revealed the fact that the anterior portion of the vesicula seminalis does not turn back on itself, though it may be somewhat undulating when the cirrus is retracted, and that the eggs are narrower than those of the present species, measuring 21-24 μ long by 11-14 μ broad.

11. *Pseudolepidapedon lethrini* n. sp.

Pl. IV, Fig. 20.

Habitat. Small intestine of *Lethrinus* sp.

Material and locality. Three gravid specimens; Macassar.

Body oblong, covered all over with minute spines, 2.4-3.1 mm long, 0.4-0.5 mm broad at level of testes, forebody tapering anteriorly; hinbody flattened cylindrical, somewhat widened in testicular region, rounded at posterior extremity. A pair of conspicuous eye-spots present. Oral sucker terminal, finger-bowl-shaped, 0.075-0.14 \times 0.1-0.15 mm, with a special base of circular muscle fibers. Prepharynx 0.32-0.56 mm long. Pharynx strongly muscular, 0.12-0.16 \times 0.13-0.2 mm, produced anteriorly into a ring of circular muscle fibers. Esophagus very short and wide. Ceca also wide, terminating close to each other at posterior extremity. Acetabulum 0.2-0.28 mm in diameter, at anterior part of middle third of body or at its junction with anterior third.

Testes round, 0.25-0.36 mm in diameter, median, directly tandem, confined to posterior third of body. Cirrus pouch thin-walled, sigmoid or slightly winding when extended, 0.55-0.75 mm long, reaching midway between acetabulum and ovary, 0.06-0.105 mm broad at its posterior swelling occupied by the internal seminal vesicle which is 0.1-0.25 mm long by 0.05-0.1 mm wide. Ductus ejaculatorius winding, composed of weak circular and strong longitudinal muscle fibers. Pars prostatica and prostate cells not differentiated. Genital pore median, immediately in front of acetabulum.

Ovary globular, 0.12-0.18 mm in diameter, situated immediately in front of anterior testis a little to one side of median line. Laurer's canal short, opening middorsally at level of ovary. No receptaculum seminis. Uterus winding between shell gland and cirrus pouch; metraterm running along anterior portion of cirrus pouch. Eggs more or less shrunken, 84-87 μ by 60-66 μ in mounted condition. Vitellaria extending along ceca from a little behind acetabulum to posterior extremity, overlapping ovary and testes, especially on their dorsal side. Excretory system not made out, pore dorsoterminal.

This species differs from *Pseudolepidapedon paralichthydis* Yamaguti, 1938, and *P. kobayashii* Yamaguti, 1938 in the smaller, slender body, in the posterior position of the testes, in the submedian position of the ovary, etc.

12. *Opegaster gobii* n. sp.

Pl. IV, Fig. 19.

Habitat. Intestine of *Gobius* sp.

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

Body flattened subcylindrical, fusiform or elliptical, 0.8-2.1 mm in length with maximum breadth of 0.3-0.75 mm at or near middle. Oral sucker subterminal, 90-155 \times 95-195 μ ; prepharynx funnel-shaped, 20-60 μ long. Pharynx 45-90 \times 45-125 μ . Esophagus 30-120 μ long, bifurcating a little behind middle of anterior third of body. Ceca uniting near posterior extremity to form anal canal, which opens ventrally in the type about midway between cecal union and posterior tip of body. Acetabulum 0.135-0.28 mm in diameter, with 6 papilliform protuberances, three on the anterior margin and three on the posterior; situated at junction of anterior with middle third of body or a little more posteriorly; sucker ratio 1:1.5-1.7.

Testes transversely elongated, irregular in shape and more or less indented, but not so distinctly lobed as in the type of *Opegaster plotosi* Yamaguti, 1940, 0.06-0.27 \times 0.13-0.38 mm, placed one directly behind the other at about middle of hindbody; the anterior may be displaced a little out of median field, but the posterior is exactly median without exception. Vesicula seminalis externa

tubular or fusiform, 20–60 μ wide, extending to anterior or anterolateral margin of acetabulum, with its tapering anterior portion surrounded by prostatic cells. Occasionally it may not reach to the anterior margin of the acetabulum; but when the forebody is contracted it may well reach beyond this sucker. Cirrus pouch pyriform or subcylindrical, thin-walled, 45–90 μ long by 20–40 μ wide, containing indistinct pars prostatica and narrow ductus ejaculatorius. Genital pore in left submedian line at level of posterior end of esophagus.

Ovary approximately reniform, with the hilus produced forward in form of a prominent cone, 45–90 \times 90–240 μ , situated in median line or a little to one side of it immediately anterior or anteroventral to anterior testis, confined to posterior half of middle third of body. Laurer's canal coiled between right cecum and vitelline reservoir, running transversely toward the left and then curving backward opens outside dorsal to left part of ovary. Uterus containing abundant sperm at its proximal portion, running in intercecal field from side to side and then ascending on the left of vesicula seminalis and cirrus pouch. Eggs oval, light brown, not very numerous (not over 90), 63–76 \times 45–51 μ . Vitelline follicles extending in lateral fields from level of intestinal bifurcation to posterior extremity as well as in posttesticular intercecal field; some follicles may intrude medially across the ceca in the acetabulotesticular area. Vitelline reservoir submedian, transversely elongated, 30–75 μ in anteroposterior diameter. Excretory vesicle tubular, widened anteriorly, reaching to level of ovary; pore terminal.;

This species differs from the most closely related *Opegaster beliyai* Pande, 1937, chiefly in the sucker ratio, in the anterior extent of the vitellaria, and in the breadth of the eggs, and from *Opegaster plotosi* Yamaguti, 1940, and *O. synodi* Manter, 1947, in the testes being not so much deeply indented or lobed, and in the eggs being definitely larger. In Pande's Indian species from *Gobius giuris* the vitellaria begin at about the level of the middle of the esophagus and the eggs are 70 μ long by 34–40 μ broad.

13. *Opegaster longivesicula* n. sp.

Pl. I, Fig. 3.

Habitat. Intestine of *Gobius* sp., associated with *Opegaster gobii*.

Material and locality. A single whole mount; Macassar.

Body subcylindrical, with rounded extremities, 1.3 mm long by 0.44 mm at about middle. Cuticle with minute papillae at anterior part of body. Rounded or pyriform cervical glands present in neck region. Oral sucker subterminal, 0.11×0.145 mm. Prepharynx short, funnel-shaped. Pharynx $75 \times 86 \mu$. Esophagus 65μ long, provided with well developed longitudinal muscle, bifurcating behind middle of anterior third of body. Ceca running dorsal to outskirts of uterine coils and between testes and vitellaria, uniting posteriorly and opening ventrally by an anal canal close to posterior extremity. Acetabulum 0.2 mm in diameter, at junction of anterior with middle third of body, with 6 strongly flattened papillae, three on the anterior border and three on the posterior.

Testes indented on posterior margin as well as on each side, situated directly tandem at middle of postacetabular area; anterior 0.14×0.25 mm, posterior 0.18×0.22 mm. Vesicula seminalis externa arcuate, cylindrical, very long, 80μ wide, extending from shell gland complex to beginning of left cecum, passing between this cecum and acetabulum, with prostate cells on each side of its greater anterior part; its tapering anterior end forming an S-shaped curve before entering cirrus pouch. Pars prostatica not distinctly differentiated, enclosed together with ductus ejaculatorius in contracted pyriform cirrus pouch which is 33μ in diameter and consists mainly of longitudinal muscle fibers. Genital pore to left of posterior end of esophagus.

Ovary transversely elongated, 80μ long by 0.18 mm broad, with prominent conical hilus on anterodorsal margin near its broader left end, situated immediately in front of right part of anterior testis. Laurer's canal crossing terminal portion of germiduct ventrally and curving round vitelline reservoir, opening dorsally in median line at about midbody. Eggs oval, light brown, $66-75 \mu$ long by $48-50 \mu$ broad. Vitelline follicles extending in extracecal fields from level of intestinal bifurcation to posterior extremity, and filling up whole posttesticular area, not intruding medially across ceca as far back as posterior end of hind testis. Vitelline reservoir fusiform, 40μ in diameter, situated obliquely anterodorsal to right part of ovary, with its anterior portion ventral to right cecum. Excretory vesicle tubular, with terminal pore, widened anteriorly, apparently reaching to ovary

This species resembles *Opegaster mehrii* Harshey, 1937, in the excessive posterior extent of the vesicula seminalis, but differs from it in the position of the genital pore, in the anterior extent of the vitellaria and in the breadth of the eggs. The specific name refers to the distinctive character of the seminal vesicle. The course of the Laurer's canal also seems to be characteristic of the present species.

14. *Opecoelus piriformis* n. sp.
Pl. II, Fig. 9.

Habitat. Small intestine of *Lates calcarifer*.

Material and locality. Single whole mount; Macassar.

Body approximately pyriform, with the forebody markedly attenuated toward anterior extremity, 1.1 mm long by 0.475 mm broad at middle of hindbody. Cuticle apparently smooth. Oral sucker ventroterminal, $50 \times 70 \mu$. Prepharynx 24μ long; pharynx barrel-shaped, $50 \times 42 \mu$; esophagus 0.19 mm long, thin-walled; ceca united posteriorly and opening outside at extreme posterior end of body. Acetabulum 0.17 mm in diameter, with three papillae on posterior margin and three more inconspicuous ones on anterior margin, situated at anterior end of middle third of body.

Testes transversely elongated and pressed one against the other; anterior testis 90μ by 0.18 mm, intercalated between ovary and posterior testis and displaced only slightly to left of median line, at anterior end of posterior third of body; posterior testis 0.12×0.21 mm, just a little to right of median line at anterior end of posterior quarter of body. Vesicula seminalis club-shaped, 45μ wide at its posterior dilatation reaching just a little back of acetabulum. Pars prostatica indistinct, though numerous prostatic cells are massed together around attenuated anterior end of vesicula seminalis; cirrus opening with metraterm in left submedian line at level of intestinal bifurcation.

Ovary elliptical, 0.1×0.18 mm, lying transversely slightly in front of anterior testis and pressed against it, displaced to right of median line. Mature eggs oval, intermingled with abortive ones, measuring $78 \times 60 \mu$. Laurer's canal apparently opening dorsally just anterosinistral to vitelline reservoir. Vitelline follicles extending along each side of body as far as posterior extremity, commencing on the right at level of middle of acetabulum and on the

left just behind genital pore. Anteriorly they are mostly confined to the extracecal fields, but posterior to the ovarian level they intrude medially across the ceca and become confluent behind the posterior testis. Vitelline reservoir triangular, situated just in front of anterodextral corner of ovary.

This species is distinguished from any of the known members of the genus by the pear-shape of the body, to which the specific name refers.

15. *Marsupioacetabulum marimum* n. g., n. sp.

Pl. VI, Fig. 28.

Habitat. Intestine of *Gerres punctatus* (Bleeker).

Material and locality. A single, somewhat flattened whole mount; Macassar.

Body flattened ellipsoidal, about 3 mm long, 1.3 mm wide a little behind middle, tapered anteriorly to a blunt point, broadly rounded posteriorly. Cuticle smooth, up to 3μ thick. No eye spots. The longitudinal muscle fibers attached to the oral sucker run backward on either side of the pharynx and intestinal ceca and disappear in the parenchyma of the hindbody. Preoral lobe thick. Oral sucker subterminal, 0.22×0.255 mm, with wide lumen. Prepharynx very wide, 0.11 mm long, with cephalic ganglion on each side. Pharynx $123 \times 140\mu$, muscular, 3-lobed in front. Esophagus very short. Ceca wide, arcuate, separated from lateral margins of body by strongly developed vitelline follicles, apparently terminating at posterior extremity. Acetabulum pouch-like, 0.525×0.51 mm, situated a little in front of middle of body; its backwardly directed aperture 0.18 mm wide, slit-like, surrounded by thick lamellar muscle which forms an anterior and a posterior lip; the lumen of the sucker is spacious, and the wall is very much reduced in thickness at the base, though moderately thickened toward the lips.

Testes ellipsoidal, situated longitudinally one on each side of median line at anterior part of posterior third of body; right testis measuring 0.43×0.225 mm, left one 0.45×0.225 mm. The vasa efferentia arising from the anterior end of the testes run forward convergently and unite together just before opening into the vesicula seminalis; the right duct passes along the dorsal surface of the right end of the ovary and ventral to the left end of the receptaculum seminis, while the left duct crosses obliquely the vitelline

reservoir dorsally, and the Laurer's canal as well as the uterus ventrally. It is to be noted that the vas deferens opens into the vesicula seminalis at its left end and not at its base. Vesicula seminalis retort-shaped, 0.18 mm wide, lying transversely about midbody on the right of median line with the broad base directed to the right; its left end is curved at right angles and tapers to a long duct running forward in median line dorsal to the acetabulum. The prostate cells are massed immediately lateral and posterior to the acetabulum, covering the ceca, vesicula seminalis and Laurer's canal ventrally and enclosing the greater part of the uterus, being continuous posteriorly with the shell gland; they are spindle or pear-shaped, and contain a round or ovoid, vesicular nucleus 5-6 μ in diameter with a distinct nucleolus, and fine granulo-reticular protoplasm or clear secretory product. When fully distended with this secretory product they assume a subglobular to elliptical sac measuring up to $42 \times 30 \mu$; their ducts run convergently on the dorsal side of the acetabulum and open into the short pars prostatica, which lies immediately dorsal to the anterior border of the sucker and passes into a short cylindrical duct surrounded by accompanying cells. This duct in turn is directly continued into a cylindrical genital atrium, into which the uterus appears to open dorsal to the male duct. Genital atrium about 60 μ long by 30 μ wide, provided with weak longitudinal muscle fibers, lined with rough, apparently spinose cuticle; genital pore exactly median, 0.15 mm posterior to intestinal bifurcation, 0.11 mm anterior to acetabulum.

Ovary approximately reniform, 0.18×0.325 mm, placed a little obliquely in nearly median line in front of testes. The wide germiduct arising from the middle of the anterior surface of the ovary proceeds anterodextrally and after forming a small bulbous swelling 20 μ wide joins the receptaculum seminis just at the point where the Laurer's canal is given off; further it runs toward the left to receive the vitelline duct in front of the vitelline reservoir. Ootype bulbous, 60 μ in diameter, on the left of median line opposite receptaculum seminis, constricted off from uterus. The latter turns back on itself in front of the ovary, and crossing obliquely the receptaculum seminis ventrally runs forward along the right end of the seminal vesicle. Further it describes two turns on each side of the median line as shown in the Fig. 28, and then proceeds

straight forward dorsal to the acetabulum alongside the tubular distal portion of the seminal vesicle. Eggs oval, about $75 \times 60 \mu$; only three of them were observed. Receptaculum seminis elongate, 0.25×0.11 mm, lying transversely behind vesicula seminalis, with its anterior border overlapping this vesicle dorsally; it tapers toward the left to form an arcuate Laurer's canal which opens outside on the middorsal line at the level of the seminal vesicle about 0.2 mm behind the acetabulum. Vitellaria consisting of comparatively large follicles, commencing outside ceca at level of intestinal bifurcation; in the hindbody they extend over the ceca and testes ventrally, and occupy the whole posttesticular area. The right vitelline duct runs transversely dorsal to the base of the seminal receptacle and anterodorsal to the ovary crossing the commencement of the germiduct dorsally, while the left vitelline duct passes obliquely through the shell gland. Vitelline reservoir transversely elongated, situated immediately anterosinistral to ovary; the efferent duct arises from the left anterior margin of the vesicle and proceeding a short distance toward the right joins the germiduct.

Excretory vesicle tubular, enlarged anteriorly, extending in median line between two testes and reaching to ovary; giving off a pair of collecting vessels at level of anterior part of testes; excretory pore terminal.

The present worm bears a certain resemblance to *Labrifer semicossyphi* Yamaguti, 1936, in the lipped acetabulum, and in the disposition of the prostate cells, but differs definitely in the juxtaposition of the testes, in the absence of the cirrus pouch, in the cylindrical genital atrium, in the median postbifurcal genital pore, and in the more extensive vitellaria. There is no doubt that it represents a new genus of the family Allocreadiidae, for which the name *Marsupioacetabulum* is proposed in reference to the pouch-like acetabulum.

Marsupioacetabulum n. g.

Generic diagnosis. Allocreadiidae Stossich, 1904. Body not very small, unarmed. Oral sucker subterminal, prepharynx wide, pharynx small, esophagus very short, ceca terminating blindly at posterior extremity. Acetabulum pouch-like, with distinct muscular lip-like structure at its backwardly directed aperture, pre-equatorial. Testes juxtaposed in posterior half of body. Vesicula seminalis saccular, extending back of acetabulum; pars prostatica not very distinct, prostate

cells profusely developed lateral and posterior to acetabulum. Neither cirrus nor cirrus pouch. Genital pore median, pre-acetabular. Ovary median, pretesticular. Receptaculum seminis and Laurer's canal present. Shell gland, ootype and vitelline reservoir on the left of median line anterior to ovary. Uterus coiled from side to side in intercecal field between ovary and acetabulum. Eggs few, large, without polar filaments. Vitellaria follicular, occupying extracecal and posttesticular fields. Excretory vesicle reaching to ovary. Parasitic in marine fishes.

Genotype. *Marsupioacetabulum marinum*.

MONORCHIIDAE Odhner, 1911

16. *Diplolasiotocus chaetodontis* n. g., n. sp.

Pl. III, Fig. 12.

Habitat. Intestine of *Chaetodon awuga*.

Material and locality. Two mature specimens fixed in acetic sublimate, stained and mounted in toto; the type was straightened out too strongly when fixed under a cover slip; Macassar.

Body slender, fragile, 0.7–2.9 mm long, 0.15–0.28 mm broad; greatest diameter at level of posterior testis in the larger type, but at ovario-vitellarian level in the paratype; forebody tapered to a blunt tip, nearly as long as hindbody; hindbody broader than forebody, bluntly pointed behind. Cuticle thin, unarmed, but may be spined if not macerated. Subcuticular musculature very poorly developed. Oral sucker terminal, cup-shaped, 60–66 × 70–78 μ , with very weak musculature. Prepharynx present. Pharynx oval, 36 × 30 μ . Esophagus very narrow, 0.11–0.75 mm long, bifurcating at posterior part of anterior third of body. Ceca also narrow, terminating at level of anterior testis. Acetabulum 0.06–0.13 mm in diameter, feebly developed, situated at about midbody.

Testes oval to elliptical, situated one behind the other at about middle of hindbody. In the type the anterior testis is oval and 120 μ long by 65 μ broad, while the posterior testis is elliptical and 300 μ long by 70 μ broad; in the paratype the anterior testis, 90 μ by 70 μ , entirely overlaps dorsally the posterior testis which is 150 μ long by 90 μ broad. The vasa efferentia, each of which arises from the anterior end of its own testis, run forward alongside each other dorsal to the uterus and unite together before opening into the seminal vesicle. There is a long claviform cirrus pouch which is 0.13–0.51 mm long by 30–86 μ broad and has a very delicate wall, and extends for

its greater part posterior to the acetabulum; vesicula seminalis occupying base of cirrus pouch, distinctly bipartite; in the type the smaller posterior portion is $44\ \mu$ long by $48\ \mu$ wide and the anterior $100\ \mu$ long by $62\ \mu$ wide. Pars prostatica distinctly differentiated, up to $30\ \mu$ long, with maximum width of $12\ \mu$ posteriorly, surrounded by well developed prostate cells, which fill up the available space within the cirrus pouch. A comparatively short ductus ejaculatorius follows the pars prostatica. Cirrus narrow proximally, somewhat widened distally ($30\ \mu$ wide in the type), densely covered inside with acicular spines which are about $20\ \mu$ long except at the distal end where they are $12\ \mu$ long. Genital pore median, $0.11\ \text{mm}$ in front of acetabulum in the type, but immediately anterior to it in the paratype.

Ovary globular to elliptical, $30-75\ \mu$ long by $30\ \mu$ broad, situated in front of anterior testis a little to left of median line at junction of middle with posterior third of body. Receptaculum seminis and Laurer's canal lacking. Shell gland dorsal to ovary. Vitelline gland divided into few tubular acini extending on each side from behind acetabulum to cecal end; in the paratype the gland of each side consists of four digitiform lobes, one of which is subdivided at the tip into one to three nodules. Transverse vitelline ducts uniting between ovary and anterior testis. The uterus is confined in the paratype to the vitellotesticular region, but in the type it shows a very characteristic course; at first it coils in the posttesticular region and then ascends along the right side of the testes as far as the ovary, where it turns backward and descends along the right side of the first ascending uterus to the posterior extremity. Thence it ascends again between this descending portion and the right margin of the body, and crossing the median line behind the cirrus pouch descends along the left side of the ovary and testes as far back as the posterior end of the body where it takes the final ascending course along the left margin of the body, and leads into the metraterm at the level of the pars prostatica. The metraterm, $0.4\ \text{mm}$ long in the type, becomes dilated as it proceeds forwards along the left side of the body and attaining a maximum width of $70\ \mu$ turns toward the genital pore. It has a very thin delicate wall, and is covered rather sparsely with bristle-like spines of varying length. Eggs light brown, elongate oval, $36-51\ \mu$ long by $18-21\ \mu$ broad, with a very long filament (up to $0.2\ \text{mm}$) at antiopercular

pole ; contained ovum not segmented. Excretory vesicle tubular, with terminal pore, reaching to posterior testis.

The present new genus differs from the most closely related *Lasiotocus*, in the testis being double and in the eggs being filamented. The first attributive of the compound name refers to the double testis.

Diplolasiotocus n. g.

Generic diagnosis.. Monorchidae Odhner, 1911. Body small. Oral sucker terminal. Prepharynx present. Pharynx small. Esophagus long and slender. Ceca terminating some distance in front of posterior extremity. Acetabulum small, at about middle of body. Testes double, median, tandem, in posterior part of body. Cirrus pouch elongate, containing a bipartite vesicula seminalis, a distinct prostate complex and a densely spined cirrus. Genital pore pre-acetabular. Ovary pretesticular, submedian. Receptaculum seminis and Laurer's canal absent. Uterus running back and forth, encircling ovary and testes and occupying entire posttesticular region. Metraterm well differentiated, spined, functioning like terminal organ of *Lasiotocus* (= *Proctotrema*). Eggs light brown, thin-shelled, filamented at antiopercular pole. Vitellaria lateral, in ovarian zone, divided into few tubular lobes. Excretory vesicle tubular, with terminal pore. Parasites of marine fishes.

Genotype. *Diplolasiotocus chaetodontis*.

17, *Opisthomonorchis carangis* n. g., n. sp.

Pl. I, Fig. 5.

Habitat. Small intestine of *Caranx* sp.

Material and locality. A dozen mature specimens, fixed in acetic sublimate under a cover slip, stained and mounted as usual ; Macassar.

Body lanceolate, blunt-pointed at each end, 1.75-2.85 mm in length, with maximum breadth of 0.25-0.43 mm in pre-equatorial region ; forebody usually wider than hindbody, but the posttesticular part may attain the greatest diameter when fully distended with eggs. Cuticle up to 3 μ thick, beset throughout with thick placoid scales which are arranged regularly in quincunx, diminishing in size and density toward the posterior extremity. Fine pigment granules of larval eye spots present on either side of esophagus. Oral sucker ventroterminal, spherical, 48-90 \times 60-95 μ . Prepharynx 24-65 μ long. Pharynx globular, 30-63 \times 39-68 μ . Esophagus 0.06-0.13 mm long, with delicate wall, up to 60 μ wide

when dilated, bifurcating at about middle of anterior third of body. Ceca simple, usually narrow but may be up to $45\ \mu$ wide, terminating dorsolateral to uterus at a distance of $0.12-0.28$ mm from posterior extremity. Acetabulum $80-130\ \mu$ in diameter, a little in front of midbody.

Testes subglobular, oval or elliptical, single, $0.13-0.27\times 0.09-0.2$ mm, situated just in front of middle of posterior third of body, occupying entire breadth of intercecal field. Two vasa efferentia arising from dorsal side of anterolateral parts of testis, running forward convergently toward posterior end of cirrus pouch, which they penetrate alongside each other; the right one passing between ovary and right vitelline duct, and the left one between shell gland and left vitelline duct. The large elliptical or subcylindrical cirrus pouch with a very thin, membranous wall and measuring $0.27-0.44$ mm long by $0.068-0.16$ mm wide lies longitudinally in the median field in front of the testis with its rounded proximal end overlapping the ovary and shell gland dorsally. The distance between the cirrus pouch and the testis varies from $40\ \mu$ to 0.15 mm. Vesicula seminalis oval, $0.08-0.16\times 0.068-0.1$ mm, occupying entire basal portion of cirrus pouch, abruptly tapered anteriorly to a narrow duct leading into cirrus. Pars prostatica not distinctly differentiated; prostate cells strongly developed and converged toward proximal end of cirrus. Cirrus cylindrical when at rest, funnel-shaped when contracted and protruded into genital sinus, $0.18-0.23$ mm long by $42-90\ \mu$ wide, densely covered throughout with hollow spines which are largest ($18-30\times 6-8\ \mu$) and somewhat claw-like at the anterior end of the cirrus but become gradually smaller posteriorly and assume a conical shape at the posterior end of the cirrus, measuring $5-6\ \mu$ long by $2-4\ \mu$ wide at the base. Genital sinus tubular, $0.13-0.21$ mm long by $0.035-0.15$ mm wide, provided with a layer of longitudinal muscle fibers, covered inside with minute pointed spines and surrounded by accompanying cells; genital pore round or oval, $24-40\times 29-60\ \mu$, postacetabular, equatorial or pre-equatorial, a little to left of median line.

Ovary subglobular to oval, $0.12-0.18\times 0.086-0.13$ mm, situated just in front of testis a little to right of median line at anterior part of posterior third of body or at its junction with the middle third. In the larger examples it develops dorsally a small oval lobe which may overreach the lateral margin of the main part of the ovary.

In the smaller examples, however, this dorsal outgrowth is not recognizable. The germiduct arising from the middorsal surface of the ovary proceeds toward the median line and joins the vitelline duct in front of the vitelline reservoir; the uterine duct is convoluted in the compact mass of the shell gland and then runs backward ventral to the testis. Shell gland enclosed in a membranous capsule with smooth contour, situated dorsally between testis and cirrus pouch, overlapping ovary and vitelline reservoir, and posterior end of cirrus pouch, too, unless the body is extended. The winding uterus occupies the most of the posttesticular region leaving the posterior extremity free, and then ascends almost straight on the ventral side of the testis, shell gland, and cirrus pouch, and finally opens into the genital sinus ventral to the cirrus at about the middle of the vitellarian zone. Receptaculum seminis uterinum present in posttesticular area, but true seminal receptacle and Laurer's canal absent. Mature eggs light brown, elongate oval, but nearly hemispherical in profile, $15-21 \times 9-12 \mu$, with a short filament up to 8μ long at antiopercular pole; immature eggs colorless, may or may not be filamented. Vitellaria follicular, extending along ceca, mostly on their outer side, for a distance of $0.25-0.45$ mm, commencing at about level of genital pore and terminating at a variable distance in front of ovary; follicles round, oval or elliptical, $35-90 \times 30-66 \mu$, 9 on each side without exception. Right vitelline duct descending dorsal to ovary or between ovary and right cecum, left one crossing shell gland dorsally; vitelline reservoir oval or elliptical, $15-70 \times 45-110 \mu$, situated transversely or seldom obliquely only a little to ovarian side of median line or occasionally in median line between testis and ovary near dorsal cuticle.

Excretory pore terminal; excretory vesicle median, wide, tubular, reaching to a level a little behind cecal ends, where it gives off a pair of collecting vessels running forwards.

This apparently monorchiid genus differs from any of the related members of the family in the postacetabular position of the genital pore and in the absence of the spined metraterm or terminal organ. So far as the genital pore is concerned it presents a very extreme case of deviation from the usual median pre-acetabular position, *Asymphylogora* Looss being intermediate. A new genus *Opisthomonorchis* and a new subfamily *Opisthomonorchiinae* are

therefore proposed with the following diagnosis respectively.

Opisthomonorchis n. g.

Generic diagnosis. Monorchiidae Odhner, 1911. Body much elongated, oculate, covered with scale-like spines. Oral sucker ventroterminal. Prepharynx distinct. Pharynx small. Esophagus short. Ceca not quite reaching to posterior extremity. Acetabulum in anterior half of body. Testes single, median, in posterior third of body, with two efferent ducts. Cirrus pouch elongate, containing vesicula seminalis, well developed prostatic cells and heavily armed eversible cirrus, situated in median field between acetabulum and testis. Genital sinus tubular, armed, opening behind acetabulum, a little to one side of median line. Ovary entire or somewhat lobed, pretesticular, a little to one side of median line. Receptaculum seminis and Laurer's canal absent. Uterus occupying most of post-testicular area. Receptaculum seminis uterinum present. Neither metraterm nor so-called terminal organ differentiated. Eggs numerous, nearly hemispherical in profile, with a short filament at antiopercular pole. Vitellaria divided into small number of follicles, lateral, extending between acetabulum and ovary. Excretory vesicle tubular, relatively short, with terminal pore. Parasitic in marine fishes.

Genotype. *Opisthomonorchis carangis*.

Opisthomonorchiinae n. subfam.

Subfamily diagnosis. Monorchiidae Odhner, 1911. Body elongate, armed. Digestive system as in Monorchiinae. Testes single, posterior. Cirrus pouch elongate, pretesticular. Cirrus spined. Genital sinus well developed. Genital pore postacetabular, submedian. Ovary pretesticular. Vitellaria follicular, lateral, postacetabular. Uterus posttesticular, with simple, unarmed, terminal portion. Eggs small, filamented. Excretory vesicle tubular. Parasites of fishes.

Type genus. *Opisthomonorchis*.

HETEROPHYIDAE Odhner, 1911

18. *Paracryptogonimus ovatus* n. sp.

Pl. I, Fig. 4.

Habitat. Unknown marine fish (slide label missing).

Material and locality. Four gravid specimens fixed in acetic sublimate, stained with iron hematoxylin and mounted in balsam; Macassar.

Body flattened oval, 1.35-1.75 mm long, 0.8-1.0 mm wide at middle. Cuticle very thick, especially in neck region, attenuated at terminal excretory pore, beset anteriorly with exceedingly minute scale-like spines, with fine striations at right angles to body surface. In the neck region there are scattered pigment granules of

the larval eye-spots and well developed pyriform dermal glands. Oral sucker discoid, nearly terminal, 0.22-0.31 mm in diameter, covered with very thin smooth cuticle and armed along the outer boundary with a single crown of about 80 simple blunt spines 8-12 μ long by 2-4 μ wide; when protruded the central area is produced in form of a rounded cone. Its opening ventroterminal, transversely elongated oval, 40-70 μ in transverse diameter, surrounded by fine circular muscle fibers. Prepharynx up to 0.1 mm long by 0.1 mm wide. Pharynx bulbous, 0.15-0.19 mm in diameter. Esophagus very short, practically absent. Ceca unusually wide (0.1-0.16 mm in diameter), arcuate, terminating blindly at posterior extremity one on either side of excretory vesicle. Acetabulum round, 0.16-0.2 mm in diameter, embedded in body parenchyma at junction of anterior with middle third of body, with a crescent depression in front. There is a circular fold of the body wall enclosing this sucker as well as the genital pore; it is 0.17-0.23 mm in diameter and may or may not coincide with the outline of the acetabulum.

Testes rounded, 0.16-0.25 \times 0.15-0.23 mm, placed almost symmetrically just inside ceca at about middle of hindbody. Vesicula seminalis tubular, winding, 0.4-0.5 mm long by 30-70 μ wide, extending from near midbody to left side of acetabulum or a little more anteriorly. Pars prostatica oval to elliptical, 40-50 μ long by 25-40 μ wide, constricted off from vesicula seminalis, surrounded by comparatively few prostate cells, united with uterus before opening into base of genital atrium at its posterior wall. There is neither cirrus nor cirrus pouch. Genital atrium tubular, 30-90 μ long by 10-30 μ wide, appearing like direct continuation of metaterm, opening ventral to intestinal bifurcation into crescent preacetabular recess formed by above mentioned circular fold of the body wall.

Ovary three- or four-lobed, transversely elongated, 0.13-0.2 \times 0.3-0.4 mm, lying immediately in front of two testes with its center just behind middle of body. Receptaculum seminis oval, 0.15-0.23 \times 0.1-0.15 mm, situated in front of ovary close to posterior end of seminal vesicle, with one end produced backward into a comparatively wide duct, at the end of which it receives the germiduct on the right and gives off the Laurer's canal on the left. Laurer's canal following a sigmoid course and opening outside dorsal to left

lobe of ovary. Uterus running backward dorsal to ovary and then between two testes, and turning forward near posterior extremity to ascend sinuously ventral to descending portion, partly covering ceca, testes, ovary, receptaculum seminis and seminal vesicle. Eggs elliptical, $16-19 \times 9-11 \mu$. Vitellaria consisting of small follicles, forming on each side a series of three grape-like bunches along outside of ceca, occupying greater middle part of extracecal field, usually commencing at level of receptaculum seminis; vitelline reservoir $20-45 \times 10-25 \mu$, just at center of body between ovary and shell gland. Excretory pore terminal, with longitudinal folds of cuticle; excretory vesicle divided at level of testes into two wide arms reaching to sides of pharynx or prepharynx.

This species differs from *Paracryptogonimus acanthostomus* Yamaguti, 1934, and *P. americanus* Manter, 1940 chiefly in the intercecal position of the testes, in the more coarsely lobed ovary, and in the vitellaria occupying the middle portion of the extracecal field. With the addition of the present species and *P. americanus* Manter, 1940, my original diagnosis of the genus is emended as follows.

Paracryptogonimus Yamaguti, 1934, emended.

Generic diagnosis. Heterophyidae Odhner, 1914. Body rather plump, oculate, covered with minute scale-like spines, with numerous dermal glands, in anterior part. Oral sucker comparatively large, with a single crown of small spines. Prepharynx distinct, pharynx small or moderately large. Esophagus very short. Ceca terminating near posterior extremity. Acetabulum embedded in body parenchyma, inclosed together with genital pore in circular fold of body wall at about one third of body length from anterior extremity. Testes somewhat diagonal or symmetrical, in posterior half of body, lateral or medial to intestine or overlapping it, separated from each other by uterus. Seminal vesicle bipartite, extending further back of acetabulum. Pars prostatica poorly developed, united with uterus to form a short common duct. Genital pore just in front of acetabulum. Ovary lobed, median, pretesticular. Receptaculum seminis and Laurer's canal present. Vitellaria forming grape-like bunches, extending in lateral or dorso-lateral fields of hindbody. Uterine coils passing between two testes and reaching to near posterior extremity; eggs small, dark brown, numerous. Excretory vesicle Y-shaped, bifurcating behind ovary; arms reaching to near anterior extremity. Intestinal parasites of marine fishes.

Genotype. *Paracryptogonimus acanthostomus* Yamaguti, 1934.

Other species. *P. americanus* Manter, 1940.

P. ovatus n. sp.

19. *Pseudometadena celebesensis* n. g., n. sp.
Pl. VI, Fig. 25.

Habitat. Small intestine of *Lates calcarifer*.

Material and locality. 16 gravid specimens fixed in acetic sublimate, stained with Heidenhain's hematoxylin and mounted in balsam; Macassar.

Body flattened oval to elliptical, 0.7 - 1.7 mm in length, 0.5 - 0.7 mm in maximum breadth at middle; it may be somewhat pointed in front when the forebody is extended. Cuticle probably armed with spines, although no spines are recognizable owing to post-mortem maceration. On each side of the pharynx there are scattered pigment granules of the larval eye-spots. At the level of the intestinal bifurcation there is a conspicuous band of large, cervical gland cells which are massed more closely at each lateral edge than medially and may well reach to the testes to cover up their anterior end ventrally, and whose ducts run altogether along each side of the body toward the anterior extremity to open outside around the mouth aperture. Dorsally they are confluent across the median line. Some of them are pyriform and studded with very fine secretion granules among which is seen a round vesicular nucleus 4.5 - 6.5 μ in diameter and containing a large nucleolus, others are rather rounded and contain less numerous, somewhat coarser granules suspended in homogeneous, apparently liquid, substance. In these cells the nucleus is no more recognizable. Oral sucker terminal, bowl-shaped. 60 - 100 \times 80 - 135 μ , with comparatively weak musculature. Prepharynx present, but not always discernible, because of the oral sucker being very often turned over ventrally. Pharynx strongly muscular, 50 - 75 \times 45 - 80 μ . Esophagus delicate, short, somewhat widened out posteriorly, bifurcating just in front of acetabulum. Ceca widely divergent, with very thin delicate wall, widened considerably as they proceed in an arcuate course along the sides of the body toward the posterior extremity where they terminate blindly, passing ventral or ventrolateral to testes, ventral to vitelline gland and through lateral uterine coils. Acetabulum well developed, 0.1 - 0.16 mm in diameter, at second sixth of body, embedded within encircling fold of body wall.

Testes longitudinally elongated oval. 0.13 - 0.26 mm long by 0.09 - 0.14 mm broad, situated symmetrically on each side at third

sixth or at junction of second with third sixth of body. Vesicula seminalis constantly divided into two unequal portions; the greater anterior portion is retort- or pear-shaped, 0.15-0.22 mm long by 50-90 μ wide, and lies dorsolateral to the acetabulum with its posterior end reaching a little more posteriorly to this sucker; the smaller posterior portion is subglobular to oval, 48-105 μ by 45-90 μ , and well marked off from the anterior portion, with which it is connected by a very short narrow duct. Pars prostatica oval. 25-50 μ long by 20-40 μ wide, constricted off from anterior end of vesicula seminalis, surrounded by weakly developed prostate cells, tapering abruptly or slowly to ductus ejaculatorius. Latter simply tubular or tapering distally, running along uterus toward genital pore which opens on the anterior border of the acetabulum into the above mentioned pocket formed by the fold of the body wall. This pocket, which may well be called acetabulogenital pouch, is provided with circular and radial muscle fibers at its wide, antero-ventrally directed aperture. There is neither cirrus nor cirrus pouch.

Ovary multilobulate, flattened dorsoventrally, extending transversely in ventral area between two ceca at about middle of body or a little more anteriorly. 0.18-0.27 \times 0.24-0.48 mm. Receptaculum seminis irregular in shape, more or less twisted, with the largest portion directed dorsally, 0.085-0.21 \times 0.05-0.21 mm, situated in median field anterodorsal to ovary, joining germiduct at its attenuated end. Laurer's canal arising from receptaculum seminis at junction of the latter with the germiduct, moderately widened proximally but narrowed distally and opening outside, usually dorsal to receptaculum seminis, occasionally dorsal to posterior seminal vesicle. Uterus coiled intricately, occupying almost entire posterior half of body; its terminal portion narrow and not distinctly differentiated as metraterm, running forward in median field across shell gland and receptaculum seminis and then along with vesicula seminalis and ductus ejaculatorius. Eggs numerous, elongated pyriform, light brown, embryonated, 15-20 \times 9-11 μ . Vitelline gland acinous, extending profusely in dorsal area behind testes and in extracecal fields where it may well reach to near the posterior extremity. Vitelline ducts arising from behind testes, running transversely dorsal to ovary, united together immediately behind receptaculum seminis to form an inconspicuous triangular

vitelline reservoir, from which a short duct arises and joins the germiduct. The excretory system was unable to make out.

From general anatomy it is certain that the present worm belongs to the Heterophyidae Odhner, 1914. It bears a superficial resemblance to *Siphoderina* Manter, 1934, and *Metadena* Linton, 1910, but differs fundamentally from either of them in the position of the vitellaria. A new genus *Pseudometadena* is, therefore, proposed for its reception, with the following diagnosis, and placed near *Metadena*.

Pseudometadena n. g.

Generic diagnosis. Heterophyidae Odhner, 1914. Body small, spined all over. Eye-spots and cervical gland present. Oral sucker terminal; prepharynx present; pharynx fairly well developed. Esophagus short. Ceca terminating at posterior extremity. Acetabulum muscular, pre-equatorial, median, embedded in acetabulogenital pouch formed by fold of body wall. Testes placed symmetrically one on each side of body behind acetabulum, dorsal or dorsomedial to ceca. Vesicula seminalis bipartite. Pars prostatica and prostate cells present. Neither cirrus nor cirrus pouch. Genital pore median, pre-acetabular, opening into acetabulogenital pouch. Ovary multilobate, median, ventral, postacetabular. Receptaculum seminis and Laurer's canal present. Vitellaria acinous, extending profusely in dorsal area behind testes, or in posttesticular extracecal fields. Uterus confined to hindbody posterior to testes. Eggs numerous, light brown, embryonated. Excretory vesicle? Parasitic in marine fish.

Genotype. *Pseudometadena celebesensis*.

WARETREMATIDAE Srivastava, 1939

syn. *Megalosolenidae* Skrjabin, 1942

Megalosolenidae Yamaguti, 1942

20. *Pseudohapladena scatophagi* n. g., n sp.

Pl. IV, Fig. 17.

Habitat. Small intestine of *Scatophagus arsus* (Cuv. et Valenc.).

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

Body elongate, with blunt-pointed extremities, 1.3-2.0 mm long, 0.25-0.35 mm at about middle. Cuticle beset with simple spines, which are most numerous and attain a maximum length of 11 μ on the head, hence diminishing in size and number toward the pos-

terior extremity. Oral sucker terminal, with subterminal aperture, $0.09-0.14 \times 0.12-0.16$ mm. No eye-spots. There is no bulbous or annular structure attached to the oral sucker. Prepharynx $0.1-0.25$ mm long, dilated at its posterior end to fit in unusually wide pharynx, with nerve commissure dorsal to its tubular anterior portion. Pharynx barrel-shaped, $60-100 \times 100-130 \mu$; showing special annular structure at its anterior end. On each side of the prepharynx there are masses of elongate gland cells which contain fine secretion granules and a rounded nucleus $2.5-4 \mu$ in diameter, and whose ducts are directed toward the anterior end of the pharynx; behind the pharynx as well as in its vicinity there are also pyriform dermal gland cells containing fine secretion granules and a rounded nucleus which is about 6μ in diameter and has a compact large nucleolus $1.5-2.4 \mu$ across. Esophagus 0.18 mm long by 15μ wide in the type, surrounded by accompanying cells, widened at its anterior end to fit in pharynx, but narrow for the rest, provided with inner circular and outer longitudinal muscle fibers, bifurcating at junction of anterior with middle third of body. Cecae flask-shaped and $0.19-0.21$ mm long by $0.1-0.11$ mm wide in the type but cylindrical in the paratypes, lined with cuticle at the very beginning, but with cylindrical epithelia elsewhere, terminating at level of posterior end of hermaphroditic pouch. Acetabulum $0.14-0.18$ mm in diameter, situated at level of intestinal bifurcation.

Testis single, oval, $0.21-0.3 \times 0.16-0.2$ mm, situated near posterior extremity, from which its posterior end is separated by a distance of $0.2-0.26$ mm. Vas deferens arising from anterior end of testis, running forward on dorsal side of uterus, entering vesicula seminalis externa at its posterior end. Vesicula seminalis externa oval, $0.1-0.15 \times 0.06-0.08$ mm, immediately behind hermaphroditic pouch. This pouch is club-shaped, $0.36-0.54$ mm long by $0.12-0.15$ mm broad, containing vesicula seminalis interna, pars prostatica, prostate cells, metraterm and hermaphroditic duct, and extends between the digestive canal and the acetabulum with its anterior portion arched over the acetabulum and its posterior end level with the cecal ends; its muscular wall, consisting exclusively of longitudinal fibers, is perforated by the metraterm near its posterior end. Vesicula seminalis interna oval to elliptical, $0.11-0.25$ mm long by $0.06-0.125$ mm wide, giving rise sideways near its

anterior end to a narrow duct which turns forward and passes into the more or less fusiform pars prostatica which in turn opens into the hermaphroditic duct by means of a short duct devoid of epithelial lining. This duct may well be called ductus ejaculatorius. The hermaphroditic duct is 0.25-0.28 mm long by 35-50 μ wide, and provided with inner circular and outer longitudinal muscles; it receives at the posterior end the ductus ejaculatorius and metratrem, but the latter, being much wider than the ejaculatory duct and consisting of inner circular and outer longitudinal muscle fibers like the hermaphroditic duct, appears as if it were the direct continuation of the hermaphroditic duct. The prostate cells extend from the proximal portion of the hermaphroditic duct over the internal seminal vesicle where the efferent duct of the vesicle arises, surrounding the pars prostatica on all sides. There is a comparatively shallow genital atrium which opens midventrally just in front of the acetabulum.

Ovary ovoid; 100-110 \times 60-90 μ , situated ventrally directly in front of testis. The germiduct, arising from the anterodorsal side of the ovary, forms a bulbous dilatation 20-25 μ in diameter in front of the testis and soon curves ventrally to receive the vitelline duct, giving off the Laurer's canal at this point of turning. Laurer's canal proceeding at first dorsally and then posteriorly, opening on dorsal surface at about level of middle of testis; it may form near its origin a fusiform swelling which is 15-20 μ wide and filled with spermatozoa. Uterus extending between testis and hermaphroditic pouch, occupying entire breadth of body between two anterior vitelline lobes. Eggs elongate oval, thin-shelled, operculate, 63-66 μ by 36-39 μ in life, contained ovum not segmented. Vitelline gland consisting of 6 wide, tubular, more or less irregularly outlined lobes; one on each side of uterus beginning at level of external seminal vesicle, and the other four (two lateral and two median) occupying almost entire posttesticular region. In the type one of the two lateral lobes of the posterior group extends alongside the testis as far as the posterior end of the uterus, while the other does not reach the equatorial level of the testis; both terminate short of the posterior extremity, though reaching it in the paratype. The two median (one dorsal and one ventral) lobes of the same group extend between the testis and the posterior extremity. The two ducts from the anterior lateral vitelline lobes run transversely in

front of the testis toward each other to unite at a point in the dorsal median line toward which are converged the ducts from the post-testicular vitelline lobes. The median lobes of this posterior group apparently join together at their anterior ends and give rise to a common middorsal duct which receives the duct coming up obliquely from the left lobe across the dorsal side of the testis and then the duct from the right lobe just before meeting the transverse ducts mentioned above. From the junction of the ascending with the transverse ducts arises the common vitelline duct which proceeds obliquely forward and opens into the germiduct before the latter becomes abruptly expanded into the uterus.

Excretory vesicle Y-shaped, with narrow terminal pore; the stem running forward dorsal to the testis divides between the ceca and the hermaphroditic pouch into two short arms, from each end of which is given off a collecting vessel reaching as far as the level of the nerve commissure where it turns back on itself to take the same course as before; the course of the terminal capillaries have not been followed out. Lymph system unknown.

The present genus resembles *Hapladena* Linton, 1910, more closely than any of the other genera of the family Waretrematidae Srivastava, 1939, but differs from it in the structure and extent of the vitellaria¹⁾ as well as in the posterior extent of the intestinal crura. It may be defined as follows.

Pseudohapladena n. g.

Generic diagnosis. Waretrematidae Srivastava, 1939, with characters of the family. Body small, elongate, covered with spines. Prepharyngeal and dermal glands well developed. Eye-spots absent. Oral sucker terminal, with subterminal aperture. Prepharynx long. Pharynx large. Esophagus moderately long; ceca unusually short, saccular. Acetabulum about one third of body length from anterior extremity. Testis single, median, near posterior extremity. Vesicula seminalis externa present. Hermaphroditic pouch containing vesicula seminalis interna, prostate complex, metraterm and hermaphroditic duct. Genital atrium present. Genital pore preacetabular. Ovary pretesticular, ventral. Receptaculum seminis absent. Laurer's canal present. Uterus between testis and hermaphroditic pouch. Vitellaria tubular, divided into two groups. Excretory vesicle Y-shaped. Lymph system unknown. Parasites of marine fishes.

1) In this respect the present species bears a superficial resemblance to *Deradena acuta* Linton, 1910.

Genotype. *Pseudohapladena scatophagi*.

HEMIURIDAE Lühe, 1901

21. *Aphanurus caesionis* n. sp.

Pl. II, Fig. 10.

Habitat. Stomach of *Caesio kuning* (Cuv. et Valenc.).

Material and locality. One mature specimen fixed in acetic sublimate under a cover glass, stained and mounted in toto; Macassar.

Body plump, with blunt conical extremities, 1.06×0.26 mm; forebody tapering more abruptly than hindbody. Cuticle without folds or denticulations. Oral sucker subterminal, 70×80 μ ; pharynx globular, 50 μ in diameter. Esophagus about 45 μ long, widened out posteriorly. Ceca wide, terminating 80 μ from posterior end of body. Acetabulum 0.19 mm in diameter, with its center at anterior end of middle third of body.

Testes spherical, 50–60 μ in diameter, situated a little obliquely behind middle of body. Vesicula seminalis subcylindrical, strongly muscular, 0.24 mm long by 60 μ wide, extending longitudinally from right end of ovary to level of posterior end of acetabulum between right testis and right cecum, partly covered ventrally by uterus. Pars prostatica straight, well differentiated, dorsal to acetabulum, 0.16 mm long, surrounded throughout by prostate cells, united with uterus ventral to intestinal bifurcation. Ductus hermaphroditicus tubular, with very thin delicate wall, 0.13 mm long, 5–10 μ wide, enclosed in a cylindrical sheath which is 20–25 μ wide and consists of longitudinal muscle fibers. Genital pore ventral to posterior end of oral sucker.

Ovary transversely elongated, 60×90 μ , situated ventrally on right of median line at posterior end of middle third of body, with posterior end of vesicula seminalis dextrodorsally. Vitelline gland compact, 105×175 μ , with a pronounced indentation on its anterior border, lying ventrally immediately behind ovary. Receptaculum seminis uterinum conspicuous. Uterus extending to posterior extremity, coiled dorsal and dorsolateral to ovary and then ventral to left testis, finally running straight forward on the left of pars prostatica. Eggs elliptical, $21-24 \times 10-12$ μ . Excretory pore terminal; excretory arms uniting dorsal to pharynx.

This species differs from the most closely related *Aphanurus harengulae* Yamaguti, 1938, and *A. microrchis* Chauhan, 1945, chiefly in the vesicula seminalis being subcylindrical and strongly muscular, in the prostatic cells surrounding the whole length of the well differentiated pars prostatica, and in the complete absence of cuticular denticulations.

22. *Aponurus carangis* n. sp.

Pl. I. Fig. 2.

Habitat. Stomach of *Caranx* sp.

Material and locality. A single whole mount; Macassar.

Body subcylindrical, very small, only 0.58 mm long, 0.12 mm broad at ovariovitellarian level; forebody tapering anteriorly, hindbody nearly uniform in breadth and rounded at posterior end. Cuticle thin, unarmed, Preoral lobe prominent, 9μ thick. Oral sucker subterminal, 36μ long by 45μ broad, directly followed by pharynx 15μ long by 27μ broad. Esophagus short; ceca terminating at posterior extremity. Acetabulum prominent, 102μ in diameter, at junction of anterior with middle third of body.

Testes subglobular, ventral, directly tandem behind acetabulum; anterior testis $63 \times 60\mu$, equatorial; posterior testis 63μ long, 36μ thick. Vesicula seminalis oval, about 20μ in diameter, preacetabular; pars prostatica only slightly curved, with dense coat of prostate cells. Hermaphroditic pouch oval, small, 18μ in diameter. Genital pore immediately behind intestinal bifurcation.

Ovary transversely elongated oval, $45 \times 70\mu$, situated ventrally at posterior end of middle third of body. Receptaculum seminis elongate, 60μ by 35μ , lying obliquely dorsal to posterior testis and ovary. Vitellaria ventral, just posterior to ovary, divided into seven rounded lobes $35 - 50\mu$ long by $30 - 40\mu$ broad, of which three are on the right and four on the left. Uterus filling up all available space of hindbody except the narrow area between acetabulum and anterior testis, finally running to hermaphroditic pouch ventrosinistral to vesicula seminalis and pars prostatica. Eggs elliptical, $30 - 33 \times 14 - 15\mu$. Excretory arms uniting dorsal to pharynx.

This species is characterized by the unusually small size of the body, by the postbifurcal genital pore, and by the vesicula seminalis, pars prostatica and hermaphroditic pouch being very poorly differentiated.

23. *Lecithochirium lobatum* n. sp.

Pl. VI, Fig. 26.

Habitat. Stomach of *Sphyræna* sp. (type host) and *Caranx* sp.

Material and locality. Three gravid specimens (two from type host), fixed in acetic sublimate under cover glass pressure, stained and mounted; Macassar.

Body approximately fusiform. 3.27–4.7 mm in length, with maximum breadth of 1.2–1.8 mm in ovariovitellarian region. Tail conical, 0.5–0.66 mm long, entirely retracted into body. Cuticle thick, with or without transverse wrinkles. No ventral pre-acetabular pit. Oral sucker subterminal, $0.22-0.28 \times 0.31-0.4$ mm, pharynx $0.12-0.16 \times 0.11-0.17$ mm. Esophagus about 0.12 mm long; ceca wide, lined with cuticle at very beginning, terminating close together at posterior end of tail. Acetabulum 0.7–0.85 mm in diameter, at junction of anterior with middle third of body.

Testes subglobular, $0.14-0.4 \times 0.18-0.45$ mm, symmetrical or a little oblique, at about middle of body. Vesicula seminalis sigmoid, tripartite, largest basal portion immediately in front of acetabulum, 0.1–0.24 mm in diameter; anterior portion 90–120 μ wide, on left of median line close to dorsal wall of body; its tapering ventral distal end turning forward, strongly narrowed as it passes into the prostatic vesicle. Prostatic vesicle oval to elliptical, 0.14–0.18 mm long by 0.075–0.1 mm wide, filled with spermatozoa, surrounded on each side by a compact mass of prostate cells, whose ducts are converged toward the distal portion of the vesicle. Ductus ejaculatorius very short or nearly lacking. Ductus hermaphroditicus cylindrical, lined with corrugated cuticle, 0.12–0.17 mm long by 30–54 μ wide, opening into well developed, tubular, genital atrium 0.15–0.18 mm long. The parenchymatous tissue surrounding the hermaphroditic duct contains abundant muscular element and appears very compact. Genital pore immediately behind pharynx.

Ovary discoid, four-lobed, convex in front and concave behind, $0.2-0.24 \times 0.43-0.55$ mm, situated on the right of the median line or exactly in the median line a little behind middle of body. Vitellaria divided into 7 slender digitiform lobes, 4 on the right and 3 on the left or vice versa. Uterine coils not extending into tail. Metraterm 35–60 μ wide, provided with well developed longitudinal muscle fibers, running forward in median field ventral to vesicula

seminalis, joining ductus ejaculatorius to form hermaphroditic duct. Eggs elliptical, $15-20 \times 9-10 \mu$. Excretory arms uniting dorsal to anterior end of pharynx.

This species is easily distinguished from any of the known members of the genus by the distinctly lobed ovary. In other respects it bears a close resemblance to *L. caesionis* Yamaguti, 1942, though much larger. *Lecithochirium longicaudatum* may possess a lobed ovary, but is much larger and has a very long tail. The specific name refers to the lobate ovary.

MONODHELMINTHIDAE Dollfus, 1937

24. *Monodharmis arii* n. sp.

Pl. V, Fig. 24.

Habitat. Small intestine of *Arius* sp.

Material and locality. 13 mature specimens, seven fixed in acetic sublimate, stained with Heidenhain's hematoxylin; others fixed in alcohol, stained with Delafield's hematoxylin; Bandjermasin, Borneo.

Body flattened subcylindrical, with blunt ends, 0.75-1.32 mm in length 0.22-0.38 mm in maximum width at middle or near posterior extremity. Cuticle thin, unarmed (?). Oral sucker subterminal, $110-150 \times 105-156 \mu$. Prepharynx practically absent. Pharynx $48-60 \times 45-70 \mu$, its anterior end divided into three lobes. Esophagus $30-45 \mu$ long by $20-30 \mu$ wide, provided with moderately strong longitudinal muscle, bifurcating behind middle of anterior third of body. Ceca narrow, terminating some distance (0.2 mm in the type) in front of posterior extremity. Acetabulum very weakly muscular, 0.08-0.16 mm in diameter, situated just behind middle of body.

Testes subglobular to oval, unequal in size, $80-150 \times 50-105 \mu$, placed almost symmetrically anterolateral to acetabulum just inside ceca. Vesicula seminalis elongate, 0.1-0.21 mm long, constricted into two portions; the posterior portion 45μ wide in the type, lying obliquely ventral to ovary and immediately in front of right testis: the anterior portion 38μ wide in the type, bordering on right side of atrial pouch mentioned below; its anterior end tapers abruptly to a short narrow duct 18μ long, which opens into the oval pars prostatica measuring 42μ long by 30μ wide in the type. The

prostate cells extend not only over the pars prostatica but also over the distal end of the vesicula seminalis as well as around the narrow duct between the seminal vesicle and the pars prostatica. Since the pars prostatica opens directly into the genital atrium, there is neither the ductus ejaculatorius nor the cirrus. Cirrus pouch also lacking. The genital atrium is up to $50\ \mu$ in inside diameter and provided with very strongly developed concentric circular muscle fibers forming a ring $56-85\ \mu$ in outside diameter. It develops posteriorly a flask-shaped muscular accessory organ presenting a very characteristic structure; the basal swelling of this organ is $70-100\ \mu$ in outside diameter and has a very thick wall consisting of an outer and an inner thin layer of longitudinal muscle and a much thicker middle layer of strong radial muscle, and lies in the median field at the anterior end of the middle third of the body, being covered up posteriorly by a scyphiform coat of small pyriform gland cells containing opaque hyaline protoplasm. A hyaline mass of varying size and shape, probably the secretory product of these gland cells, is seen at the bottom of the flask; sometimes it is simply globular or scyphiform, sometimes it may fill up the lumen of the flask and project into the genital atrium in form of a dumb-bell, or it may present on the anterior surface a number of pointed horn-like projections, assuming a sea-urchin-like appearance. The neck portion of the flask consists also of three layers of muscle fibers, the inner and the outer layer being continuous with the corresponding layer of the basal swelling, but the thickest middle layer is made up exclusively of concentric circular muscle fibers. Genital pore midventral, at posterior end of anterior third of body.

Ovary subglobular, $50-90\ \mu$ in diameter, situated dorsally in median line or only a little to one side of it posterodorsal to accessory genital flask. The receptaculum seminis and Laurer's canal have not been observed with certainty. Uterine coils occupying whole posttesticular intercecal field; when fully developed they extend more laterally and posteriorly, so that the posterior part of the body bulges out to attain the maximum width. The distal portion of the uterus ascends on the dorsosinistral side of the genital atrium and opens into the latter near the genital pore. Eggs numerous, elliptical, moderately thick-shelled, $45-69 \times 23-39\ \mu$; contained ovum segmented, but not yet fully embryonated

when laid. Vitellaria consisting of 30-40 small follicular acini, extending along each side of body outside intestine for a distance of 0.13-0.26 mm, commencing at level of testes or immediately behind it. The symmetrical vitelline ducts cross the ceca ventrally and running inwards along the anterior borders of the testes unite with each other in the median line between the two testes to form a compact vitelline reservoir which is usually transversely elongated oval and measures up to 38 μ in diameter. Excretory vesicle V-shaped, divided at posterior end of body into two long, wide, symmetrical arms extending forward dorsal to uterus and ceca as far as level of esophagus; common stem very narrow, only 20 μ long in the type. In the specimens fixed in alcohol the excretory arms appear dark brown owing to presence of very fine excretory granules, and present an uneven contour. Further details could not be made out.

The present species bears a close resemblance to *Monodharmis torpedinis* Dollfus, 1937. The latter species is, however, too meagerly described to institute comparison. It seems to me that some misinterpretation is made by Dollfus in regard to the structure of the genital sinus and the position of the genital complex. This parasite is stated to have been found in the digestive tract of *Narcacion torpedo* but there is some doubt as to whether it is the natural habitat of the parasite. Secondary transmission due to ingestion of some natural teleostean definitive host may probably not be excluded. Dollfus' species is characterized by the oral sucker being definitely larger than the acetabulum (0.24 \times 0.22; 0.15 \times 0.11) and by the two testes being oblique and contiguous with each other and separated from the intestinal limbs. In *Mehratrema dollfusi* Srivastava, 1939, and *M. polynemusinis* Chauhan, 1943, the cirrus pouch is stated to be well developed, but in the present species it is practically absent or obsolete if any, and the acetabulum is very poorly muscular as in *M. polynemusinis*. In this latter species the excretory arms extending to the oral sucker are convergent in the testicular zone in contrast with those of *Monodharmis torpedinis* and *Monodharmis arii*.

25. *Prosogonarium arii* n. g., n. sp.

Pl. V, Figs. 21-23.

Habitat. Small intestine of *Arius* sp.

Material and locality. Numerous mature specimens fixed in acetic sublimate under a cover slip, stained with iron hematoxylin and mounted in balsam; Bandjermasin.

Body flattened pyriform or ellipsoidal, more or less pointed in front but broadly rounded behind, 1.2–2.6 mm in length with maximum breadth of 0.8–1.5 mm at about middle. Cuticle up to $4\ \mu$ thick, beset with minute slender spines 5–7 μ long. Subcuticular longitudinal and circular muscle fibers well developed, especially in neck region. At the anterior extremity is a hemispherical preoral lobe. In a younger paratype the conical anterior extremity is produced 65 μ beyond the oral sucker, along the anterior border of which open three pairs of the ducts of the larval penetration glands. Oral sucker subterminal, bowl-shaped, 0.1–0.175 \times 0.16–0.2 mm; prepharynx very short; pharynx 65–90 \times 70–96 μ , with its anterior end rolled up inwards. Esophagus 0.1–0.26 mm long, with comparatively weak longitudinal musculature, bifurcating just behind middle of anterior third of body. Ceca simple, arcuate, parallel to, and a little apart from, lateral margins of body, terminating at anterior end of caudal third of body. Acetabulum entirely different in structure from the usual form, embedded in body parenchyma at about midbody, consisting of a large (0.12–0.6 mm in diameter) globular mass of gland-like cells, with a central cavity and a slit-like ventral opening bordered by a thick layer of circular muscle from which fine muscle fibers are radiating. The cavity of the sucker is lined with cuticle 3–6 μ thick and reduced to a transverse slit (105 μ in transverse diameter in the type) owing to development, in its anterior wall, of 4 or 5 peculiar semicircular bolsters of lamellar muscle fibers. The largest outer bolster embracing the other three is 135 μ anteroposteriorly and 190 μ transversely in the type and shows a distinct lamellar structure, whereas the other bolsters are pressed against one another and appear chitinous and homogeneous. In the immature paratypes, however, all the bolsters still present a distinct original lamellar structure of fine muscle fibers.

Testes oval, 0.195–0.3 \times 0.13–0.24 mm, situated symmetrically in front of acetabulum just inside ceca, with their long axes nearly parallel to longitudinal axis of body. The two vasa efferentia, each arising from the anterior end of the corresponding testis, run inwards over the ventral surface of the ovary and open together

into the vesicula seminalis at its posterior end. There is a large, subcylindrical, comparatively thin-walled cirrus pouch extending on the right of the median line from the ventral side of the ovary to that of the posterior end of the esophagus in an arcuate or rectangular curve with the convexity directed dorsolaterally. It is 0.25–0.3 mm long by 0.06–0.1 mm wide, and contains an elliptical or subcylindrical vesicula seminalis 0.13–0.16 mm long by 50–90 μ wide and a well developed prostatic complex. The pars prostatica is tubular, 0.1–0.12 mm long and may be dilated proximally to a width of 65 μ , and opens directly into the base of the genital atrium at its anterodextral corner. The prostate cells, filling up all available space within the pouch analogous to the cirrus pouch, are most numerous at the distal end of the pouch which covers up dorsally the anterior part of the genital atrium. There is neither ductus ejaculatorius nor cirrus. The genital atrium, oval in contour and lined with thick cuticle, lies ventral to the posterior end of the esophagus and opens ventrally by a comparatively wide aperture, whose margin is surrounded by a strong circular muscle. From the dorsal wall of the atrium projects dorsoposteriorly or posterolaterally a very conspicuous subcylindrical, muscular sac 0.09–0.18 mm long by 0.08–0.15 mm wide. It consists of circular muscle fibers and has a tubular central cavity opening into the genital atrium and lined with cuticle. From the base of this cavity reaching to near the posterior end of the sac arises a digitiform process which is 70–90 μ long by 12–20 μ wide and projects a little into the genital atrium, and apparently consists of extremely fine longitudinal muscle fibers. Around the posterior end of the sac, especially behind it, there is a compact mass of fusiform gland cells directed convergently toward the base of the digitiform process. What the use of this sac is I am at a loss to say, but from its structure and position it seems very likely that it serves as an accessory genital apparatus.

The ovary, 0.21–0.31 \times 0.23–0.33 mm, consists of three subglobular to oval lobes and a small central cone from which the germiduct is given off, and lies in the dorsal median field behind the genital atrium, partly overlapping the accessory genital sac and the false cirrus pouch dorsally. In the somewhat contracted type it reaches to the anterior border of the acetabulum, but in an extended paratype it lies about 0.2 mm apart from this sucker; the ovarian

and testicular zones may overlap each other or may be directly continuous. In the type the three lobes measure 0.165×0.13 mm, 0.15×0.12 mm and 0.165×0.12 mm respectively. The narrow germiduct (Fig. 23, inverted) arising from the backwardly pointing tip of the ventral cone of the ovary runs backward sinuously and widens out abruptly ventral or immediately posterior to the ovary to form an elongate, somewhat curved receptaculum seminis $0.09 - 0.12$ mm long by $30 - 35 \mu$ wide. The posterior end of this receptacle is produced forward to receive the backwardly directed, pointed end of the vitelline reservoir, and leads into the wider uterine duct which may serve as receptaculum seminis uterinum. The Laurer's canal arising from the posterior end of the seminal receptacle proceeds dorsally and then backwards and opens to the outside in the median line dorsal to the anterior portion of the acetabulum. The shell gland cells are rather loosely massed around the proximal end of the uterine duct and in the vicinity of the seminal receptacle. The uterus, when fully developed, occupies not only the hindbody but also the lateral fields of the forebody, and may well reach to the pharynx and esophagus. The well differentiated metraterm extends obliquely forward across the acetabulum, and passing between the left testis and the ovary crosses the left vas efferens ventrally, and running arcuately ventral or ventrolateral to the left cecum opens into the base of the genital atrium at its posterosinistral corner. It is moderately wide and provided with a layer of longitudinal muscle fibers. Eggs elliptical, thin-shelled, emryonated, $66 - 81 \times 27 - 33 \mu$ in life. Each vitelline gland forming a bunch of 5 or 6, large, subglobular, oval or elliptical follicles $48 - 110 \mu$ long by $30 - 80 \mu$ wide lies along the intestinal limb outside the testis or the ovary; the vitelline ducts from the two sides run almost transversely in front of the testes and unite together ventral to the ovary to form a triangular vitelline reservoir, which is $30 - 90 \mu$ wide at the base, and whose pointed end is directed toward the distal end of the seminal receptacle. The large excretory pore, surrounded by circular muscle fibers, lies on the middorsal side of the body $0.12 - 0.4$ mm from the posterior extremity; the excretory vesicle consists of two wide, symmetrical, arcuate arms running forward by the sides of the acetabulum, and crossing the intestine ventrally just lateral to the testes reach to the pharynx or the esophagus, so that it assumes approximately a U-shape; the collecting vessel

arising from the ventral side of the anterior end of each arm proceeds backward a short distance and divides into two tubules, an anterior and a posterior; the anterior tubule ascends toward the oral sucker, while the posterior descends as far back as the posterior extremity.

The present worm bears a certain resemblance to *Tandanicola* Johnston, 1927, especially in the presence of an accessory genital organ and in the general topography of the digestive and reproductive organs as well as in the shape of the excretory vesicle. It cannot, however, be included in this genus and in the subfamily Tandanicolinae Johnston, 1937, because of marked differences in the structure of the acetabulum, in the presence of a male terminal sac, in the absence of the genital sac in the sense of Johnston (shown in his text-figures as c.s. = cirrus sac!), and in the excessive development of the uterus. In Johnston's species the uterus is confined to the median field, whereas in our species it may occupy nearly all available space in the whole body. Furthermore, it is to be noted that the seminal receptacle is a mere dilatation of the germiduct in the present parasite, whereas in the Australian species it is formed by dilatation of the Laurer's canal which is stated to arise "immediately before the oviduct enters the shell gland." In *Monodharmis* Dollfus and *Mehratrema* Srivastava the acetabulum is poorly developed and nearly as large as oral sucker or even smaller, the ovary is unlobed, the uterus does not form extracecal loops, and the vitellarian follicles are much smaller, more numerous and more extensive than in the present worm.

A new genus *Prosogonarium* is proposed and assigned to the family Monodharmithidae Dollfus, 1937.

Prosogonarium n. g.

Generic diagnosis. Monodharmithidae. Body small, plump. Cuticle beset with minute spines. Oral sucker subterminal. Pharynx small. Esophagus moderately long. Ceca terminating at about junction of middle with posterior third of body. Acetabulum embedded in parenchyma in middle third of body, consisting of a compact mass of glandular cells with a central slit-like cavity whose anterior wall is occupied by semicircular bolsters of lamellar muscle fibers, and whose external opening is bordered by strong circular muscle. Testes entire, symmetrical, pre-acetabular, intercecal. Male terminal sac enclosing vesicula seminalis, pars prostatica and prostate cells, situated on one side of median line near intestinal bifurcation. No cirrus proper. Genital atrium large, opening midventrally in

front of ovary, receiving pars prostatica at its anterodextral corner and metraterm at its posterosinistral corner, with a muscular accessory sac between metraterm and false cirrus pouch. Ovary trilobate, situated in dorsal median field in front of and between two testes. Receptaculum seminis and shell gland ventral or posterior to ovary. Laurer's canal present. Vitelline gland consisting of few, comparatively large follicles, situated symmetrically along intestinal limbs lateral to testes or ovary. Uterus occupying most of hindbody, may intrude into lateral fields of forebody. Metraterm well differentiated. Eggs innumerable, embryonated. Excretory vesicle U-shaped; arms wide, reaching to near anterior extremity. Parasitic in marine or brackish water fishes.

Genotype. *Prosogonarium arii*.

PROSOGONOTREMATIDAE Pérez Viguera, 1940

26. *Prosogonotrema clupear* n. sp.

Pl. III, Fig. 11.

Habitat. Stomach of *Clupea (Amblygaster) clupear*.

Material and locality. Two fully gravid specimens and three immature ones. Unless otherwise stated the following description is based on mature specimens; Macassar.

Body plump, fusiform, blunt-pointed or rounded off at extremities of which the posterior may be notched, flexed dorsally at level of acetabulum, with coarse transverse wrinkles throughout, 9 mm long, 4 mm wide at middle. Cuticle very thick, smooth. Preoral lobe very prominent, 0.275 mm thick, not two lobed in contrast with *Prosogonotrema bilabiatum* Pérez Viguera, 1940. Oral sucker subterminal, 0.94–1.0 mm in diameter. No prepharynx. Pharynx 0.38–0.4×0.4 mm. Esophagus very short. Ceca running transversely and then turning backward at nearly right angles, with sinuous, folded wall, winding irregularly in hindbody, terminating blindly close to each other at posterior extremity. Acetabulum prominent, 2.9–3.1 mm in diameter, occupying most of middle third of body, with its center a little behind equator.

Testes ovoid, 0.6–0.75×0.4–0.5 mm, situated almost symmetrically medial to ceca at about junction of anterior two thirds of body with their long axis oblique or transverse. The intertesticular space is free in the type but occupied in the paratype by vesicula seminalis and partly by the uterine coils. Vesicula seminalis tubular, 0.06–0.15 mm wide, convoluted between testes or in front of left testis. Pars prostatica strongly developed, twisted, situated

between vesicula seminalis and genital cone. Ductus ejaculatorius about $30\ \mu$ wide, convoluted at base of genital cone in the close-set muscle fibers, which are continued onto the posterior part of the genital atrium. Genital cone blunt-pointed, 0.62-0.65 mm long, 0.3-0.32 mm wide at base, corrugated transversely, especially at its posterior part, covered with thick cuticle, consisting of longitudinal muscle fibers and containing in the central axis the straight or somewhat undulating distal portion of ductus ejaculatorius and the metraterm. It fills up almost entire genital atrium, leaving a narrow space between. Genital atrium lined with thick folded cuticle, opening outside ventral to pharynx.

Ovary oval, 0.65×0.45 mm, situated obliquely in the type anterodextral to acetabulum just in front of equator. In the paratype, however, it lies a little more medially, and in all the immature specimens it is exactly median and directly preacetabular. Receptaculum seminis and Laurer's canal apparently lacking. Shell gland compact, immediately posterior to ovary (posterolateral to ovary in immature specimens), enclosing fusiform ootype. Uterine coils occupying whole space between acetabulum and testes, extending anterolaterally to right or left testis and finally leading into metraterm. They may well overreach the ceca ventrally anterolateral to the acetabulum, and may or may not intrude into the intertesticular area. Metraterm narrow, winding on ventral side of convoluted ductus ejaculatorius, then running straight forward through genital cone, at the tip of which it opens into the genital atrium ventral to the male aperture. Eggs elliptical, $27-30\ \mu$ long, embryonated. Vitellaria forming slender, convoluted, partly branched tubules, extending for the most part along outside of ceca; in the type the right gland crosses the right cecum ventrally and passing anterior to the right testis, and dorsal to the vesicula seminalis and left testis reaches as far as the left side of this last named organ. The stems from the two sides unite with each other just before joining the germiduct; there is no vitelline reservoir.

Excretory pore dorsal, close to posterior extremity; excretory vesicle divided dorsal to acetabulum into two very wide arms which have finely sinuous wall and are united with each other dorsal to the pharynx.

The present species differs from the only known member of the genus *P. bilabiatum* in body size, in the absence of the bilobate

preoral lip, in the length of the eggs and also in other respects, but unfortunately a more detailed comparison is unable to make because the author of the genotype has made some misinterpretations which may be pointed out as follows.

1. The esophagus has been obviously overlooked.
2. There are a tubular winding vesicula seminalis and a well developed prostatic complex, though not mentioned.
3. Los conductes deferentes forman un largo tubo que describe numerosas asas localizadas en las areas laterales de la zona uterina,..... This tubular organ is the vitelline gland as is evident from the contents therein.
4. "La bolsa del cirrus" is not the true cirrus pouch, because the cirrus which he considers to be, containing the metraterm, too, should be called "genital cone". The "vesicula seminal que describe varias asas" which is contained in the "bolsa del cirrus" corresponds to the convoluted ductus ejaculatorius, and not to the true seminal vesicle, which lies entirely outside the basal muscular tissue of the genital atrium.
5. "Las glándulas vitelógenas están reducidas a 7 u 8 folículos compactos pequeños, unidos, y próximos al borde posterior del ovario y delante de acetabulum". It seems very likely that he mistook the vitellarian convolutions or the optical sections of them for the vitelline follicles.

The diagnosis of the genus *Prosogonotrema* and that of the family Prosogonotrematidae are emended as follows.

Prosogonotrematidae Pérez Viguera, 1940, emended.

Family diagnosis. Digenea van Beneden, 1858. Body robust. Acetabulum very large, wide apart from oral sucker. Pharynx present. Ceca long. All genitalia in forebody. Testes two, in front of main bulk of uterus. Vesicula seminalis and prostatic complex well developed. Genital cone containing terminal ducts of both sexes, enclosed in genital atrium. Genital pore ventral, near anterior extremity. Ovary posttesticular, uterus winding for the most part between acetabulum and testes. Vitellaria tubular, very long and slender, mainly lateral to ceca. Excretory system Y-shaped, with the arms united anteriorly. Parasites of marine fishes.

Type genus. *Prosogonotrema* Pérez Viguera, 1940.

Prosogonotrema Pérez Viguera, 1940, emended.

Generic diagnosis. Prosogonotrematidae Pérez Viguera, 1940, with emen-

ded characters (v.s.). Body large, subcylindrical to fusiform, covered with thick, smooth cuticle. Oral sucker subterminal, surmounted by two-lobed or simple preoral lobe and directly followed by pharynx. Esophagus very short; ceca winding, reaching to posterior extremity. Acetabulum much larger than oral sucker, nearer to posterior extremity than to anterior extremity. Testes juxtaposed, intercecal. Vesicula seminalis tubular, winding, chiefly in front of testes. Pars prostatica winding, surrounded throughout by dense layer of prostate cells. Ductus ejaculatorius convoluted, embedded in muscular tissue at base of genital cone, its terminal portion running through genital cone, at the tip of which it opens into the genital atrium. Genital pore posterior or ventral to pharynx. Ovary anterolateral to acetabulum (may be median in immature examples). Shell gland posterior or posterolateral to ovary. Receptaculum seminis and Laurer's canal absent (?). Vitelline gland mainly extracecal, partly intruding into intercecal field; no definite vitelline reservoir. Uterus coiled transversely between testes and acetabulum, may or may not pass between two testes; metraterm running through genital cone and opening at its tip. Eggs numerous, rather small.

Genotype. *Prosoгонотрема билбиатум* Pérez Vigueras, 1940.

Other species. *P. clupear* n. sp.

Literature

Chandler, Asa C., Parasites of fishes in Galveston Bay. Proc. U. S. Nat. Mus., 83 (2977), 113-157, 1935. — Chauhan, B. S., Trematodes from Indian marine Fishes. Part III. Description of a New Species of the Genus *Mehratrema* (Family Monodheminthidae Dollfus, 1937). Proc. Ind. Acad. Sci. 17, 133-137, 1943. — Chauhan, B. S., Trematodes from Indian marine Fishes. Part IV. On some Trematodes of the Family Hemiuridae Lühe, 1901, with Description of Six New Forms. Proc. Ind. Acad. Sci. 21, 160-173, 1945. — Dollfus, R. P., Les Trématodes Digenea des Sélaciens (Plagiostomes). Catalogue par hôtes. Distribution géographique. Ann. par. hum. et comp. 15 (2), 164-176, 1937. — Harshey, K. R., On two new trematodes of the genus *Opegaster* Ozaki, with a systematic discussion on the families Opecoelidae Ozaki, 1925 and Coitocaecidae Ozaki, 1928. Proc. Ind. Acad. Sci. 5 (2), 68-70, 1937. — Johnston, T. H., New trematodes from an Australian Siluroid. Trans. Proc. Roy. Soc. South Australia. 51, 1927. — Layman, E. M., Parasitic worms from the fishes of Peter the Great Bay. Bull. Pacif. Scient. Fish. Res. Inst. 3 (6), 97-98, 1930. — Linton, E., Fish parasites collected at Woods Hole in 1898. U. S. Fish Comm. Bull. for 1899, 297-298, 1900. — Linton, E., Helminth fauna of the Dry Tortugas. Pap. Tortugas Lab. Carneg. Inst. Wash. Vol. 4, 11-98, 1910. — Looss, A., Beiträge zur Systematik der Distomen. Zur Kenntnis der Familie Hemiuridae. Zool. Jahrb., Syst. 26, 169, 1908. — Manter, H. W., Some digenetic trematodes of marine fishes of Beaufort, North Carolina. Parasit. 23 (3), 396-411, 1931. — Manter, H. W., Some marine

fish trematodes of Maine. Jour. Par. 12 (1), 13-14, 1925. — Manter, H. W., Some digenetic trematodes from deep-water fish of Tortugas, Florida. Pap. Tortug. Lab. Vol. 28, Carneg. Inst. Wash. Publ. No. 435, 261-345, 1934. — Manter, H. W., The structure and taxonomic position of *Megasolena estrix* Linton 1910 (Trematoda) with notes on related trematodes. Parasit. 27 (3), 431-439, 1935. — Manter, H. W., Digenetic trematodes of fishes from the Galapagos Islands and the neighboring Pacific. Allan Hancock Pacif. Exped. 2 (14), 329-497, 1940. — Manter, H. W., The digenetic trematodes of marine fishes of Tortugas, Florida. Amer. Midl. Nat. 38 (2), 257-416, 1947. — Nicoll, W., The trematode parasites of North Queensland. III. Parasit. 8 (1), 33-34, 1915. — Odhner, T., Zum natürlichen System der digenen Trematoden. Zool. Anz. 37, 249-250, 1911. — Pande B. P., Two new fish trematodes from Allahabad. Proc. Nat. Acad. Sci. India, 7 (2), 113-115, 1937. — Park, J. T., A revision of the genus *Podocotyle* (Allocreadiinae) with a description of eight new species from tide pool fishes from Dillon's beach, California. Jour. Parasit. 23 (4), 405-422, 1937. — Shipley, A. E. and Hornell, J., Further report on parasites found in connection with the Pearl Oyster Fishery at Ceylon. Rep. to the Govern. of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar. Part 3, 53-54, 1905. — Srivastava, H. D., The Morphology and Systematic Relationship of a New Genus of Digenetic Trematode belonging to the Family Monodhalmidae (Dollfus, 1937). Ind. Jour. Vet. Sci. & Anim. Husband., Delhi. 9 (1), 97-99, 1939. — Viguera I. Pérez, Prosogonotremidae n. fam. y *Prosogonotrema bilabiatum* n. gen. n. sp. (Trematoda, Distomata) parasito de *Ocyurus chrysurus* Bloch (Pisces). Mem. Soc. Cub. Hist. Nat. 14 (3), 249-252, 1940. — Yamaguti, S., Studies on the helminth fauna of Japan. Part 2. Trematodes of fishes, I. Jap. Jour. Zool. 5 (3), 249-541, 1934. — Yamaguti, S., Studies on the helminth fauna of Japan. Part 16. Trematodes of fishes, III. Published by author, Kyoto. 3-5, 1936. — Yamaguti, S., Studies on the helminth fauna of Japan. Part 21. Trematodes of fishes, V. Published by the author, Kyoto. 139 pp., 1938. — Yamaguti, S., Studies on the helminth fauna of Japan. Part 26. Trematodes of fishes, VI. Jap. Jour. Zool. 8 (2), 211-230, 1939. — Yamaguti, S., Studies on the helminth fauna of Japan. Part 31. Trematodes of fishes, VII. Jap. Jour. Zool. 9 (1), 35-108, 1940. — Yamaguti, S., Studies on the helminth fauna of Japan. Part 39. Trematodes of fishes mainly from Naha. Biogeographica. 3 (4), 329-398, 1942.

Explanation of Plates

Plate I

- Fig. 1. *Bucephalus sphyraenae* n. sp., ventral view.
 Fig. 2. *Aponurus carangis* n. sp., ventral view.
 Fig. 3. *Opegaster longivesicula* n. sp., ventral view.
 Fig. 4. *Paracryptogonimus ovatus* n. sp., ventral view.

Fig. 5. *Opisthomonorchis carangis* n. g., n. sp., ventral view.

Plate II

- Fig. 6. *Bucephalopsis tenuis* n. sp., ventral view.
 Fig. 7. *Podocotyle serrani* n. sp., ventral view.
 Fig. 8. *Prosorhynchus chorinemi* n. sp., ventral view.
 Fig. 9. *Opecoelus piriformis* n. sp., ventral view.
 Fig. 10. *Aphanurus caesionis* n. sp., ventral view.

Plate III

- Fig. 11. *Prosogonotrema clupeae* n. sp., ventral view.
 Fig. 12. *Diplolasiotocus chaetodontis* n. g., n. sp., dorsal view.
 Fig. 13. *Bucephalus retractilis* n. sp., dorsal view.
 Fig. 14. *Plagioporus (Plagioporus) tongivesicula* n. sp., ventral view.
 Fig. 15. *Diplobulbus scari* n. sp., ventral view.

Plate IV

- Fig. 16. *Podocotyle gracilis* n. sp., lateral view.
 Fig. 17. *Pseudohapladena scatophagi* n. g., n. sp., lateral view.
 Fig. 18. *Plagioporus (Plagioporus) macassarensis* n. sp., ventral view.
 Fig. 19. *Opegaster gobii* n. sp., ventral view.
 Fig. 20. *Pseudolepidapedon lethrini* n. sp., ventral view.

Plate V

- Fig. 21. *Prosogonarium arii* n. g., n. sp., ventral view.
 Fig. 22. Same, lateral view.
 Fig. 23. Shell gland complex of *Prosogonarium arii*, ventral view, inverted.
 Fig. 24. *Monodharmis arii* n. sp., ventral view.

Plate VI

- Fig. 25. *Pseudometadena celebesensis* n. g., n. sp., ventral view.
 Fig. 26. *Lecithochirium lobatum* n. sp., ventral view.
 Fig. 27. *Plagioporus (Caudotestis) synagris* n. sp., ventral view.
 Fig. 28. *Marsupioacetabulum marinum* n. g., n. sp., ventral view.

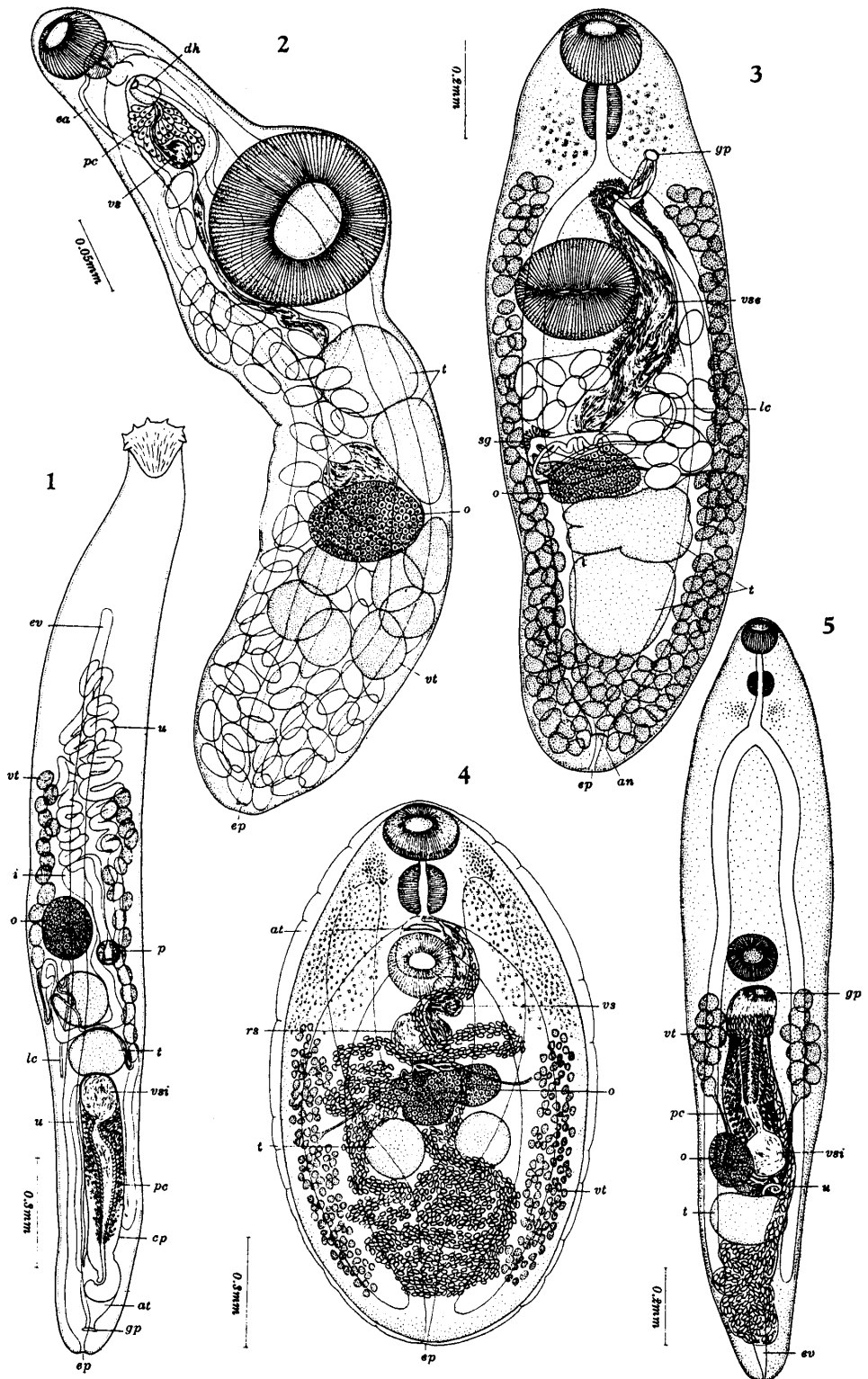
Abbreviations used in Figures

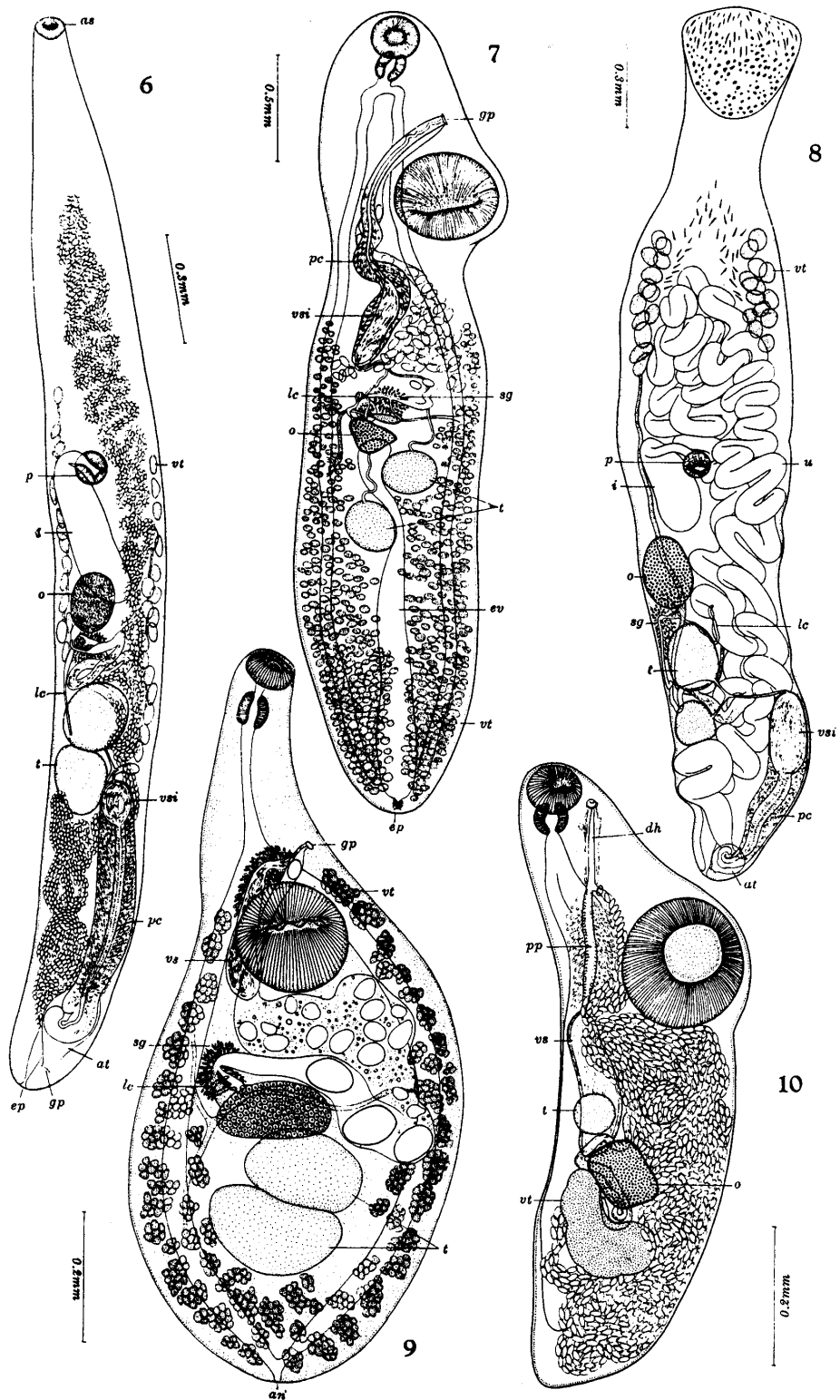
a = acetabulum, an = anus, ao = accessory organ, ap = preacetabular pit,
 as = anterior sucker, at = genital atrium, c = cirrus, cg = cervical gland,
 cp = cirrus pouch, dh = ductus hermaphroditicus, d = vas deferens, ea =
 excretory arm, ep = excretory pore, ev = excretory vesicle, gc = genital cone,
 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 = re-
ceptaculum 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 . I

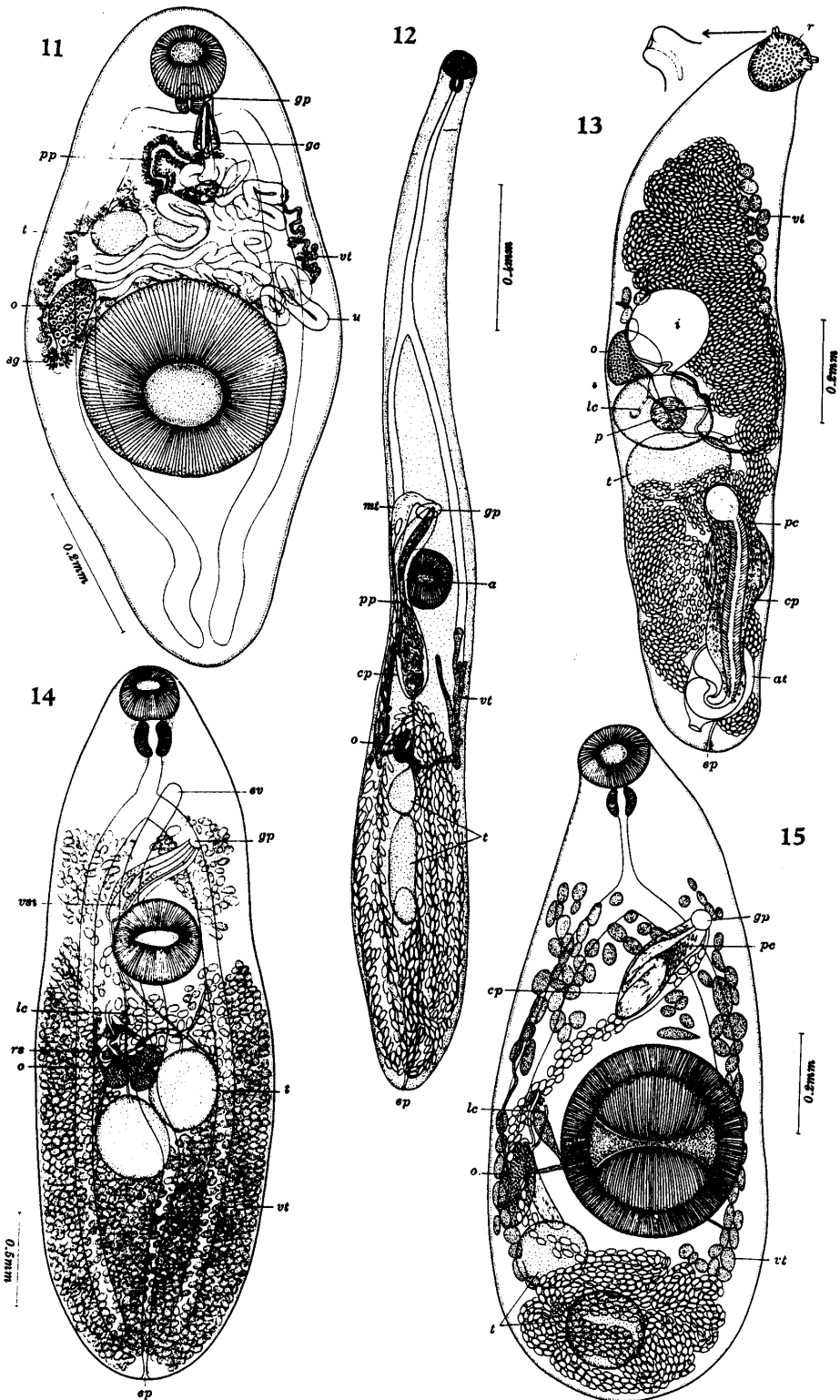
Pl. I





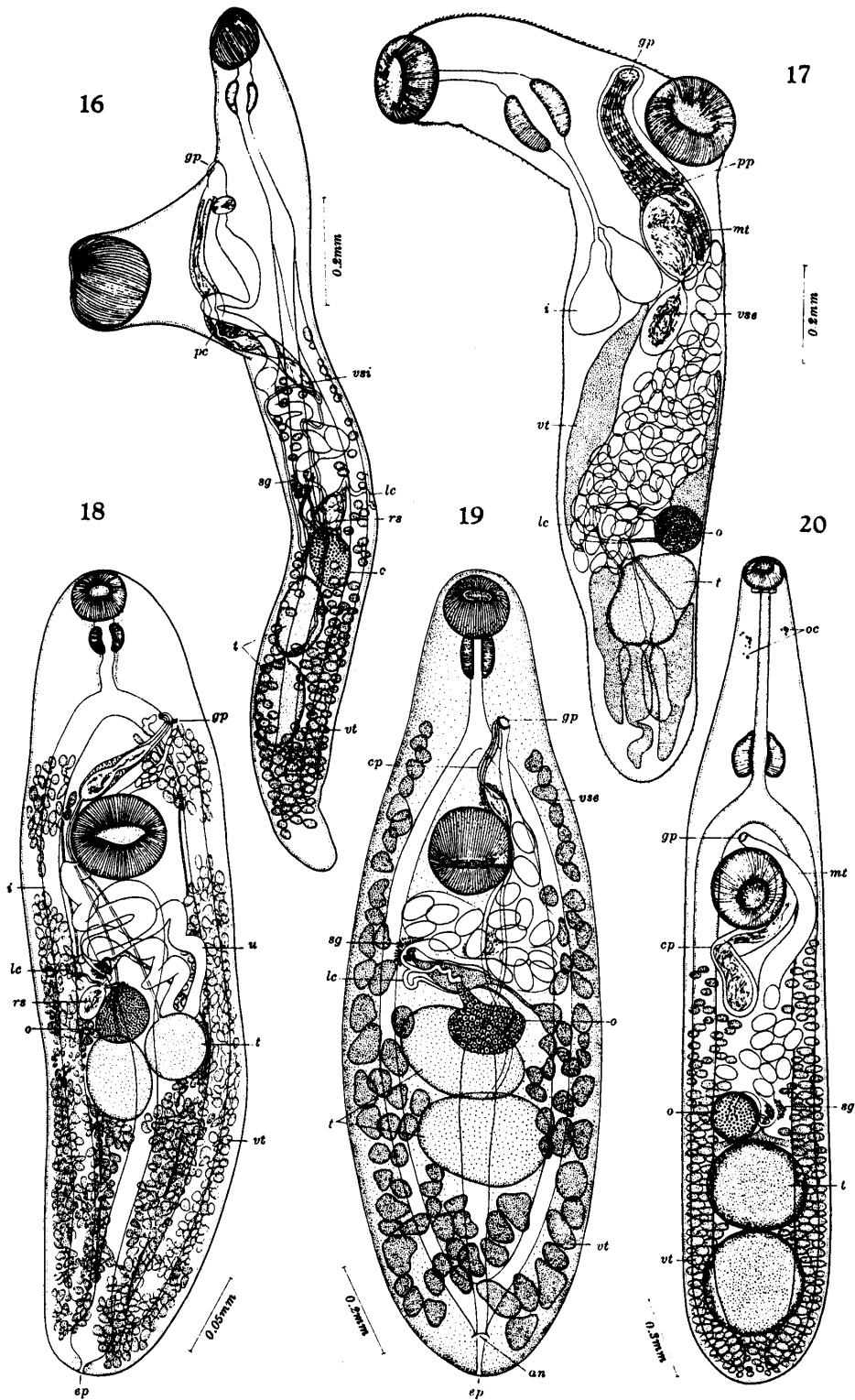
YAMAGUTI: DIGENETIC TREMATODES OF FISHES. I

Pl. III



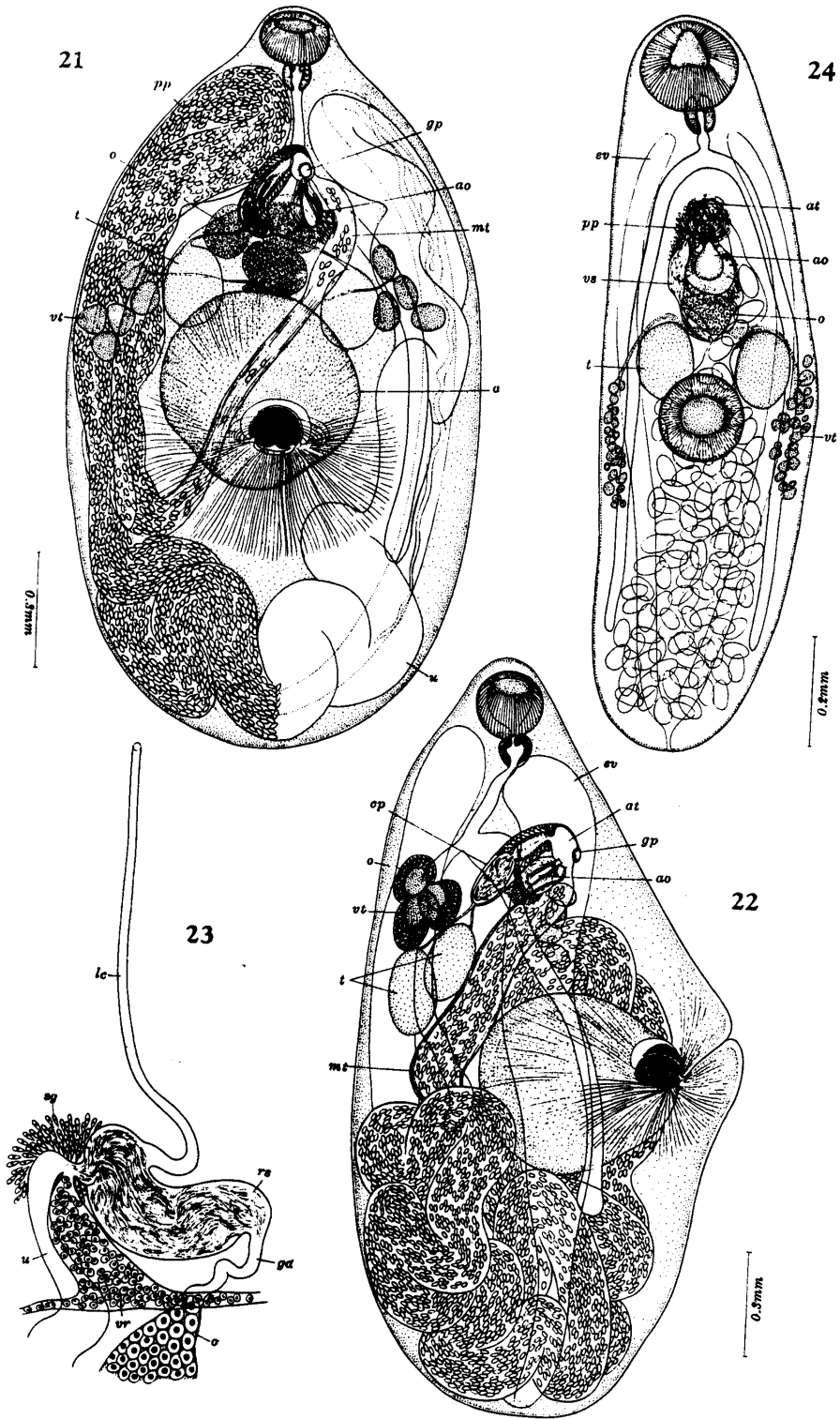
YAMAGUTI: DIGENETIC TREMATODES OF FISHES . I

Pl. IV



YAMAGUTI: DIGENETIC TREMATODES OF FISHES. I

Pl. V



YAMAGUTI: DIGENETIC TREMATODES OF FISHES . I

Pl. VI

